perfomative interfaces

mixed reality environment

distributed systems and
parallel archives for the web

cast01

// living in mixed realities

netzspannung.org event //

September 21 – 22, 2001
Schloss Birlinghoven (near Bonn)

Conference on artistic, cultural and scientific aspects of experimental media spaces

netzspannung.org/cast01

cultural archives

interactive tv

awareness, memory space and knowledge discovery

tracking tracing vision systems

hypermedia formats

proceedings

cast01 // living in mixed realities

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Conference on artistic, cultural and scientific aspects of experimental media spaces

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content

editorial

living in mixed realities

Starting into a new millenium, the ongoing discussions and research around Mixed Realities are a current challenge: they offer new ways of perceiving, new means of applications, new mixtures of awareness for scientists, artists and the public. After the conference on Mixed Reality in Yokohama, in Japan in March 2001, the conference „living in mixed realities" broadens the aspects of Mixed Reality that are under discussion. In contrast to the categories and topic developed there, the contribution of this conference in Schloss Birlinghoven is in the areas of artistic productions, mixed reality environments, awareness, memory space and knowledge discovery, agents and narrative intelligence, performative interfaces as well as the areas of architectures for the web, hypermedia formats (XML, VRML, MPEG-4, MPEG-7), tracking and vision systems.

These proceedings are the second, and a very special issue of the magazine *netzspannung.org/journal*. They represent the broad range of issues that are examined by scientists and artists in this domain.

The goal of the conference „Living in Mixed Realities" is to give a representative overview on recent projects in the field of Mixed Reality research on an international level.

The following topics are in the core of this conference: 1) Understanding Mixed Reality? Spaces for emergent communication, 2) The Information Society Landscape/ New Formats of Expression in EU/IST projects, 3) Networked Living/ Connected Citizen, 4) netzspanung.org/ From digital Archives to Mobile Units, 5) Tools and Strategies for Intermedia-Production, 6) Performative Perception/ The Body as Instrument, 7) Media Art Education /Teaching New Media.

The presentation of the conference results online is an integral part of the conception of this volume.

The papers and posters collected here are recent projects by outstanding scientists, artists, architects and designers. The artistic and scientific committee had the very challenging task of choosing among 450 submissions. The electronic workspace of netzspannung.org was used as a platform to organize the entire submission and review process, the careful selection of papers, posters and screenings.

The proceedings present all the scientific and artistic projects within the seven main themes of this conference. An online version is integrated into and represented by a knowledge discovery map, which allows navigation through this compilation of knowledge.

Among the events around the conference are the presentation of the results of >digital sparks< competition, the launch of the internet media lab netzspannung.org, the mobile unit, projects to enhance the awareness of the public for the dynamics of productions in this field.

Enjoy reading!

netzspannung.org/journal editors
Andrea Helbach, Dr. Ingrid Leonie Severin

chairs preface

cast01// communication of art, science and technology

Monika Fleischmann, Wolfgang Strauss
MARS Exploratory Media Lab, Fraunhofer Institute for Media Communication

For the first time, the conference cast01// communication of art, science and technology is taking place in September 2001. The intention of the conference is to present the status of research, theory and teaching on the subject of "Living in Mixed Realities" from such different perspectives as media art and interface design, as well as information technology and media communications. The dialogue among researchers, artists, and designers is intended to stimulate intercultural co-operation to reflect on and improve life in a digital networked society.

"The dependence of society on knowledge is accompanied by the decay of the authority of experts. That creates space for global and local networks of distributed alternative knowledge", writes the Heinrich Böll foundation in their online education portal.[1] Life in the knowledge society presupposes that diverse disciplines develop ideas together. How are such networks structured? How does information become knowledge? How does knowledge become public? Which knowledge is important for the individual in society? How are journalists, instructors or curators involved in the process of intermediation? What examples are there for a culture of networking, for the linking of public and electronic space? Which meaning has electronic surveillance, the control of space, local and global communication for our society? Which new models and formats does Mixed Reality space offer for discussion, exhibition and production?

On the European level, the Information Society Technologies (IST)[2] programme and its constituent Intelligent Information Interface (I[3])[3] programme support interdisciplinary co-operation in art, design and technology. The planned ART-IST newsletter is to report on themes which concentrate on European programs, international co-operation projects and issues like Tools for the Art of Tomorrow.[4]

The cast01 conference presents results of projects of the European IST program, as well as international contributions from media art and interface design. It is not easy to compare the selected contributions in terms of their aesthetics, design concepts and technical developments since they address different contexts. This mirrors the main problem of the knowledge society: How can invisible connections between different disciplines be made perceivable?

The cast01 conference demonstrates practical developments and different positions of those who followed our call to submit a contribution to "Living in Mixed Realities". Not only research, developments and applications are presented, but also digital sparks in new media teaching. The student works give an insight into media curricula practised at German colleges.

[1] See: Portal der Heinrich Böll Stiftung zur Bildung 2010: Bildung in der Wissensgesellschaft, http://www.bildung2010.de/

[2] The Fifth European Community Framework Programme covering Research, Technological Development and Demonstration activities, http://europa.eu.int/information_society/newsroom/istevent/programme/index_en.htm

[3] European Network for Intelligent Information Interfaces, http://www.i3net.org/

[4] Tools for the Art of Tomorrow is the website for a final presentation from a three-year research project, eRENA. Members of the eRENA consortium are the ZKM, Iluminations, EPFL, GMD/FhG-MARS Lab, KTH, MIRALab,... http://www.erena.kth.se/

Living in Mixed Realities, Fleischmann&Strauss
Artists Talk/Physics Room, Christchurch, New Zealand

The most important prerequisite for making the resources of our research system[5] useful is the successful co-operation of artists, computer scientists, designers, media theorists and cultural researchers. The project netzspannung.org[6] - supported by the German Ministry of Education and Research (bmb+f) - is intended to energize co-operation between media art, information technology and business. With the cast01 conference we launch the netzspannung.org online platform, a digital archive and media laboratory in the Internet. netzspannung.org is at the same time a model for a new type of knowledge space, connecting its associative and reconfigurable contents semantically in emergent contexts. All conference contributions are represented in a semantic map[7] online and arranged there according to similarities. The Knowledge Discovery Tool is based on a neural network that contextualises the mapping of the projects depending on user selection.

Living in Mixed Realities

Telecommunication and information technology, the Internet and mobile communication produce a globally interlaced space, thereby changing our understanding of space. The notion of Mixed Reality was mentioned for the first time in 1994 by Paul Milgram in his paper on Mixed Reality visual displays[8] aiming to enhance the limited research field of Virtual Reality. According to Steve Mann, wearable computing promises ubiquity any time anywhere.[9]

The perfect Mixed Reality display – the Retina Scanner – has been developed since 1991 by Tom Furness. Refractive and reflective optics direct the light beam into the viewer's eye, projecting an image through the viewer's pupil onto the retina.[10] Thereby the viewer perceives a superimposed real/virtual image. This notion of Mixed Reality, oriented to computer graphics and visual communication, is shifting to a notion of sensual communication, social interaction and awareness of the individual.[11] Early awareness concepts can be found in telematic art projects ranging from »Hole in Space« by Kit Galloway and Sherrie Rabinowitz to »Telematic Dreaming« by Paul Sermon. Mobile communication is the main generator for dissolution of space. Mobility and domestics interlace in a new day-to-day space.

cast01 presents examples addressing Mixed Reality that communicate information and locate the user in a situation of presence and awareness. Only then is true interactivity enabled.

As hosts of the conference, we thank the international scientific and artistic committee for its valuable cooperation in reviewing and commenting the more than 450 contributions sent in for cast01 and digital sparks.

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[5] Edelgard Bulmahn - the federal minister for education and research - concludes that „the substantial resources of our research system are not used effecitvely enough, and the opportunities for combining competences are not sufficiently utilized." Press conference on research in Berlin, September 4, 2001. http://www.bmbf.de/presse01/463.html

[6] http://netzspannung.org

[7] http://netzspannung.org/tools/

[8] Paul Milgram, A Taxonomy of Mixed Reality Visual Displays in: IEICE Transactions on Information Systems, Volume E77-D, Nr. 12, December 1994.
http://vered.rose.utoronto.ca/people/paul_dir/IEICE94/ieice.html

[9] Wearable computing: A first step toward personal imaging. http://about.eyetap.org/library/weekly/aa012301a.shtml

[10] http://www.mvis.com/corpoverview.htm

[11] See article on awareness:
http://netzspannung.org/journal/issue0/awareness_en.html

welcome address

interfaces between art, science and technology

If you look up my sector in the organigram of the Commission, you will find that I am head of “Interfaces”. Usually we understand here the two major interfaces in the chain of seamless end to end audiovisual services, namely the one between the end user and the service delivery platform and the one between that platform and the service provider. This is an interdisciplinary area of engineers, content creators, service providers, systems experts and psychologists. One of the projects in this area is the project SONG, which accommodate the people who are organizing this Conference.

In this opening address, I would like to widen the scope of my interfaces to be able to discuss the underlying theme of this conference, the relation between art, science and technology.

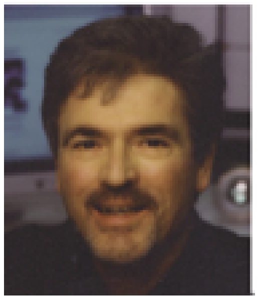
I don’t need to say much about the interface between science and technology as this is a wide-open interface that is used all the time in our research projects, at least between the material sciences, mathematics and engineering. The interface between human sciences, such as psychology, and engineering is already more problematic, but in principle it is known what should be done in interdisciplinary areas such as user interface design.

Much more clarification need the interfaces between art and science and between art and engineering. The information that has to flow through these interfaces in both directions depends on how art wants to be defined, what it wants to be, to express or to achieve and what it needs as input from science and engineering and on what science and engineering want or could learn from questions asked by artists.

If these questions have been clarified, one can tackle the next question: what are the best conditions and institutions to promote the exchanges through these interfaces.

I hope this conference will show that these exchanges are fertile and produce a complex cultural richness. Only such a result will be able to support claims for institutionalising more formal interfaces between art, science and technology.

Leon van Noorden
European Commission
DG INFSO E3 Interfaces



welcome address

on the way into a digital culture

The current media revolution is leading us into a digital culture of innovative communication. Real and virtual worlds fuse into Mixed Reality environments and offer a platform for new kinds of content. The new media will in future be geared more directly to the needs of humans for interaction, mobility and individuality, and make a significant contribution to the creation of the knowledge-based society.

Networking between different disciplines is essential to the goal of developing information and communication technology for people and for society. Needs-oriented innovative media communication cannot be created without artists and designers, and they in turn need the viewpoint and know-how of technology experts for their work. Exchange and cooperation create the basis for new, creative product developments between art, business, education and training.

This is the starting-point for cast01// Living in Mixed Realities – Conference for Art, Science and Technology.

The conference is unique in combining media art, media design and information technology. The main focus is on questions such as: What does it mean to live, play and work in a world that is formed and perceived via digital media, networks and real-virtual architectures? How are complex communication and living spaces and economic models created in the interplay between art, science and technology? Notable scientists and artists from all over the world present their projects. Two special events will enhance the extensive program of papers and presentations: "netzspannung.org", the media lab for digital culture on the Internet, is launched and goes online; and "digital sparks" will award prizes to three outstanding projects by students in German higher education in the fields of media art and design and media information technology.

The conference, with around 200 participants from the worlds of science, art, business and politics, will be an international event. It offers an interdisciplinary, media-compliant platform for media art and culture, business and education.

The conference is being run by the MARS Exploratory Media Lab at my institute. The Fraunhofer Institute for Media Communication, and in particular the MARS research group, are notable for their interdisciplinary and international character.

The conference is funded by the German Federal Ministry of Education and Research and the European Commission. I am particularly delighted that Mrs. Edelgard Bulmahn, the Federal Minister of Education and Research, has agreed to be patron of the event.

Professor Dr. Martin Reiser
Fraunhofer Institute for Media Communication IMK

keynotes

the composite state of being

notes on the technoetic implications of mixed reality

Roy Ascott

The emergence of Mixed Reality technology marks a further step in our quest to control our own evolution, to redefine what it is to be human, and to become actively responsible for the construction of our own reality. It is this quest which distinguishes us from past generations imprisoned in superstition or in thrall to scientific determinism .

Mixed Reality, in its convergence of events in actual and virtual space, parallels the convergence in the material world of nano structures and living systems.

This convergence of *Bits Atoms Neurones* and *Genes* constitutes a kind of Big *Bang* in the cultural universe, producing a new global structure, and calling for new social process.

The evident aesthetic, as well as pragmatic, value of this technology should not however disguise the fact that what is commonly regarded as "unmediated" and "directly apprehended" reality is as much a construction as the virtual reality with which it becomes technologically fused.

If we see the tools of Mixed Reality as an extension of our own organic systems of perception and cognition (together constituting an emergent faculty of *cyberception*), we can more readily understand the whole flow of events in this domain as primarily *technoetic*.

Technoetic consciousness arises from our desire to combine *techne* (machine) and *noetikos* (mind), in new configurations of thought and awareness.

This convergence of immaterial systems and material structures, of the *dry* digital and *wet* molecular worlds, of the artificial and organic, produces for the artist a kind of *moist* media.

Overall, we can foresee the development of a Reality which will be made up of three essential parts, which can be called the Three VRs,

- Validated Reality
  involving reactive, mechanical technology in a prosaic, Newtonian world
- Virtual Reality
  involving interactive, digital technology in a telematic, immersive world
- Vegetal Reality
  involving psychoactive plant technology in an enthnogenic, spiritual world

They prioritise in turn the body, the senses, and the mind (all of which are of course interdependent)

In this perspective (the formation of which depends significantly on the advent of the Mixed Reality technology), it may be seen how these three Realities might lead us to a *composite state of being*, involving a seamless flow of consciousness and many constructions between many layers and levels of reality, between many realities.

Osaka's nano-bull, Roslin Institute's lamb called Dolly, Kac's Alba the Rabbit are the harbingers of the re-materialisation of a culture which earlier we thought would be totally immaterial

But the Net reaches everywhere and intelligence is spilling out of our minds into every quarter

This foresees an interplay between visioning, envisioning, and constructing reality.

This means that Mixed Reality is both an environment and a tool. As an environment it calls for, and elicits, new kings of behaviour and new sorts of relationship between ourselves, our agents, our products, our locations; as a tool it is a component, along with bio-, neuro- and nano-technologies, in the repertoire of practices that will enable us to construct a post human reality and a post biological culture

Investment in research of a high order is necessary if we are not to collapse in the stupor of current global capitalism.

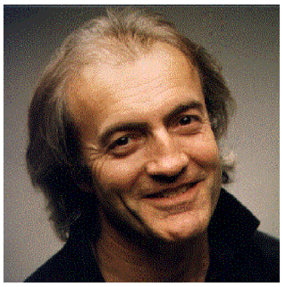
Art has a part to play in this, where issues of aesthetics, perception, creativity and human values are fundamental.

While Art research may be practiced locally (in a well resourced locale) it must develop globally (in a well connected network).

This paper addresses the need for a Planetary Collegium, envisioned by the author as a set of networked nodes constituting a transdisciplinary field of inquiry and production.

CAiiA –STAR is the prototype node of this network. Its architectural definition is being developed employing the *cybrid* concept of Peter Anders (a research fellow of STAR).

Thus Mixed Reality technology and its associated praxis is an important component in the development of the Collegium.



from virtual to mixed reality

Bill Buxton

Input and output technologies constitute perhaps the most important dimension of change in terms of defining the nature of future systems. The reason lies in the fact that one of the most significant issues confronting computer users is the problem of bridging the gap between the physical and virtual worlds. We simply don't just live any more in just one or the other. We need to function seamlessly in both. Yet, current systems make this too difficult. Hence, the documents, designs, or other artefacts relevant to our activities are isolated in one or the other, or split between the two.

Bridging between the two solitudes of the physical and the virtual domains. (Image courtesy of Gray Holland)

With appropriate design, however, the I/O technologies of future systems will be designed so as to absorb and desorb the relevant artefacts, thereby providing the much desired seamless bridge between these two solitudes.

Tuning the I/O for specific activities is contrary to most current design, which follows what might best be called, "The Henry Ford School of Design." Just as Ford is reputed to have said about his automobiles, "You can have it in any colour you want as long as it is black," so today,s computer designers say, "You can have it in any form you want as long as it has a keyboard, a display and a mouse, regardless what you are doing." Hence, temporarily assuming the role of an anthropologist examining the tools of a society, we notice that there is little significant difference in the tools used by the physician, accountant, photographer, secretary, stockbroker architect, or ticket agent. Instead of specialisation, a one size fits all approach to design prevails.

As we shall see going forward, I/O devices are key to our ability to tailor computer systems to the specific needs of various users. Hence, their place at the top of my list in importance, at least insofar as technology is concerned. But technology is only of secondary importance. It is the human's capability, intent and need that should be (but too often is not) the driving function in all of this.

Mixed reality is about people, how, where, when and why they think, learn and problem solve. Here we discuss how this seemingly simple observation can drive a new way of thinking about the design of computer based systems.

media- or netmorphosis

Manfred Faßler

The Internet as a large-scale-technology, integrating instant e-mailing, just-in-time production, global storages, global grass-root-news, TV, Video on demand, collaborating work, is a dynamic processor, based on the interactive use. One result is that the traditional scientific and cultural methods of observation pale. Why?

Well, one reason is, that the bandwidth of computer-based communication is based on *standardizations*, which grasp all global medial environments, and we still don't know, how to observe and how to categorize this in terms of communication, culture, society, and legitimacy; in difference to traditional (even modern) concepts, the answer is not the dominance of institutions and norms, but the dominance of an enormous process of *individualization*, which is a product of selective communicational acts (potentially all over the world). And this takes place/ or happens/ is constructed/ is generated/ or processed in de-territorialized artificial environments. The list: take place, happen, construct, generate, process are short impressions about the observers problem facing media-spheres or to observe the *interfacial* activities on both sides: human/ media. This human-media-interactivity or *human-media-human-interactivity* is the fundament for the use of different media-functions (push- and pull-communication).

These dimensions: global standardization, individualization, interface and human-media-human-interactivities should channel scientific and even political perception to the fact, that electronic, artificial environments include different constitutional conditions for communities, identities, biographies, trans-social stratifications and political self-organisation.

Does the Net matter as infrastructure or as media?

Let's take the public as an example. The Public is not exclusively bound to publicity or publishing. The definition of the public as an extension of media reduces the heterogeneous constitutional and normative fields of public as there are:

- freedom of information (push- and pull-structure, free access to all relevant and not-classified information; pretty good privacy)
- freedom of speech, of authorship (text, picture, sound)
- freedom of association (even in text-based environments like MUD's and MOO's, in virtual three dimensional graphical rooms)
- public opinion (not regulated thematic fields; except hate-pages, racial web-sites and news-groups)
- public control or users self control
- information and media competences
- education
- competition of elites.

The diffusion, stabilization, and using of Internet influence these dimensions. Whilst

- transforming the institutional structure of knowledge storages to an economic structure,
- ignoring the traditional boundaries between privacy and public as communicational formats,
- offering multi-sited informational environments,
- ignoring the national and social boundaries,
- mixing and segregating regional information backgrounds etc.

The Internet opens the way to short time fusions and new synthesis of long-term orientation. How the local, national, territorial, global or individual parts of this orientation will be constructed and finally composed, is one of the most interesting research fields. Nevertheless the cultural use of the Internet promotes obvious changes in all sectors of socio-economical and socio-informational environments.

These transformations do not proof the Internet *neither as technology of freedom nor as a new hyperstructure of control*. Freedom or control are dimension of the net-use. The term ,mediamorphosis' was coined by Roger Fidler.

He used it as a paradigm which allows to describe, how knowledge-systems, social and cultural scripts of communication and maps of cognition are influenced by the material order and the performative presence and use of media. He integrates the present global situations into long-term processes of multi-directional evolution of media-capacities, media-competences and media-infrastructure. Fidlers historical materials, his long-term arguments and the technological examples, are impressing.

For my arguments it might be enough to use the term 'mediamorphosis' as a paradigm for media-generated concepts of communicational environment and division of user-cultures. They, the user-cultures, build the field of media-integrated communication and are the sources for new mixtures, new samplings of more or less intelligent or creative interactivities. These user-cultures not only 'handle' codes or the real virtuality/virtual reality.

They apply the architecture (such as SISD-architecture, SIMD-architecture... [1]) of the invisible and create visibility. And by this, they transform their environment of reference from geography to 'infography'.

Mediamorphosis, communicational environments and interactivities within the artificial spaces of the electronic media-spheres and augmented by their processing capacities, build various dynamic networks.

Call this 'inter-dependence', call this 'fundamentally inter-related', or 'co-evolutive'. All these concepts underline the fact, that these phenomena follow the rules of the unobservable regimes of trans-personal relations, even though each and every detail was and is invented, planed, constructed, and applied. Mediamorphosis, from my point of view, means more of an instable and evolving structure of pragmatic fusions (which are close to the term '*hybridity*'), than the dominance of matter or number.

All three (morphosis, environments, interactivities) are part of the transformed cultural networks, which start a broad and extensive change in the way interpersonal relations, communicational constancy or identities are structured. And this makes obvious, that it isn't any kind of 'subject', (which) or (who) creates the environments, but these offer the chances for enactment. In this sense 'being interactive' means, 'using the electronic infrastructure to co-create artificial environments for informational exchange and specific form-generating decisions'. Or as F. Biocca pointed it out: "All computer-based interactivity is a form of interaction with other humans even when none are present."

[1] SISD-architecture: single instruction stream, single data streams
SIMD-archictecture: single instruction stream, multiple data streams
MISD – multiple instruction stream, single data stream
MIMD- multiple instruction stream, multiple data stream

tangible bits
designing seamless interface – between digital and physical

Hiroshi Ishii

Abstract

At the seashore, between the land of atoms and the sea of bits, we must reconcile our dual citizenships in the physical and digital worlds. Our windows to the digital world have been confined to flat rectangular screens and pixels – "painted bits". But while our visual senses are steeped in the sea of digital information, our bodies remain in the physical world. "Tangible Bits" give physical form to digital information, making bits directly manipulable and perceptible. Tangible bits pursues seamless coupling between these two very different worlds of bits and atoms, blurring the boundary between science-technology and arts-design.

1. At the Seashore

Where the sea meets the land, the coastline appears. It is unique in the landscape as a home to the living organisms of an inter-tidal zone. Here they engage in a fierce battle for survival between the tides, struggling in turn with heat and dryness followed by rough pounding waves. At the same time it is a fertile space where these organisms mix with light, water and air. Here at the border of sea and land they have blossomed into a myriad of unique forms. Many millions of years ago our ancestors also emerged from the ocean across this border.

We are now preparing to cross another coastline: the border between the land of the physical world and the sea of digital information. This will not be an easy transition. Our visual and auditory sense organs are steeped in the sea of digital information, but our bodies remain behind in the physical world. Beyond the countless screens which fracture our spatial experience, there extends a disjointed space composed of infinitely hyper-linked digital information. In this space, one has no sense of one's own physical presence, nor the presence of those who have passed through it.

The "Tangible Bits" vision is to provide seamless coupling between bits and atoms. The core goal is to give physical form to digital information, allowing us to directly manipulate it with our hands, and to enable environmental recognition of digital information at the periphery of perception [5].

This paper introduces the conceptual framework of Tangible Bits and the some concrete interfaces designed by the members of the Tangible Media Group. These works were neither intended as purely aesthetic art pieces nor as technological demonstrations meant to solve well-defined problems. The goal of our research is to create new concepts.

The Tangible Bits vision is like a pair of eyeglasses intended to help people see what would otherwise remain invisible. Our hope is that these eyeglasses will help people see physical architectural spaces as interfaces with the digital world. A one-year exhibition of Tangible Bits started on Spetember 1st, 2001 at the Ars Electronica Center in Linz, Austria. We invite you to come to Linz and experience these conceptual eyeglasses by touching and feeling a variety of interfaces. In this exhibition, we invite you to experience a new and yet somehow familiar sense of what an interface can be, something that gestures to a new relation between information and ourselves.

2. Beyond Graphical User Interfaces, Towards Tangible User Interfaces

The basic concept behind today's standard human computer interface, the GUI (Graphical User Interface) has been in existence for more than thirty years. The GUI works by visualizing information on the screen as pixels or "painted bits." It began with the Xerox Star Workstation and, after some changes (some positive and some negative) and with the commercial success and dissemination of Microsoft Windows, the GUI has become the standard paradigm for Human-Computer Interaction (HCI) today. We believe this paradigm is reaching the end of its evolutionary potential.

The GUI, tied down as it is to the screen, windows, mouse and keyboard, is utterly divorced from the way interaction takes place in the physical world we inhabit. It makes no use of the skills we have learned through direct tactile contact with and manipulation of objects in our material world. Neither does it allow us to monitor ambient stimuli, such as changes in the weather and the passage of time. Today the interface which links cyberspace with the real world is the standard three-part set: screen, keyboard, and mouse. The GUI is designed on the assumption that we will sit directly in front of it and that it will be able to monopolize our vision and our foreground attention.

The objective of Tangible Bits is to provide concrete suggestions for how we might create a new interface paradigm that goes beyond the GUI paradigm.

Figure 1 illustrates the concept of "Foreground and Background" which serves as the foundation of the Tangible Bits design space. In this space the purpose is:

- to make bits directly manipulable in the foreground by combining information with graspable objects (as in the architectural models in “Urp”), and
- to be constantly aware of the information in the background (as in pinwheels) by infusing the environment with digital information using ambient media.

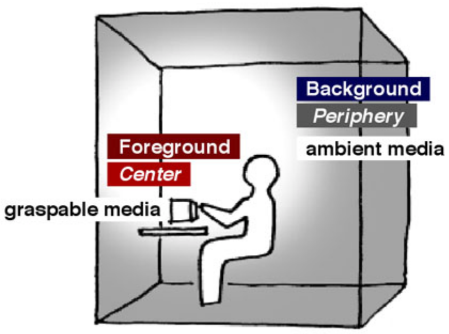


Figure 1: The relationship between the center and periphery of awareness in physical space, and graspable media and ambient media.

Caption: Human beings unconsciously take in and process a wide range of information from the periphery of their attention. Our research attempts to enable the smooth transition between this foreground and background information. This is achieved by combining graspable objects and ambient media. In this way, we attempt to refashion the very architectural spaces in which our bodies exist into interfaces between people and information.

3. Abacus – The Origin of Tangible Bits

The author met a highly successful computational device called the "abacus" when he was two years old. He could enjoy the touch and feel of the “digits” physically represented as arrays of beads. This simple abacus was not merely a digital computational device: because of its physical affordances, the abacus also became a musical instrument, an imaginary toy train, even a back-scratcher. He was captivated by the artifact’s sound and its tactile properties.

This childhood abacus was also a medium for awareness. When his mother kept household accounts, he was aware of her activities by the sound of the abacus, knowing that he could not ask her to play while the abacus made its music.

This abacus revealed a new direction in Human-Computer Interaction (HCI) that we call Tangible User Interfaces (TUI).

First, the abacus makes no distinction between “input” and “output.” Instead, its beads, rods, and frame all serve as physical representations of numerical information and computational mechanism. They serve as directly manipulable physical controls to compute on numbers.

Second, the simple and transparent mechanical structure of the abacus (without any digital black boxes made of silicon) provides rich physical affordances. Anyone can immediately understand what to do with this artifact without reading a manual. The TUI design challenge is to seamlessly extend physical affordances into the digital domain.

The Tangible User Interface (TUI) is significantly different from the GUI. The TUI gives physical form to digital information, serving as both a representation *and* a control. The TUI’s physical embodiment makes digital information directly manipulable with our hands and naturally perceptible through our peripheral senses.

4. Sampler of Tangible User Interface Design

4.1 Pinwheels

Pinwheels is an example of ambient display that spins in a wind of digital information (bits). The spinning pinwheels allow people to feel the flow of bits representing human activities or happenings in the natural world in their peripheral vision while they concentrate on other activities (such as conversation) in the foreground [4].

An astronomer following the activities of a solar corona could install these pinwheels in his or her home in order to monitor solar winds in the background. Being peripherally aware of subtle changes in solar activity leading up to significant events could help the astronomer time periods of intensive observation. The basic concept is to make solar winds of ionized particles and all kinds of other information flows perceptible in architectural space as a “wind” driving old-fashioned pinwheels. Current graphical user interfaces display most of the information as pixels on a screen, requiring the user’s conscious attention. As such they are foreground media. But our capacity to recognize and process information is exhausted when we are faced with too much data in the foreground, leading to information overload. Ambient displays, such as spinning pinwheels, help to solve this problem by representing continuous information flows as continuous physical phenomena in the background so the user can be aware of them peripherally.

http://tangible.media.mit.edu/projects/ICC_Exhibition/pinLarge.htm

4.2 inTouch

InTouch is a project that explores new forms of interpersonal communication through touch. InTouch uses force-feedback technology to create the illusion that people – separated by distance – are actually interacting with shared physical objects (Distributed Shared Physical Objects). The "shared" object is a haptic link between geographically distributed users, creating a channel for physical expression over distance [1].

Each of two identical InTouch devices use three freely rotating rollers. Force-feedback technology synchronizes each individual roller to the corresponding roller on the distant mechanism; when one InTouch roller is moved the corresponding roller on the other InTouch also moves. If the movement of one roller is resisted, the corresponding roller also feels resistance. They are, in a sense, connected by a stiff "digital spring." Two distant users can play through touch, moving rollers to feel the other's presence. InTouch demonstrates a unique interface that has no boundary between "input" and "output" (the wooden rollers are force displays as well as input devices). The sense of touch is playing critical role, and information can be sent and received simultaneously through one's hand.

Past communication media (such as video telephony) tried to reproduce the voice or the image of the human face as realistically as possible in order to create the illusion of "being there." InTouch takes the opposite approach by making users aware of the other person without explicitly embodying him or her. We think that InTouch creates a "ghostly presence." By seeing and feeling an object move in a human fashion on its own, we imagine a ghostly body. The concept of the ghostly presence provides us with a different approach to the conventional notion of telepresence.

http://tangible.media.mit.edu/projects/ICC_Exhibition/inLarge.htm

4.3 curlybot

curlybot is an educational toy that records and plays back physical motion. When the user takes hold of curlybot and moves it around on a flat surface it remembers how it has been moved. When it is then released, it replays the movement with all the intricacies of the original, including every pause, acceleration, and tremor of the user's hand. It was designed to help children develop geometrical thinking and as a medium for lyrical expression [2].

Phil Frei created the curlybot concept and completed the industrial and interaction design in late 1998. With the support of Victor Su for electronic circuit design and prototype construction, the first prototype was completed in the spring of 1999. The forced-feedback technology used for real-time simultaneous communication in inTouch is used in curlybot for the recording and playback of non-simultaneous gestures.

This project has significance in terms of both interface design and the use of computers for educational purposes. As a tangible interface it blurs the boundary between input and output (similar to inTouch): curlybot itself is both an input device to record gestures and a physical display device to re-enact them. By allowing users to teach curlybot gestures hand and body motions, curlybot enables a strong connection between body and mind not obtainable from anything expressed on a computer screen.

From an educational standpoint, curlybot opened new horizons as a toy that may help children acquire mathematical concepts. It is programmed not on the computer screen but simply by moving it around in physical space, demonstrating the power of "programming by gesture."

http://tangible.media.mit.edu/projects/ICC_Exhibition/curlyLarge.htm

4.4 Urp

Urp is a tangible urban-planning workbench based on the "I/O Bulb" concept originally developed by Dr. John Underkoffler in 1998. The "I/O bulb" creates high resolution, bi-directional light flows. It collects photons from physical surfaces, and uses knowledge about a particular domain, such as urban planning, to interpret the light patterns. It then responds with digitally-controlled light output, which is projected back onto the physical space.

In Urp, physical architectural models are placed on a table illuminated with "I/O bulbs" and shadows are cast according to a computer simulation. By adjusting the clock, it is possible to track the shadow movements and sun reflections. In addition, air currents around the buildings are rendered visible and a wind gauge can be used to measure the wind speed at any point. Using "I/O bulbs" to project real-time computer simulations onto physical models makes it possible to understand and directly manipulate digitally rendered urban spaces in a world that is contiguous with one's own body [6].

When designing tangible interfaces, it is important to consider which elements should be given physical form and which elements should be rendered as digital images. The key to a successful interface lies in hiding the boundary between the digital and physical worlds. The digital shadows (video projections) cast by the physical models in Urp represent one solution to this problem.

If we were to replace all of the hundreds and thousands of light bulbs in an architectural space with I/O bulbs, what kind of interaction design would be possible? The I/O bulb, as the core concept in this project, has demonstrated the potential for new digital interactions that occur not only on the tabletop, but within architectural space itself.

http://tangible.media.mit.edu/projects/ICC_Exhibition/luminLarge.htm

4.5 bottles

Through the seamless extension of physical affordances and the metaphor of bottles, this project explores interface transparency. Humans have used glass bottles for thousands of years. The basic concept uses glass bottles as both containers and minimalist interfaces to digital information. Just as we naturally open and close lids to access bottles' physical contents, in this project users open and close lids to access digital information. A wide variety of contents (including music, weather reports, and stories) have been developed to test the concept [3].

The "bottle-as-interface" concept began as a "weather forecast bottle," which Ishii envisioned as a present for his mother. Upon opening the weather bottle, she would be greeted by the sound of singing birds if the next day's weather was forecasted to be clear. On the other hand, the sound of rainfall would indicate impending rain. Such an interface would be consistent with her everyday interactions with her familiar, physical environment, such as opening a bottle of soy sauce. She never clicked a mouse or typed a URL in her life, but opened soy sauce bottles thousands of times.

In late 1998, Ishii and Rich Fletcher expanded this idea into "musicBottles" and began the project. They used sensor technology developed by Dr. Joe Paradiso and collaborated with different designers, engineers and artists to create a custom table and bottles with special electromagnetic tags. Three sets of bottles – each with different content: classical, jazz, and techno music – were designed and built. In June 2000, this project received the IDEA 2000 Silver Prize (International 2000 Industrial Design Excellence Awards competition).

We also developed custom wireless sensing technology for this project. An antenna coil attached to the underside of the table creates a magnetic field above the table. A custom electronic circuit detects disturbances in this magnetic field that are caused by the placement and opening of tagged bottles. The system then executes musical programs for each bottle (e.g. opening one bottle plays a piano) and controls the patterns of colored LED light projected onto the table.

This project uses a combination of artistic and technological techniques to support emotional interactions that are fundamentally different from conventional, function-centric interfaces.

http://tangible.media.mit.edu/projects/ICC_Exhibition/bottlesLarge.htm

5. Conclusion

This paper introduced our approach to take up these challenges based on the vision of "Tangible Bits" that gives physical form to digital information, making digital information directly manipulable and perceptible. Tangible bits pursues seamless integration between these two very different worlds of bits and atoms, blurring the boundary between digital and physical worlds.

Mark Weiser wrote in the first paragraph of his landmark paper "The Computer for the 21st Century" as follows [7]: "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it."

We continue our design research with strong hope that Tangible Bits will contribute to realize the ultimate invisible technologies that Mark envisioned.

6. Acknowledgement

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http://tangible.media.mit.edu/projects/ICC_Exhibition/index.htm

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living in mixed realities

statement to address the origins, relevance and ambitions of the work

Natalie Jerimijenko

Social change is effected less by marching the streets waving banners, shouting slogans, and more by the transformations of everyday life effected with and through information technologies. The research and projects that I will cover in this presentation are focused on the interrogation of the transformative potential of new information technologies: redressing what counts as information, exploring tangible open-ended design strategies, and critique to generate, instantiate and explore alternatives to dominant information technology design paradigms.

What information counts?

Information design is traditionally treated as a matter of formal criteria concerned with clarity of presentation of neutral or factual data. However, this work considers and analyses the politics of information - what information gets to count as information, and who's information gets to count - because information is always a partial representation and can never, by definition, be complete or comprehensive. The problem space is defined by what information and data doesn't show, as much as what it does; whom it benefits and why; and what information actually is. This is the 'politics of information', the central concern of my work, and, I argue, the ‘design’ opportunity of the information age.

The Suicide Box [Sbx] project demonstrates this approach most directly. This video system was installed in the vicinity of the Golden Gate Bridge to detect vertical motion, capturing video footage of all the suicides at the premier suicide site of the United States. There are no 'official' video cameras on the bridge, nor effective obstruction to jumpers. By contrast, the number of video cameras that are trained in a place of commerce such as a shopping mall typically cover the entire square footage. By any measure, shoplifting get much more technological attention, although the scale of loss is incomparable. Except for the Sbox project, the tragic social phenomenon of suicides off the Golden Gate Bridge is not actually counted, so literally does not count. While the Suicide Box project demonstrates a technological blind spot, the Despondency Index provides a contrast with what does get to count. This economic indicator indexes the moving average of the suicides off the Golden Gate Bridge to the Dow Jones Industrial Average. In juxtaposing these two data sources the project demonstrates that the DJ industrial average -- in representing the 'health of the nation'; being reported on every media station everyday; being available at 5 minute updated intervals -- does not provide more comprehensive or timely information but evinces radical exclusions of important social issues. There is no correlation between this index of national economic performance and the index of national suicide rate, but that many people look for a relationship demonstrates that economic representations are expected to account for almost everything. What the Despondency Index shows is what gets left out, what doesn't get represented, again, what literally does not count.

Likewise, very familiar inequities can and do get reproduced with new technologies. This is illustrated by the 1/2 life ratio, a project that compares the market value of sperm to the market value of ova. There is equal market demand for these two types of reproductive tissue, yet the difference in 'value' is enormous, once you factor in the exposure to risks, opportunity costs, labor costs, future litigation and other factors in a benefit cost analysis. While the value of sperm is around 3cents per viable sperm, the oocyte costs the women approximately $38,000/oocyte to 'donate'.

The bit-plane project demonstrates that we take the 'stuff of information' to be tangible or at least photographable. In flying through the no-camera zones of the corporate research in silicon valley, this small RC airplane equipped with video micro camera and transmitter sees nothing but the banality of corporate work in these highly secured, guarded beige cubicles and offices. This challenges the well-accepted notion that information can be treated as property, that is, imaged, threatened or stolen by cameras. The project begins to demonstrate an alternative way to understand information: less as 'stuff' and more something that is embedded in a mixed reality, that is the communities of expertise, particular practices, discourses and networks of communications, all of which resist being 'imaged'. The basis of this work is involved in theorizing the relationship between power and information. Typically this relationship is thought to be an external one in which power can distort information (e.g. paying off journalists; fraudulent science bribed by corporate money) however, there is actually a more integral relationship, in which power relationships determine what gets attention, and the scripts of interaction define who's control is effected, and who's information is represented. The responsibility of design is to challenge, situate and understand the social consequence of the information.

Against Virtualized Information: Tangible and Open-ended Strategies for Information Technology. My approach treats information as crucially more than data on the screen, and interaction as much more than 'point and click'. Interaction is redefined as interpretation and active learning, and involves interacting with the local environment and situations. One strategy that privileges interaction-as-interpretation (vs. aesthetics, or clicking) is to use tangible approaches to representing information. This necessarily embeds the information in a real social context rather than a virtual nowhere and anywhere. The LiveWire, was the first instantiation that demonstrated the viability of this approach. Converting ethernet traffic loading to the motion in a dangling wire (movement of the wire was proportional to the #of packets on the hub), the wiggling wire is radically different data display to live with. Similarly Trigger, the Loma Prieta pony project, the information (earthquake ground motion, and Ethernet traffic) is also readily available in the scientific genre of representation, an XY plotted graph. However, using these material tangible representations renders the information as a shared social experience, rather than a fact, facilitates peripheral monitoring and the finely tuned 'sense' that is developed with ongoing monitoring, and exploits a rich material language. This recognizes work, learning and interaction, not as the passive consumption of information but an active, irreducible, and ongoing process of sitting abstraction in particular situations. Another related strategy is to privilege and facilitate open-ended digital interaction, as in Voice Boxes, Real-Time and the Park In Formation projects. In these projects the interaction is structured, yet it is also open ended, that is, the number of different ways that they can be used (combining spatial and verbal queues), or results (parking patterns) attained, is infinite. This contradicts the prescript menus of choice in the dominant 'user-friendly' design paradigms, in which people become abstracted users, without radically different skills, situations and capacities. Privileging diverse interactions that exploit local context of use is the central concern.

Tangible and open-ended strategies of information design are used in the OneTree project. As an electronic and biological instrument it is a radically cross platform, exploiting biologically cloned trees, viruses, Artificial Life screen savers, distributed CO_2 data sensors, and public sites throughout the Bay Area. It is a project designed to complicate the genetic determinism that dominates the public imagination. Firstly by displaying clones that have been raised in identical environmental conditions, the project confounds most people's expectation that the exact same genetic material and exactly the same environmental conditions will result in (cloned) trees that look the same. The differences between the clones demonstrate empirically and unequivocally that genes do not encode nor determine life, contrary to mainstream media coverage. Secondly, the project is a platform for the ongoing accumulation of interpretation. The trees are placed in the public sphere, and the public imagination, as the clones are planted in pairs throughout parks and other public sites. In the next 50-100 years they will continue to render the environmental and social differences to which they are exposed. Thirdly there are electronic components to this project that includes an A-life (electronic clone) tree that can be downloaded and grown on your screen, the growth of which is controlled by a CO_2 meter that comes with it. This is the basis for a distributed data collection project that is intended to reorganize who owns and produces the information on CO_2, and to popularize the data. This provides a different context for public discourse of global climate change than one that is based on passive consumption of authoritative data. The thesis that combines the different parts of this project is that ownership of data and the direct experience of the material evidence changes who can participate in the public debates around new genetic technologies and bio-complexity that are represented in this project. By exploiting popular representation strategies, yet raising the standards of evidence, public discourse on issues of climate change, environmental/genetic interactions and bio-complexity can move beyond the authoritative delivery of fragmentary 'facts' reported incessantly in the mainstream media.

The popular misconception that new technologies are developed in a rational optimising process that ‘makes things better’, improves our well being, and raises standards of living, is often demonstrated as misleading. However, if we were really to take this popular idea seriously as a design imperative, then radically different tools of analysis would also need to be developed. These would need to address the wider socio-technical interactions that determine how a device is used and what changes it engenders, rather than an isolated users, test in labs outside of their meaningful context. Therefore the development of independent tools of analysis, which are in turn generative of novel design approaches, is imperative. Analysis is generative. I will survey several projects of this sort include, among others: the Corporate Imagination archive, the largest archive of corporate visions of the future, which is focused on finding ways to hold corporations accountable to the claims that they use to capture the public imagination; Market Research, an empirical method for capturing interactions with machines, in-situ over long time periods (months, years i.e. the timeframe of learning and diversification of use); methods for reassessing the organizational structures and their impact on material culture, (for example, bounded responsibility of design in a service context ; experimenting with different forms of product ownership such as distributed, collective, serial); the Autonomy Index which measures the actionable autonomy within a corporate structure as an inversion of incentive; and finally, with the increasing delegation of the function of monitoring environmental data (and corporate breeches) to the citizenry, this challenge is taken up in the BangBang Media service exploring a different editorial logic that puts a premium on legibility.

New technologies provide an opportunity for social change. While they do not cause social change, they are a site at which the shifts and uncertainties can be exploited, a strategic site in which the resources of the establishment and the status quo cannot ensure success. The projects I will survey demonstrate and explore alternatives to the corporate imperatives of information technologies and biotechnologies that are effecting change and reshaping what we view as work, how we work and interact (in private and public), what information counts in the information age, and what and who gets to represent life. The 'mixed reality' approach provides opportunity to privilege the shared social interpretation that has been crucially underprivileged in the dominant cognitivist traditions, an opportunity that I am very appreciative that the organizers of CAST 01 are celebrating.

Keywords: information design, tangible information, situated learning, accountability structures, bounded responsibility, unbounded rationality; design decision analysis, risk/ threat conversion, play theory, commodification, faction, fiction forecast, possibilities, critical path engineering, politics of information, located information, situated learning; real-time monitoring; ubiquitous computing; human computer interaction design; science un-fiction; technological justice, networked society, eco-informatics; socio-technical interactions.

panel 1:

understanding mixed reality

spaces of emergent communication

Wolfgang Strauss, FhG.IMK (D) – Navigator

understanding mixed reality?

spaces for emergent communication

The first panel discussion includes papers by Strauss, Kusahara, Benayoun, Schkolne, Schiphorst and Ishii.

In his paper Wolfgang Strauss presents a conceptual model of a Mixed Reality architecture by the fusion of physical and digital space exemplified with the Murmuring Fields scenario, an interactive installation by Fleischmann/Strauss. The concept of spatial perception is supported by perceptive interfaces superimposing different levels of reality. By acting the performer experiences being present in Mixed Reality space.

Machiko Kusahara presents mini-screens and big screens: aspect of mixed reality in everyday life. For her, different from VR, MR enables to re-integrate the reality and virtuality, without loosing the physical existence of body. In analyzing what MR means to the way we see the world, the nature of MR should be examined from a wider aspect. She thinks, telecommunication technology has been already changing our cognition of the space, realizing a mixed reality environment in our daily life. Therefore big screens and mini-screens we see in today's urban life can be seen as the realization of mixed reality in our daily life, combine the real and the virtual, making the boundary already blurred.

The vision of Hiroshi Ishii is to design seamless interfaces (objects) between physical and digital worlds. For him, “Tangible Bits” give physical form to digital information, making bits directly manipulable and perceptible. Tangible bits pursue seamless coupling between these two very different worlds of bits and atoms, blurring the boundary between science-technology. Actually, seamlessness, is one of the big issues of Mixed Reality 3DCSCW research.

Maurice Benayoun sees the digital world, with the development of the Internet, leading to consider the end of boundaries in terms of writing space. We are used to saying that political and geographical frontiers have been erased by the upcoming of the Internet, that pictures, text, music, animation film and interactive media are now parts of the same workspace. Outside the Internet there is a limit brandished as the ultimate banner: the limit between the virtual and the real. This goes with the limits between Art and crafts, real life and illusion, tea and milk.

Schkolne/Schröder use the Responsive Workbench system to display geometry in the space of the user, and sense the hand and a number of tangible tools to translate motion and action into form. As an alternative approach to traditional 3d modeling software utilizing a complex interface, that restricts free conceptual thinking, they developed a simplified interface that is based on physicality, making marks with the body in space.

The Intentional Grammars research by Thecla Schiphorst investigates, designs and implements a predictive and encoded gesture-based approach to transform and reduce the motion data for transmission in a networked environment. Her research based on emerging knowledge in the domain of experiential movement analysis, is being built upon Credo Interactive's Life Forms movement tool and its new research project, the I-Move single stream video translation system. Gestures encapsulate the intent of the motion performed by the user in an input video stream. Thus, only the important characteristics of the motion are transmitted to other users in a multi-user application. The transmitted gestural information will also contain encoding for synchronization, interpretation and re-creation of motion data at the destination. An example is a multi-player networked game scenario, where players use video camera input to represent their movement and interactions while connected to their computer. A key to the analysis and categorization of gesture will be modeling intentionality within the gesture.

paper

World Skin, 1997, M. Benayoun, J.-B. Barrière, Z-A, AEC, SGI.

from virtual to public space

toward an impure art

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Abstract

The digital world, with the development of the Internet, leads to consider the end of boundaries in terms of writing space. We are used to saying that political and geographical frontiers have been erased by the upcoming of the Internet, that pictures, text, music, animation film and interactive media are now parts of the same workspace. Outside the Internet there is a limit brandished as the ultimate banner: the limit between the virtual and the real. This goes with the limits between Art and crafts, real life and illusion, tea and milk...

Keywords: Virtual Reality, public space, CAVE, immersive television, Agents, art installations, augmented reality, virtual environment, intelligent interfaces, situation art

URL: www.benayoun.com, www.Z-A.net

Introduction

Like the physical space, thanks to the virtual, the area of representation is becoming a space to live in. It shares with our physical environment, properties that had so far been parts of reality, only: the fact that the representation strives towards an unlimited and unpredictable number of possible futures – that is the basis of the virtual; or the fact to be, part of the world, as a visitor of the virtual, to interact with the fictitious environment, and therefore, that this very representation can be altered by our presence.

When we come to understand that virtuality is, at the origins, a property of the 'real' world, we should admit that the exchange between fiction and reality would be balanced only if the dynamic and symbolic properties of the virtual representation become part of the physical world.

This explained that, after having been a matter of experiment, in search of specific properties that would only belong to the medium, VR and VE are becoming, like the art of using them, more and more impure. This impurity might characterize the mature stage of the medium, and the merging of the virtual and the physical world is probably the extension of the human trend of converting the objective environment into an informational system. These concerns affect the art world as well. The artist is more and more involved in the development of the understanding of medias, creating new interfaces, adapting the narrative and the building of meaning to new media, bringing the breaks through coming from technology far from the pixel, the sound sample, and the HMD straight to the other fields of human activity.

We now might be able to consider that the digital media brings us back to the time when the artist was in charge of any domain involving the symbolic dimension: painting, writing, music, architecture, communication, events... and, also, together with scientists, of bringing up new visions of our daily environment.

When exploring the potentialities of VR, I have jumped from one side to another of the representation boundaries. Step by step, starting from the computer field of creation, I tried to spread VR over other territories.

Project descriptions:

The Big Questions (Is God Flat? 1994 Is The Devil Curved? 1995 And What About Me? 1 and 2 1995-1996) was an attempt to build metaphorical dynamic architectures.

http://www.synesthesie.com/SYN3/SENS/benayou.html

The Tunnels (The Tunnel under the Atlantic, 1995, The Paris-New Delhi Tunnel, 1997) and Labylogue, 2000, tried to shape distance communication in a dynamic virtual world. They were also a way to develop agents based on dynamic auto profiling (Z-A Profiler) in an informational architectural space.

World Skin, a Photo Safari in the Land of War, 1997, and Crossing Talks, Communication Rafting, 1999, were two CAVE installations that helped me to consider the virtual environment as a collective experience which I define as Situation Art.

Art Impact, Collective Retinal Memory constitutes a bridge between the real world and its representation as a collective experience where, thanks to VR and networks, we share the unsharable, the gaze as a painting tool.

Fig. 1: Art Impact, 2000. M. Benayoun, Jean-Baptiste Barrière, Z-A, oraos.com

Along with this activity, I had to conceive user interfaces to access information through 3D objects and agents for interactive exhibitions, TV, the Web and the computer: Hypercube, HyperTV, HyperWeb, Moving words, Infoskin, Tunnels...

VR contaminated traditional media like TV with the concept of Immersive Television experimented in the pilot of the series Parallel Architectures conceived by Odile Fillion: Instant City (Peter Cook and Archigram).

This activity increasingly deals with the physical space designing exhibitions and cultural theme park scenography, (New Image, New Networks, 1997, Transformed Human, 2001, Planet of Vision, Hanover EXPO2000, with the Panoramic Tables, an augmented reality device, together with François Schuiten), and the next metro station Franklin D. Roosevelt in Paris with Jean Nouvel in which we mixed light, sound, video, Internet and VR in a real architectural project that adds a symbolic dimension to the public space.

paper

mini-screens and big screens

aspects of mixed reality in everyday life

Machiko Kusahara

Abstract

Mixed reality (MR) is important as the major concept in the age of digital technology. MR as a concept will become a model with which the relationship between the real space and the virtual or cognitive space will be understood. Different from VR, MR enables to re-integrate the reality and virtuality, without loosing the physical existence of body. In analyzing what MR means to the way we see the world, the nature of MR should be examined from a wider aspect. Telecommunication technology has been already changing our cognition of the space, realizing a mixed reality environment in our daily life. Big screens and mini-screens we see in today's urban life can be seen as the realization of mixed reality in our daily life, combine the real and the virtual, making the boundary already blurred.

Introduction

The way we see the world goes through changes in relation to scientific discoveries and technical inventions. Digital technology has brought a series of major changes in the way we see and recognize the world, including our sense of space and body. While telecommunication technology has been influencing our notion of space and distance, digital imaging technology has blurred the boundary between the real, physical world and imaginary worlds. Images are seen everywhere, from regular TV screens to extra large screens on the street corner or to mini-screens on mobile phones, mixing the real and the virtual, the close and distant. In Japan, mobile phones with colour displays are becoming the most common mobile tool for the Internet access, sending email or downloading images, sounds or even games, and exchanging photos with friends, etc. At the same time extra large screens on street corners display all sorts of images including life size elephants, whales, houses and airplane.

In such an environment filled with real and virtual images, our sense of reality cannot remain the same as the way it used to be.

This paper discusses the cultural and epistemological aspects of the way we see the world with mixed reality. The aim of the paper is in analyzing the basic nature of mixed reality from the above mentioned point of view and contextualize it within the media culture today.

Combining augmented reality and augmented virtuality, MR provides a more flexible environment compared to VR. Real and virtual coexist and overlap each other in an ideal MR environment. The optical information from both of them are mixed on retina and sent to the brain through the same channel, to be treated equally in the perception system.

The continuity and equality among the real and the virtual worlds in MR is a new approach to the way we see and interact with the world. It leads us to an insight about how we recognize and deal with different types of fictional, imaginary, non-physical space we conceive in our daily life, and locate them in the real, physical space around us. By juxtaposing and blending imaginary objects with the real, MR brings up an epistemological question on the way we see the world.

Mixed reality has technically made it possible to blend the real and the virtual or distant worlds. However, the importance of MR is not limited in the technical issue. As virtual reality has become a popular idea in our society in understanding what a virtual world created with digital technology can be, MR will soon become a key concept in understanding the world today where the reality is so often mixed with virtuality. Analyzing the nature of mixed reality from everyday life aspects is needed in order to understand what we mean by living in mixed reality.

1. Space Recognition with VR and MR

In virtual reality, the user is supposed to be immersed in the virtual environment. Ideally it means that the real, physical world including the user's real physical body disappears from both his/her sight and consciousness. As a physical device, HMD typically provides such a situation where the user would see nothing but the virtual world, immersed in the virtual environment. If necessary, the user's hand would be shown as a 3D floating hand on the screen. It also means that there is a clear boundary between the real world and the virtual world. "Diving into the virtual world" is considered as the process a user would experience.

In mixed reality, there is no such clear boundary. Images from the virtual world will be shown typically either on the see-through glasses or as projection on real space. The sense of reality for the virtual world is enhanced by the images from the real world. The user's body is visible and integrated into the mixed reality environment, supporting the sense of reality. Also, objects that belong to the user (i.e. things he/she carries or wears) are integrated in the environment. Therefore entering a mixed reality environment is rather like stepping into a room through a door or entering a garden through a gate. One's real body still exists, and other people around as well.

To summarize, a typical MR environment does not subtract information from the real world but adds information from the virtual world to the user's cognition and experience. The sense of body and space remains the same, while virtual objects or landscapes overlap with the real and the user can interact with them. Entering an MR environment is not like diving into a virtual world, but rather stepping into it on the same ground level, if it is not totally continuous. (If the environment is realized with glasses, for example, there is a moment that the user wears the glasses to enter the mixed reality space.)

Therefore there is a critical difference between VR and MR in the way a user relates him/herself with the environment. While VR brings the user into an artificial environment, MR keeps the user in the real space. At the same time, the boundary between the real and the virtual, and the distance between here and there, become blurred with mixed reality.

2. Body and Media Technology

Our concept of body has changed through history, both according to scientific knowledge and philosophical ideologies, and the influence they have had on culture, which, in turn, influence science and technology. Also, there are different but related approaches in thinking about body. That is, body can be seen either as a physical object, an organic system, a mental model, etc. Actually, notion of body is a social matter as well. For example, the idea about the ownership of one's own body changes notably in different societies. Slavery is an extreme case. Altogether, what body means to each person -- to one's self or identity -- differs according to the above mentioned issues and elements such as religion, culture, science, technology, politics and gender, among others.

Development of media technology has brought a big change to the notion of body. The complex network of influence among technology and science, philosophy, religion, fashion, etc. is forming a new vision and status of body in our contemporary culture. Today, digital media technology has been changing our way of seeing body in many ways. We observe different ways of seeing human bodies in our media environment according to the way the technology relates to the body. Body can be regarded as an image, a virtual object, or even as a data set, instead of a physical, real object that is alive in the real time/space. Body is no longer "as it is", as a biological and physiological entity that belongs to the domain of animals. A body can be enhanced and extended, not only with tools and technologies but also with supplements such as artificial organs embedded inside the body. Also, technologies such as telecommunications, digital entertainment and virtual realities have brought us a new feeling that a virtual world exists within the computer or in the Net, where minds can go in, leaving the bodies behind.

How do we understand these phenomena and relate them within the media culture? What are the roles of the technology and the culture? These questions should be answered to find a better solution to place our bodies in more comfortable positions in the digital society.

We can classify the above mentioned phenomena into the following list.

- Body as an image - with imaging technologies: It already happened with the advent of photography. Body has become a recorded image without a physical entity. With the arrival of electronic media, bodies can be "live" images. We observe anonymous actors and actresses on TV commercials playing a similar role. What matters is only their physical body, detached from the personality, voice, or name.
- Body as a virtual object - with reproduction-technologies: Such body for appreciation that can be recorded, reproduced and looked at, independent from its ownership.
- Body as a data set - with digital reproduction-technologies: Digital technology de-materializes human body to a set of data. We have many real human bodies and virtual characters on the Net: Both are there as data sets, regardless of their originals and the identities. Akira Gomi's CD-ROM-based artwork "Yellows" depicts what is happening to body and identity.
- Enhanced body - with tools incorporated in body: We are all cyborgs, according to Donna Harraway and others. Our body, or even life, is often enhanced or supported with medical artifacts embedded in the flesh. Is there any clear boundary between such body and a body enhanced with high-tech equipment? Or, will there any clear boundary between the Robocop and a person who has his/her body parts replaced by artifacts that are much powerful and stable than organs made of flesh? In fact, Steve Mann consciously experiments himself to be a cyborg connected to the Internet.
- Extended body - with tools and telecommunications technologies: Tools extend our body, both physically and virtually. The feeling of virtual extension of body was observed since early forms of telecommunications technologies such as radio or telephone, with which the sense of space and the location (and size, transparency, etc.) of one's body has changed._However, digital telecommunication has changed the relationship between our body, space and time in a drastic manner.
- Lost body - with telecommunications and other digital environments: In the age of the Internet, "the other end of the telephone line" is no longer clear. Our body is extended, but we do not know where are our extended eyes, ears, etc. Our body can spread in the space without physical entity, or it can be lost in the space, without

knowing exactly where it is. Moreover, while the real space is measurable, there is no sense of scale in cyberspace.

- Immersed body - with cyberspace and other digital environments: Immersion typically happens while playing a game or online chat, or other entertainment. In subjective sense the mind loses connection to the body, which is left in the physical space.

As we can easily see, these are related to and overlap each other. There are both technical elements that work on objective level, and social, cultural elements that work on the subjective level that produce the above status. The subjective elements are in their nature similar to what we already knew with "analogue" media such as photography, film, TV, etc. However, digital technologies have not only enhanced these elements far beyond what analogue media technologies could have done, but also changed the way we regard body and space. Objective elements such as telecommunications technologies and virtual realities or mixed realities, have brought new dimensions in the relationship between the body and the environments. From a wider aspect, these are a part of the fundamental changes that has been taking place in today's world in the way we see body and life, with other -- yet related-- elements such as genetic engineering.

3. Mixed Reality as an Everyday Life Environment

We are used to environments where there are screens and speakers everywhere, blending images and sounds from TV, video, games, CD, DVD, etc. with the real landscape and sounds cape around us. We regard images on billboards, big screens on the facades of buildings, loud music from the car stereos on the street as a part of the real landscape/sounds cape. A huge screen at the corner of Shibuya, Tokyo, is even larger than a house, showing all kinds of images from movie, TV, music video, and commercials. Most of the images are computer manipulated or generated. We live in "real" environments that are flooded with "unreal" images. In between these images the live video of the people crossing the street in front of the screen is shown. The image from the virtual world and the real here-and-now world are juxtaposed, to be seen as a part of the real environment.

If they belong to the real environment, what about personal, portable sources of images and sound? It is known that Sony's Walkman has brought an epistemological change to its users as they walk on the streets. The everyday landscape becomes a different experience because of the music that accompanies. A walkman-user carries his/her sound environment, which can be mixed with the real sounds cape (if the sound volume is set not too high), and combined with the changing landscape.

A similar situation has been taking place with mobile phones. Already with its original use as a telephone, it was observed that a user talking to a friend lives both in the real world and the virtual world, which is shared by him/her and the friend. Today, many Japanese walk on the streets or take trains while checking information, exchanging messages and playing games on their i-mode phones. They carry their small screens with them while living and walking in the real landscape. Images from the virtual world or a remote place that are displayed on the mini-screens no longer belong to the outside world but practically become a part of one's body. By being integrated within the mobile phone, which is the last object they leave behind, these images become a part of the mixed reality to go.

Recent program on the big screen in Shibuya is the interaction with mobile phones. Guided by the message appearing on the large screen, people on the street are invited to send the name of one's girl/boyfriend, or a favourite idol or musician, or even an "anime" character, to the large screen, which will be displayed in real time. Extremely personal information of an anonymous passer-by is sent from a mini-screen of one's own mobile phone, to be shown on the extra large screen and to be shared by anonymous crowd, creating a borderless mixture of real and virtual as well as the personal and public.

4. Conclusion

Digital media and telecommunication technologies have changed our sense of space, as well as of reality. In our real life we live in environments surrounded by images and sounds that consist of bits, not atoms, which are sent from or generated somewhere.

The boundary between real and imaginary is no longer clear. Today we live in what is called a mediated society. Both real and imaginary information arrive through media technologies in the same manner, forming our knowledge of the world. In such a situation, maintaining a sound sense of one's own body is an important issue. We have been developing the way, how to deal with the real and unreal at the same time.

A mixed reality environment offers a psychologically easier access to users compared to a VR environment. A user does not go through the loss of one's natural sight or his/her own body on the scene. He/she is not isolated from other people and the real world around. But these might not be the only reasons why users feel MR environments more comfortable compared to VR.

Mixed reality can be considered as a technical answer to the above discussed situation. The way the real world and additional information from the virtual world are integrated in one's perception can be identified as a simulation of our nature; perception/recognition system. Actually that might be why mixed reality seems to be familiar to us, and will have a great possibility in visualizing our thought and the way we see the world.

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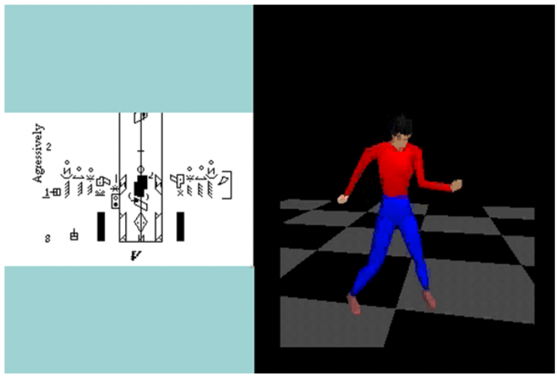

intentional grammars:

networked gestural analysis for mixed realities

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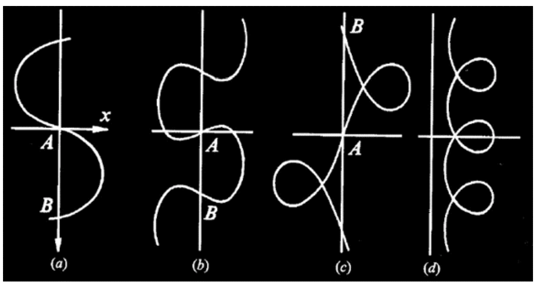
Abstract

The Intentional Grammars research is investigating, designing and implementing a predictive and encoded gesture-based approach to transform and reduce the motion data for transmission in a networked environment. This research will be based on emerging knowledge in the domain of experiential movement analysis, and is being built upon Credo Interactive's Life Forms movement tool and its new research project, the I-Move single stream video translation system. Gestures encapsulate the intent of the motion performed by the user in an input video stream. Thus, only the important characteristics of the motion are transmitted to other users in a multi-user application. The transmitted gestural information will also contain encoding for synchronization, interpretation and re-creation of motion data at the destination. An example is a multi-player networked game scenario, where players use video camera input to represent their movement and interactions while connected to their computer. A key to the analysis and categorization of gesture will be modeling intentionality within the gesture.



Keywords: gestural analysis, gesture-based performance, dance and technology, perception of movement, gestural recognition, design process, full-body interface, intention, action theory, effort-shape analysis

Project Partners: Credo Interactive, TechBC [Technical University of British Columbia], Electronic Arts, NewMic Foundation

1. Introduction

Research and development in game interface dialogues and architectures can be informed by, and benefit from the research domain of gestural movement analysis. Movement analysis techniques incorporate interdisciplinary knowledge domains such as computing science, cognitive science, psychology, kinesiology, somatics, and the performing arts. In the latter categories, [somatics and the performing arts] movement analysis methodologies are constructed from experiential body practice which provide a means to accessing and constructing knowledge.

The Intentional Grammars research is investigating, designing and implementing a predictive and encoded gesture-based approach to transform and reduce the motion data for transmission in a networked environment. This research will be based on emerging knowledge in the domain of experiential movement analysis, and is being built upon Credo Interactive's Life Forms movement tool and its new research project, the I-Move single stream video translation system. Gestures encapsulate the intent of the motion performed by the user in an input video stream. Thus, only the important characteristics of the motion are transmitted to other users in a multi-user application. The transmitted gestural information will also contain encoding for synchronization, interpretation and re-creation of motion data at the destination. An example is a multi-player networked game scenario, where players use video camera input to represent their movement and interactions while connected to their computer. A key to the analysis and categorization of gesture will be modeling intentionality within the gesture.

Gestures can be defined as "body movements that are used to convey some information from one person to another" (Väänänen & Böhm, 1993). If our goal is to get away from pre-defined interaction techniques and create natural interfaces for human users, we should concentrate on the type of gestures that are used in normal human communication. We know that listeners attend to unplanned, unselfconscious gestures, and that they use gesture in communication to form a mental representation of the communicative intent of other gesturing human body.

What kinds of meanings are conveyed by gesture? How are these meanings extracted by viewers | players? Does gesture in mixed reality environments and experiences differ in intention, scale, resolution, or range from other types of gestures? How does gesture enable a greater level of immersion in immersive environments?

Rudolf Laban's movement analysis [Laban], and the work of other researchers [Bartenieff et al.], [Dell], are examples of gestural typologies that analyze and specify a range of qualities and modes of movement for gesture recognition. They present possibilities for exploration into ways that the computer can recognize different aspects of movement, and define a means to approach recognition of gesture systematically. Movement theory can be incorporated as an analytical framework for real-time recognition. The purpose of the research is to find a means to use gesture to control interaction within a 3-d environment. Along with extracting quantitative movement information, building a categorization schema for the qualities of movement being performed can enable an initial model of gesture intention. Intentional grammers can form an interaction with the computer that augments current technologies by extending the input paradigm.

The intentional grammars project will provide the grammar, vocabulary, and knowledge base for a specific domains of movement. Definition of specific movement domains will be an aspect of the project. Intentional grammars for motion encapsulate the "intent" as well as the "kinesthetic" aspects of the motion domain.

1.2 Background

Life Forms was developed at Simon Fraser University at the Computer Graphics and Multi Media Research Lab under the direction of Dr. Thomas Calvert. [Calvert et al, 1991, 1993], as a pilot project in the research of compositional and design processes in movement, dance and technology. Life Forms is a movement tool for choreography and animation, and has innovated a visual way of representing, manipulating, and experimenting with human motion. Merce Cunningham has been composing with Life Forms since December 1989. Cunningham's early work with Life Forms enriched and expanded the interface to a high degree. Today, Choreographers use it for discovery, planning, and visualization [Schiphorst, 1997]. In addition to Merce Cunningham, its users include Michael Cole a former principle dancer with the Merce Cunningham Dance Company, Jimmy Gamonet de los Heros, and Professor Rhonda Ryman from the University of Waterloo. Cunningham's use of Life Forms is primarily a procedural tool for exploring non-habitual ways of constructing, viewing and developing movement for performance. Cunningham continues to use LifeForrms in an on-going basis to invent movement sequences individually that form the basis of a new major work. Jimmy Gamonet de los Heros, an independent choreographer formerly with the Miami City Ballet Company, uses Life Forms as a tool to visualize or transform his dance from an internal choreographic visual gesture, to a large ensemble of sometimes 40+ animated dancers.

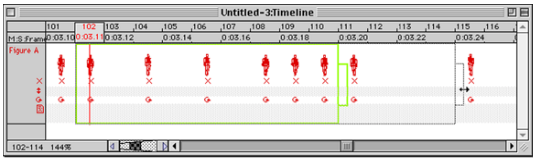


Figure 1. Lifeforms Timeline

Rhonda Ryman, Professor of Dance at University of Waterloo, uses Life Forms is to recreate digital libraries of ballet and modern dance vocabulary for education and preservation. Today, Credo Interactive develops and distributes LifeForms movement animation software and is partnering in research which includes features that support higher level compositional activities in motion analysis, capture, editing, visualization improvisation and composition.

1.3 Current Research in Movement Notation and Translation

The Intentional Grammars research is an aspect of current special research projects for movement notation and video extraction. One of the most recent research projects is the collaboration between movement notation and Life Forms animation. Credo Interactive, with the Dance Notation Bureau and TechBC, is working on a major initiative to translate between movement notation and Life Forms 3d animation. A related observation is that reading notional script requires domain knowledge, i.e. the reader or notator adds information in interpreting the notation. They fill in the gaps of notation with domain specific knowledge based on specific movement vocabularies as found in context specific traditions of modern dance or ballet. In addition to Laban and Benesh notation, there are, and has been, many other movement notation languages, some that are very narrow designed specifically for the specific domain they represent.

I-Move is another research technology project under development for partial- and/or full-body motion control for interactive entertainment and online community. The I-Move project is the underlying technology that Intentional Grammars is based upon. I-Move is a key strategic project for the extraction of 3D motion data from a single markerless video stream (e.g. Fig 2. Notation translated to 3d movement of human motion). A related problem is the synchronization of motion from different people in an online multi-user platform that is subject to load-based transmission delays.

The I-MoVE project investigates and develops new knowledge-based technologies and user-directed tools for analyzing, extracting and reconstructing 3D human movement from 2D image streams. Due to the complexity of human movement, the state-of-the-art only provides partial solutions for the reconstruction of 3D movement from single view 2D video streams.

The objectives of the i-MoVE project are:

- development of new algorithms for 3D motion reconstruction from 2D imagery;
- enhancement of algorithms for component technologies (e.g. more "natural" solutions for inverse kinematics computations);
- design of editing tools that integrates video into the animation process; and empower animators and other users with next-generation 3D tools.

The stream of extracted 3D data can be used to control a 3D character in an interactive application (e.g. a computer game) or an "avatar" in an online community. However since the extracted 3D data is mostly on a frame-by-frame basis, the data stream is dense and not optimal for transmission over the internet for online community applications.

1.4 Intentional Grammars

With a single video stream, there is incomplete information for reconstructing 3D human motion, and thus, heuristics are being explored to guide the reconstruction process. The project team's knowledge of movement, and specific domains of movement, can provide information to assist in the reconstruction process. For example, with I-Move as a core-technology, tai-chi movement could tracked and reconstructed as 3D motion. The rules and the knowledge of the actual tai chi motion grammar/vocabulary are necessary in order to analyze and extract valid movement, transition and blending from one movement to the next, expected sequences of motion. The key element is to couple analysis and reconstruction with heuristics and prediction techniques.

The research will investigate, design and implement a predictive and encoded gesture-based approach to transform and reduce the motion data for transmission over the internet. Gestures encapsulate the intent of the motion performed by the user in an input video stream. Thus, only the important characteristics of the motion are transmitted to other users in a multi-user application. The transmitted gestural information will also contain encoding for synchronization, interpretation and recreation of motion data at the destination. An example in a mixed reality scenario is where users are standing in front of a video camera connected to their computer.

Each user could be in their own personal local space while interacting with others in a shared virtual environment. Their motion must be synchronized in the shared space, viewed locally, and maintained centrally, particularly for contact points in the motion. Each user's local view is impacted by their individual transmission (and to a lesser extent computational) delays. A gesture-based approach to "compression" of the motion data will provide that synchronization needed for an engaging experience.

1.5 Investigation questions

Investigation questions include the following:

- What kinds of meanings are conveyed by gesture?
- How are these meanings extracted by viewers | players?
- Does gesture in game play differ in intention, scale, resolution, or range from other types of gestures?
- How does gesture enable a greater level of immersion in gaming environments?
- What are techniques can be applied for recognition and categorization of gesture gradients (how fine or broad is a "gesture")?
- What techniques can be applied for recognition and integration of partial body gestures?
- Is the gestural information layered and contained within unique channels (i.e. a separation of arm and leg gestures)?
- How should interruption and discontinuation of a gesture be handled by the system?
- What are the issues in mapping gestures from the input body (e.g. human body) to a virtual body?

1.6 Related work at Then | Else Interactivity Centre

As a research partner, Then | Else the Interactivity Research Centre at TechBC [the Technical University of British Columbia] is engaged in a number of research directions which complement this research. This includes: gesture-based performance environments and interaction; development of 3d behavioral animation; perceptually-based video compression; avatar interaction in virtual environments

1.7 Value to game development

The technology [intentional grammars coupled with Credo's i-Move technology] can be applied to immersive online environments in gaming, performance and other tele-present applications. The motion domain knowledge itself can be applied to other types of development where movement analysis, recognition or performance is a key element of the experience.

1.8 References

Somatics education is a term applied to several disciplines developed during the twentieth century in Europe and America. The field has been called Somatics by American philosopher Thomas Hanna, and Somatotherapie by French physicians and educators. Hanna founded the American journal Somatics in 1976, and French psychiatrist Richard Meyer the French journal Somatotherapie in 1989 to review theoretical and practical work in the field.

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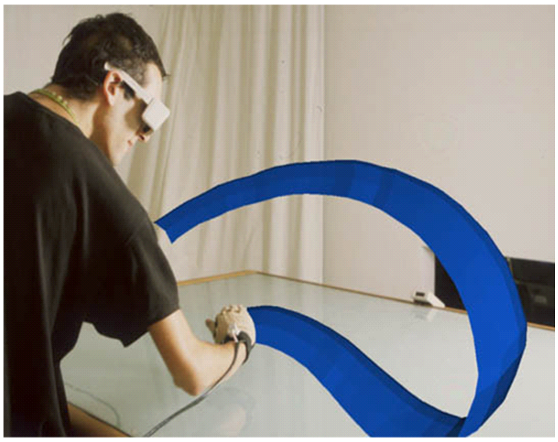

tracing the line of thought on the responsive workbench

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Caltech

Abstract

Traditional 3d modeling software utilizes a complex interface that restricts free conceptual thinking. We have developed an alternative approach that is based on making marks with the body in space. This simplified interface reduces cognitive overhead, enhancing the conceptual development of geometric shapes. This system uses the Responsive Workbench to display geometry in the space of the user, and senses the hand and a number of tangible tools to translate motion and action into form.

Project URL:
http://www.cs.caltech.edu/~ss/sdraw

1. Introduction

Commercial 3D modeling software, such as Maya and 3DS Max, uses a mouse/monitor interface metaphor to create 3D shapes. Spline surfaces or subdivision meshes are used as a representation. Artists control a surface primarily via mathematical control handles, whose positions in virtual space are indirectly altered by mouse motion.

Artists and designers have numerous difficulties with this approach. Using the system requires learning a variety of ways of constructing surfaces and placing them in space. Artists have to understand the mathematical properties of the underlying surface representation. Even after learning these systems, the process of modeling a shape in them is still onerous. An artist begins working by planning their model, picking the layout of spline patches or a subdivision base mesh. To switch directions, a designer has to start from scratch with a new base layout, or go through a series of intricate manipulations of the existing mathematical infrastructure to realize their design. The ability to conceptualize and think freely about a model while it is being made is severely limited. The software is used more to execute ideas than to develop them – concepts are instead explored with traditional tools such as paper and pencil.

We propose an integrated modeling medium that supports conceptual development. Our method allows artists to create shapes through direct contact between digital surface and the body in a hybrid space. This medium uses physical intuition, instead of internal mathematical representation, to dictate the semantics of the shape's response. Because the interface is based on a physical understanding that is automatic, the artist can forget about the interface and focus on the form. This medium allows shapes to be sketched quickly by novice users. It also allows the creation of complex, precise shapes through a process of refinement. The shapes have an organic appearance that reflects the bodily nature of their construction. This is in stark contrast to the inherent coldness of much digital geometry. This medium presents an intuitive way of creating with its own visual language.

2. Interface

Our system is based upon the Responsive Workbench. This is a large, table-sized display that is projected on from below. The user wears head-tracked stereo shutterglasses that lift the two-dimensional display on the table into 3D space by showing each eye a different image. A magnetic tracker detects the position and orientation of the user's head to give a parallax effect, completing the three-dimensional illusion.

Shapes are created by tracing them with the hand. A glove senses the shape of the hand, and a magnetic tracker senses its position. The path of the hand in space is captured and displayed as a stroke which hovers in space. Multiple strokes are put together to form a 3D shape, in much the fashion that strokes are combined on a page in 2D drawing.

Sensed tongs move and stretch a shape. One tong grabs a shape, moving it and rotating it in a space. A second tong has the same function, but used together they can stretch a shape (by pulling it apart) or shrink it to make it smaller. An eraser removes portions of the shape when squeezed, and a magnet tool gently pulls a surface to create small deformations. A full description of this interface is presented in an earlier article [1].

Figure 1: The path of the hand in space is converted to a geometric stroke that floats in space, as shown in this composite image.

Figure 2: Several shapes, ranging from a one-minute figure drawing to a refined ballerina, all created by the first author. The head on the right was refined using the magnet.

3. User Experience

We have exhibited prototypes of this system at SIGGRAPH 1999's Emerging Technologies, and at the Mostra da Realidade Virtual 2000 in Rio de Janeiro. In these shows, we observed the responses of hundreds of users. Virtually every user quickly understood the medium and began making shapes in seconds. The sophistication of the shapes varied with user experience. Trained artists successfully leveraged their traditional skills. Those with less artistic background had more difficulty adjusting, although some of them successfully made less detailed stick-figure drawings.

To further qualify the response of artists, we ran an informal user study in June 2000. We taught the system to art students, with backgrounds ranging from computer modeling to oil painting. We found that all of these artists adapted successfully to this medium and could make shapes with an alarming degree of personal style and graphical communication in their first half hour of exposure. Many of the users of traditional media said that they had always avoided computer modeling because they were afraid of the interface. Our approach, they said, worked the way they thought. This new tool makes creating ideas interactively in 3D simple.

We have also examined more complicated shapes that require expert knowledge of the system. These include physically accurate human forms and industrial design prototypes. These models indicate that this medium, while tuned to the early, conceptual phase of design scales gracefully and naturally to more complicated shapes.

4. Future Directions

Our method gives artists and designers an unprecedented ability to conceptualize freely in 3D space. It can be used to create models that mimic many shapes in the current environment – cars, people, buildings, etc. Its greatest potential lies in its ability to create shapes that have not been seen before. For example, complex relations in 3D space that are very difficult to realize with traditional tools are easily constructed in this medium (see [2] for details). We are interested in seeing what different types of effects can be achieved – bringing a visual language as rich as that of oil painting to 3D space.

Our investigation demonstrates the power of physicality in interface. In the future we will extend our metaphor of tangible interaction with tools that enlarge both the types of material can be created, and the interactions that can be defined between elements. The medium presented herein opens a new aesthetic space of digital geometry, whose intuitive exploration is enabled by a physical interface.

5. Acknowledgements

The photograph in Figure 1 was made by Vanessa Stump. This work was supported in part by NSF (ACI-9721349), Designworks/USA, Intel, Alias|Wavefront, Pixar, Microsoft, and the Packard Foundation.

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paper

imagine space fused with data

a model for mixed reality architecture

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Abstract

The paper presents a conceptual model of a Mixed Reality architecture by the fusion of physical and digital space exemplified with the Murmuring Fields scenario. The concept of spatial perception is supported by perceptive interfaces superimposing different levels of reality. This situation shapes the performers experience of being present in Mixed Reality space by acting. The structure of this Mixed Reality architecture is a notation system describing layers of physical and digital space for a hypermedia storybook. The inter-connected space creates a new framework for communication and interaction. To this end, the result is eMUSE, electronic Multi-user stage environment for rapid prototyping of Mixed Reality architectures.

1. Envisioning Mixed Reality

Imagine space fused with data. Imagine data representing a tangible situation. The underlying paradigm of Mixed Reality (MR) is that of an information space merging components of physical and digital information. The metaphor we use for MR space is that of a room furnished with data. The basic idea is the linking of physical and digital space by perceptive interfaces.

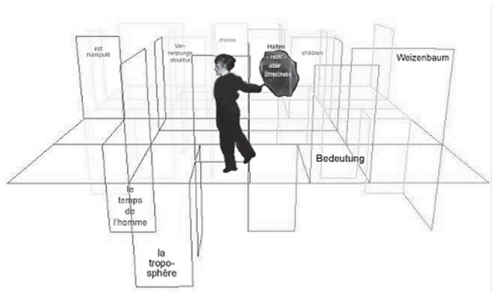

Fig 1 Interacting in a room furnished with data.

The room stands for a physical interaction space but the furniture of data is virtual and stands for an information space. It is a spatially organised information architecture in which data is revealed through users‘ movement and action in the combined real-virtual space, and through interaction with other users. This theatrical model is used to structure and act within day-to-day spaces. MR architecture opens up windows to data-space; conversely data-space becomes present in real space. Movement is information and reveals data from virtual space as if it were in physical space.

1.1 Sketching Mixed Reality architecture

Our approach to MR space is as an interconnection of the real and the virtual that produces a new framework for communication and interaction. The physical space is fused with the digital space. The user’s exploration of the virtual space is connected to both real space and other users’ experiences.

The goal is to build an architecture by rearranging spatial elements from static into dynamic environments, from canvas to pixelated mosaics, from materiality to transparency. The moving image arises as interactive data skin and is combined with cameras and microphones, sensors and actuators as the glue for MR space. In the following we describe how to interface the body wirelessly with digital space.

2. Interfaces sensing body and space

Mixed Reality requires a completely new kind of interface – one that allows humans to communicate the way they naturally communicate with each other by speaking, gesturing, touching, moving around, looking with the body and thinking with the hand. Fig 2 identifies a basic bundle of six artificial senses seemingly covering the classic senses.

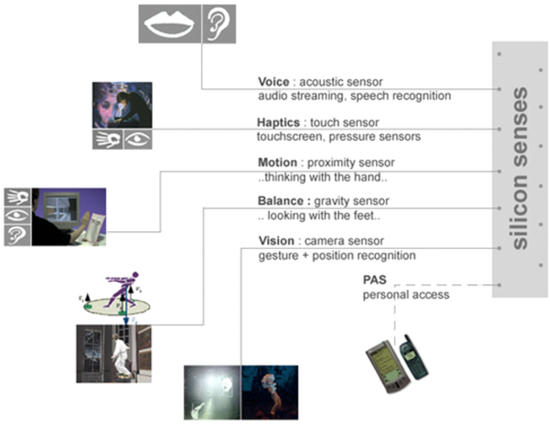

Fig 2 Perceptive Interfaces for the silicon senses

The human body with its communication channels and membranes (skin, eyes, ears, voice, and balance) are reflected and replied to by a variety of sensors embedded in real space and objects. The sensors literally hear and feel the presence and condition of the human body. The body in space is measured and detected by silicon senses e.g. a computer vision system. Thereby the interface becomes immaterial.

3 Connecting body and space

Several existing vision systems and applications provide concepts of media-related interactive stages based on video gesture control.

In the context of the MR stage we recognized several disadvantages to these systems: they are stand alone solutions which are not web-based and without access to the source code.

The computer vision system with the video camera oversees the position of people in physical space and transfers the data of movement and orientation as traces of presence in virtual space. The application scenario Murmuring Fields demonstrates this MR environment.

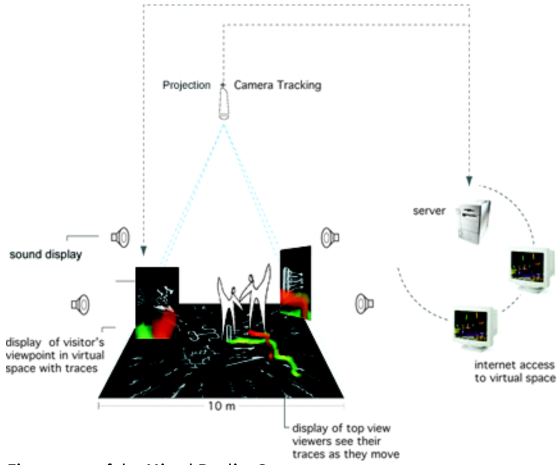

Fig 3 scene of the Mixed Reality Stage

The initial sketch for the presentation of Murmuring Fields depicts a floor projection (Fig. 3) while two side projections display individual user viewpoints. The Vision System surveys the entire inter-action in MR space. Performers are represented in digital space as colored trace of movement corresponding to their movement in physical space. The objective is to create a situation which brings the participants into mutual play by amplifying their bodily awareness of space and of each other. Thus the MR stage becomes an interface environment, not merely the connection of man and machine. It is a situation in which the performers become involved by interacting with the MR stage.

3.1 Body mapping

The electronic Multi-User Stage Environment (eMUSE) was build to link physical and digital space for group interaction around common data. It is realised as a VRML 2.0 (Virtual Reality Modelling Language) based networked environment combined with perceptive interfaces. It is a platform for multi-user interaction, communication, rendering and display organization in shared physical and digital space. The MR stage is intra-connected by the vision system, a camera-based tracking system capable of locating several humans moving in a room.

The eMUSE system consists of three main parts: the external user interface driver (EUi), the multi-user driver (mu) and a VRML browser. The external user interface driver allows arbitrary input devices for controlling navigation in the VRML scene to be attached. It reads data from input device drivers, transforms it into appropriate VRML co-ordinates for control of viewpoint and movement of avatars, and passes this data to the multi-user driver over a socket connection. The multi-user driver takes care of updating the user's local VRML scene. It runs a JAVA applet inside the Web browser and uses the external authoring interface (EAI) to communicate with the VRML browser. Changes are propagated directly between the multi-user drivers supporting individual users, through TCP/IP and UDP peer-to-peer connections. The modular structure of eMUSE enables the use of any VRML compliant browser that supports the external authoring interface. eMUSE was realised using Cosmo Player 2.0 as rendering engine. The eMUSE system can be understood as an interface for a building nonlinear communication structure.

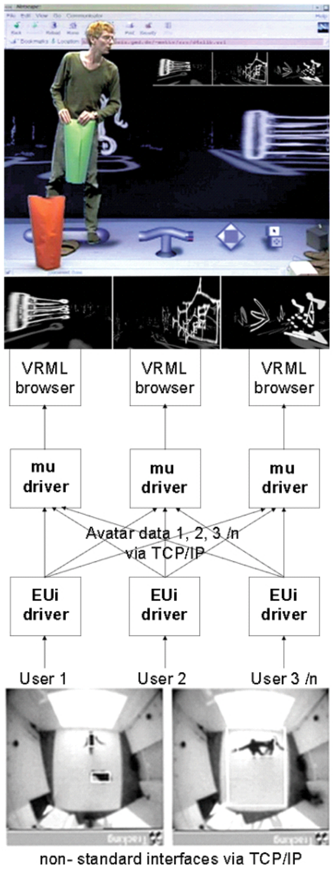

Fig 4 eMUSE interfaced by the vision system for control of several viewpoints

3.2 The Mixed Reality situation as interface

In order to realise the MR Stage concept, different perception levels need to be layered and related in a coherent structure. The interface environment functions through the interplay of the following components:

- The Vision system
- Visual representation of content
- Audio representation of content
- User representation as trace of presence
- Physical interaction space

The Vision system

A fundamental point of the MR Stage concept is connecting participant's bodily sense of being in physical space with that of being in virtual space at the same time. To achieve this we use an optical tracking system to connect participants' movement in real space with navigation in virtual space. The data provided by the tracking system controls the position and movement of the user in the virtual space, parts of which are displayed accordingly in appropriate locations of physical space. This supports the perception of virtual space reacting to users' actions as an integrated part of the physical space in which they are situated.

Visual representation of content

The visual elements of the virtual environment serve as placeholders for sounds and an orientation aid for the participants.

Audio representation of content

A participant's movement in physical space controls the creation of the corresponding trace-avatar in the virtual space. Traces of all participants trigger sounds and words in the virtual space that are emitted in the real space. The emergent soundscape inspire further movement and lead to a mutual play of the participants in producing sound patterns and dialogues together.

User representation as trace of presence

The trace of one's own movement is the orientation line. Participants communicate through their virtual traces and thereby determine the action space as well. The trace of presence becomes a visible interface and a medium for communication. It indicates the current position of the participants and triggers sounds by virtually touching sound objects. Thereby an audiovisual composition created by the participants is initiated.

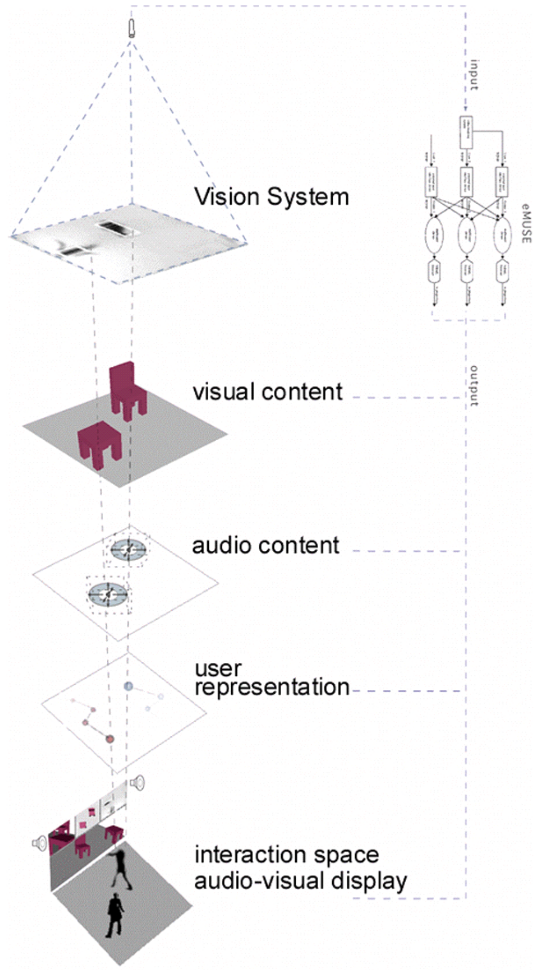

Fig 5 Layers of the Mixed Reality Stage

Physical interaction space

Unlike in systems where navigation in virtual space is achieved by directly manipulating some physical device, the MR Stage cannot be navigated without the existence of an appropriate physical space. The physical space becomes an essential part of the interface. As a participant becomes immersed in the play of movement and sound, his awareness of being in space, and of the interaction with others, becomes increasingly a bodily one.

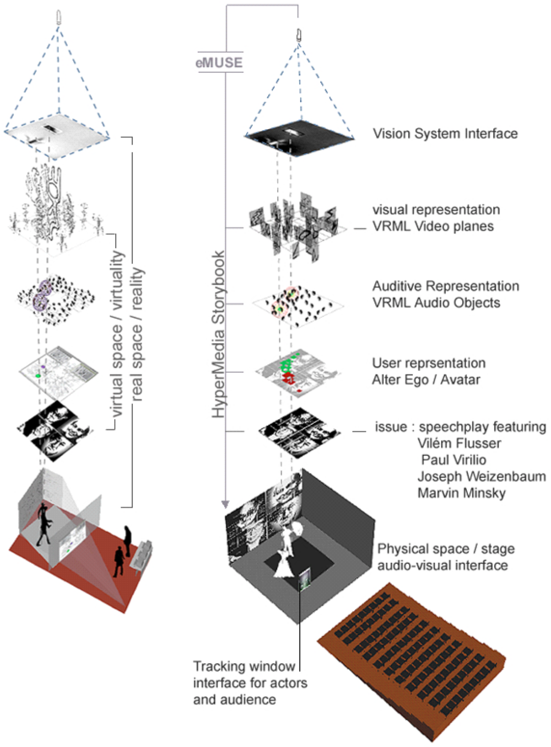

Fig 6 Murmuring Fields layers of Mixed Reality for installation and stage, Berlin/Bochum.99

4.2 The invisible map and the basic structure of the Mixed Reality soundscape

In linking, the physical and digital space must be scaled and calibrated to each other. The Murmuring Fields experiment superimposes both spaces in scale 1:1. The interactive area is 4 by 4 meters scaled to the digital scenario. In fact, the empty space is furnished with a three-dimensional audiovisual environment. In reality the performers are inside an invisible environment, minimalistically visualized on a floating screen of gauze. Sound is emitted to real space depending on the performers' position. Thereby the body is the instrument to perform in and with the MR space.

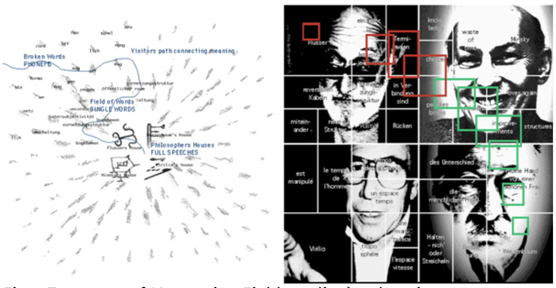

Fig .7 Two maps of Murmuring Fields audiovisual environment

The design of the audiovisual environment as shown in the map (Fig 6) builds up a field of diverse densities of spoken words and sounds. The speed of movement mixes the according sound and image. Careful and slow movement breaks a single word into phonemes, e.g. the word politik appears in an empowered dance version as poli tik, tik, tik.

As a user leaves traces of presence in the digital environment, the path of connected meaning and the notation of movement is rendered as part of the scene. In Murmuring Fields public installation visitors walk along landscapes of faces. They are engulfed in a soundscape of the voices of media philosophers Vilém Flusser, Marvin Minsky, Paul Virilio and Josef Weizenbaum.

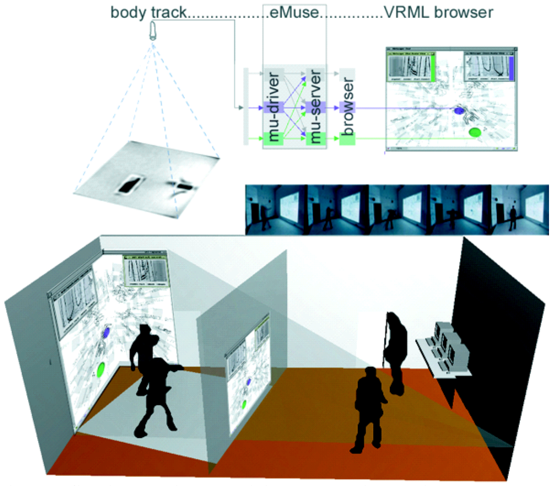

Fig 8 Configuring physical and digital space as interactive and interpassive zones

4.3 Murmuring Fields in public and performance space

The visitors of Murmuring Fields are situated in a soundscape of one hundred sound samples. The interactive protagonists control the sound stage by their position on stage. The layers of sound created by each participant intersect and weave together, thereby generating a collage of sound. This interactive body conversation of sounds is augmented by a visual map, projected on semi-transparent displays. The impression for the users is that of an invisible field of sounds existing in the physical space and revealed through their actions.

Fig 9 Emergent behaviour in Murmuring Fields Installation

To summarize: one or several participants in the physical space are simultaneously present in an information space that is made visible only through participants' actions in the real space. The overlapping and integration of these two spatial situations creates a new reality of perception.

The second public trial of Murmuring Fields took place in the context of a theatre festival. In the rehearsals, we perceived the professional performing artists having more problems in playing and exploring than the accidental visitors in the installation version. In contrast to the traditional theatrical concept of performing on stage, the MR stage requires to recognize the body as an instrument playing in an orchestra (Fig.9).

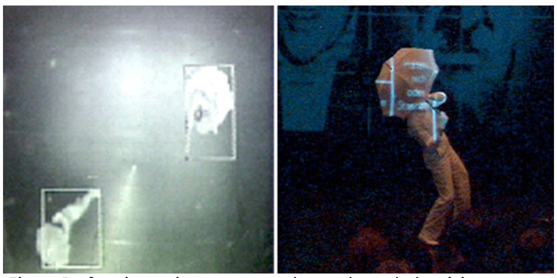

Fig. 10 Performing artist on stage and seen through the vision systems tracking window

5. Conclusion

With eMUSE we have built an architecture to design and operate Mixed Reality space and a playfield for communication in networked space. The discoveries made through the MR stage in terms of emergent patterns of behaviour and different perceptions of reality go beyond the boundaries of the theatre.

6. Outlook: streaming forward

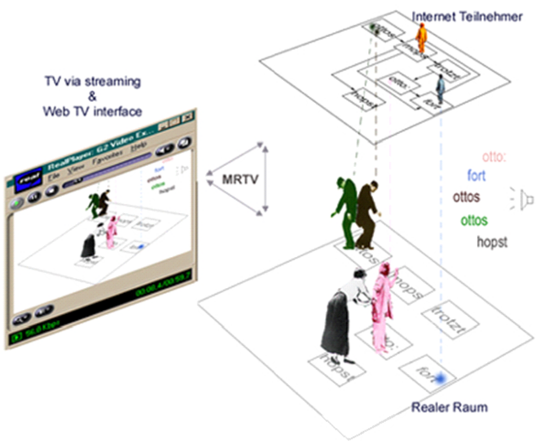

Fig. 11 Loops of streamed cycles

For the distributed poetry play "Ottos Mops" by Ernst Jandl, thematic spaces like MUDs and MOOs build up the structure for a semantic map. People meet remotely, brought together by a RealVideo window streaming and recollecting the happening. Loops of streamed cycles unfold layers of echos in space.

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papers

panel 2:

the information society landscape

new formats of expression in eu/ist – projects

Olivier Avaro, France Telecom, R&D / MDI, Paris (F) – Navigator

the information society

new formats of expression in eu/ist projects

Most prominent the European Commission funds projects in this domain, part of its politics.

Multisensory Expressive Gesture Applications is an EU/ IST three-year project, presented by Camurri/de Poli/Leman.

MEGA is centred on the modelling and communication of expressive and emotional content in non-verbal interaction by multi-sensory interfaces in shared interactive mixed reality environments. Their research represent among other results from a research concerning the development and experimenting of computational models for real-time analysis of expressive intentions in human movement. Their goal is to discover and measure movement cues useful for recognizing expressive content in movement, and in particular from dancers, music performers, actors on a theatre stage, or visitors in a museum exhibit. This provides a deeper understanding of the relations between gesture, music, and visual languages, and enables artists with conceptual as well as system tools for interactive performance.

The paper of Battenberg/ Schickel describes the influence of community software on the perception of "community" in virtual life and describes how both realities will jointly develop into a new mixed reality - a reality with new services and new rules, where distinctions such as "virtual" and "real" have to be newly defined.

The presentation by Janse addresses the role of protocols for sharing content in future media from the perspective of the behavioural sciences. Two interactive TV applications, a storytelling program for children (TOONS) and an interactive program guide (myGuide) for a general audience are compared. These applications combine Internet and broadcast technologies.

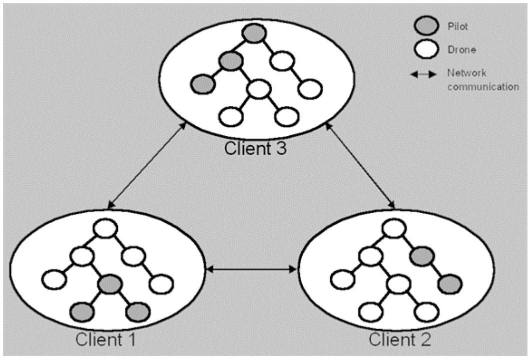
Kamyab/ Guérin et al. propose a contextually sensitive architecture for sales assistants in the SONG project. The next generation of portals will not only amend this but will provide an integrated environment with marketplaces, chat rooms and believable synthetic characters. They are concerned with the design of embodied sales assistants to be immersed in MPEG4 multi-user worlds. This means that sales assistants interact with customers, and their virtual shop in a believable manner and bring many challenges to the designer.

Transfiction, the project by Nandi/ Marichal is designed for mixing synthetic and natural images in real time and allows one to interact in these data input/output screens. The paper presents a system for interaction and is designed for mixing synthetic and natural images in real time and allows one to interact in these data input/output screens.

ARCHEOGUIDE (Augmented Reality-based Cultural Heritage On-site GUIDE) by Didier Stricker/ John Karigiannis et al. is the acronym of a project, funded by the EU IST framework, and pursued by a consortium of European organizations. The system allows the user/visitor to experience a Virtual Reality world featuring computer-generated 3D reconstructions of ruined sites, without isolating him from the "real world".

The explosive growth of the Internet in recent years has led to a proliferation of multimedia technologies for enhancing the appearance and usability of new formats of standardization and tools for sharing spaces (multi-user worlds).

paper



multi-user: the other dimension of portals

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Abstract

This paper focuses on the requirements, functionality and technology for multimedia Internet portals. Both existing and emerging technologies are presented. Special emphasis is placed on the upcoming multi-user extensions to MPEG-4, a preliminary version of which is briefly described. The paper is organised as follows: section 1 provides an introduction to the rationale behind, and state-of-the-art of multi-user multimedia Internet portals; section 2 describes how MPEG-4 can be seen as the enabling technology for portals; section 3 gives a brief technical description of the proposed multi-user extensions to MPEG-4; section 4 illustrates how this technology can be applied to portals and section 5 draws conclusions as to how portals will evolve in the long term.

Keywords: Multimedia, multi-user, MPEG-4, portal

1 INTRODUCTION

1.1 RATIONALE

Multi-user, multimedia Internet portals are gateways to a wide variety of information sources; this can range from pure reference information to product information to entertainment, education and training. This diversity places special demands on the underlying technology; in particular a wide variety of media types must be accounted for. In addition there is the need for interoperability between portals of similar type, and of different type. Portal organisation is often hierarchical such that a main, general portal will give access to other specialised sub-portals. There are three basic needs which are driving portal technology forward: multimedia to enhance the look, feel and functionality of portals; interoperability to allow sharing and re-purposing of content between different portals, media types and industries (e.g. film, game, Internet); and simultaneous, interactive portal access for multiple users. These needs are met by MPEG-4 [1] technology and its multi-user extensions.

1.2 OVERVIEW OF STATE-OF-THE-ART

There exist today a cornucopia of different technologies that add dynamic multimedia enhancements to Internet portals. The most advanced are proprietary solutions. Although shared 3D worlds and online 3D games are relatively commonplace, there are no standard, integrated solutions for sharing all common types of media (2D/3D graphics, audio, video and text). The following section briefly presents some of today's common multi-user solutions for Internet portals.

1.2.1 Multi-User multimedia portals

Probably the most widely used Internet-based multi-user application is for textual chat. This is used both as a standalone application and to enhance other forms of user interaction, most notably 3D virtual communities such as blaxxun Community Platform [2] and Active Worlds [3]. The latter examples allow for multiple users (represented with Avatars), to interact in synthetic 3D environments. Telenor's Dovre (the Distributed Object-oriented Virtual Reality Environment) [4][5] is a generic API for building custom, distributed, multiuser 3D applications. Also of note is Microsoft's Virtual Worlds [6] platform for building Collaborative Virtual Environments (CVEs). This is available in source and binary formats.

These solutions offer users a wide variety of functionality and levels of interaction. Avatars can be animated and can use pre-recorded gestures and actions (e.g. wave hello, jump, build). Moreover other communications media can be exploited such as video and audio. Many of these solutions use VRML [7] as the scene description and animation language, through there is no standard for multi-user VRML. Living Worlds [8] was an attempt at defining such an extension to VRML, i.e. for multi-user 3D applications. Much positive work was done in the proposal, however the standard was viewed as too complex to implement and consequently not widely adopted. Despite this, much of the core concepts and technologies from LivingWorlds are used in some of today's CVEs (e.g. blaxxun and Dovre). Moreover the proposed multi-user extensions to MPEG-4 (described below) use the core drone-pilot concept from Living Worlds for distributed scene management.

2 MPEG-4 TECHNOLOGY ENABLING MULTI-USER VIRTUAL WORLDS

2.1 KEY FEATURES OF SINGLE-USER MPEG-4

In contrast with the other MPEG standards (MPEG-1 and MPEG-2), MPEG-4 is more than just a format for natural video playback. It is a framework for storing, distributing and rendering all major media types, including natural audio and video, synthetic audio and video (2D and 3D) and text, in a homogeneous environment. The binary scene description format (BIFS) is based, syntactically and structurally, on VRML (in fact the VRML node description syntax is a subset of MPEG-4's). In addition the MPEG-4 standard specifies the following elements:

- a system for stream delivery [9];
- stream timing and synchronisation;
- error resilience;
- user interaction;
- an interface to intellectual property management (IPMP) systems.

In short it is a standard for holistic, integrated multimedia systems. Version one of MPEG-4 became and ISO standard in late 1999, and the final version (with multi-user extensions) is due in March 2002.

2.2 EXTENSION TO MULTI-USER ENVIRONMENTS

The current ratified version of MPEG-4 is a framework for single-user multimedia systems. Although the user can interact with content as specified by the content author, standardised interaction with other users is not possible. It is possible to use MPEG-4 in much the same way as VRML - as an interchange format for scene descriptions, and continue to use proprietary technologies for distribution. This approach was used to great effect in the Venus project [10], though it is not an interoperable solution, with regard to the multi-user protocol. There is clearly a need for a standardised protocol for scene sharing and multi-user interaction. The multi-user extensions to MPEG-4 are designed to satisfy this need. The standard should benefit end-users, content authors and service providers for multi-user portals.

2.3 TECHNICAL OVERVIEW— MPEG-4 MULTI-USER TECHNOLOGY (MUTECH)

The two main sources of inspiration for the architecture are the Living World specification [8] and H.323 [11]. Some of the authors of this system have participated actively in the design and implementations of the former two standards and have distilled the specification from their previous experiences with these specific design goals:

- Seamless integration into the MPEG-4 architecture: The architecture has been developed to fit with the existing MPEG-4 system.
- Re-use of existing MPEG-4 tools: The architecture reuses these key MPEG-4 components: BIFS (with new nodes extensions); DMIF [9]; the object descriptor protocol and all the MPEG-4 mono media representations.
- Flexibility: The architecture is not the specification of a complete application but rather a framework for a system and associated tools.

2.4 BRIEF TECHNICAL DESCRIPTION OF MUTECH KEY ELEMENTS AND FEATURES

2.4.1 High-level architecture

The architecture is designed to allow interoperability on the following levels:

- Shared objects: such that arbitrary objects can be declared as shared, and be uploaded and incorporated into MU environments
- World: such that MU-environments created by different content providers can be viewed on different MU-enabled browsers.
- Browser: such that any browser can be used to view and interact with MU-content provided by any server.

These levels of interoperability imply that the format for MU content, and the messaging protocol and generic API for conveying multi-user related data should be standardised.

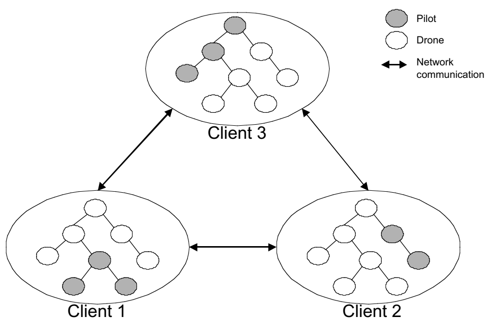

Figure 1: Drone-Pilot model

.As stated, the architecture borrows the Living Worlds' drone-pilot (see Figure 1) concept for distributed scene management:

- Drones are local (i.e. existing in the scene graph of a client terminal) instances of nodes that contact their corresponding pilots to distribute changes.
- Pilots are master copies of nodes on clients or servers.

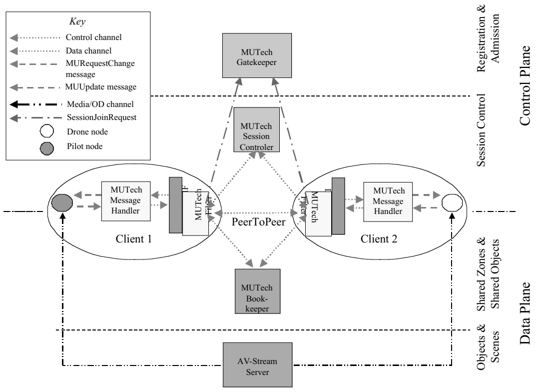

Figure 2: Multi-user architecture overview

Figure 2 shows an overview of the high level architecture illustrating the main components:

- MUTech Session Controller (MSC) is responsible for ensuring that communication between drones and pilots. It is similar to an H.323 MCU, setting up channels, maintaining an overview of client ids, capabilities, privileges and IP addresses.
- MUTech Bookkeeper (MBK) keeps track of shared zones and child shared objects; maintains access rights for all shared entities; and optionally support persistency, locking and transfer of ownership for shared objects and zones.
- MUTech Gatekeeper (MGK) acts in the same way as an H.323 gatekeeper, controlling access to the conference.
- MUTech Message Handler (MMH, see Figure 2 and Figure 3) has two main purposes: 1. to provide an interface to the client terminal for sending and receiving multi-user messages; 2. to tag messages with the correct client id before sending them along the Request/Update channel open on the DMIF.MUTechFilter is a DMIF filter that allows an application to open message channels and transfer messages to and from the MSC. The filter may also support peer-to-peer communication between clients, such that the MSC and MBK are not used for routing Request and Update messages.
- AV Stream Server is essentially a placeholder in the architecture for a server that supplies scene nodes with AV streams.

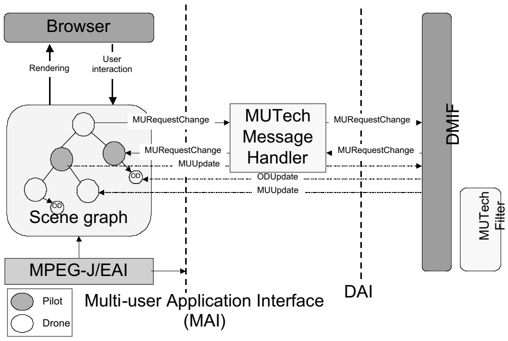

Figure 3: Mutech Message Handler

The architecture is designed to support both centralised and peer-to-peer scenarios (with and without MSC respectively), as shown in Figure 2.

2.4.2 MU node specifications

A set of new BIFS nodes (see Figure 4) is specified for a high level access to the MU features at the scene graph level:

- The MUSession node is a container root node containing a list of MUZone nodes, with the URL for the MGK or MSC;
- The MUZone node is a container for all shared nodes belonging to the zone;
- The MUDescriptor contains session related information and user related information such as username, password and capabilities;
- The MUSharedObject allows sharing to be specified at the field level.

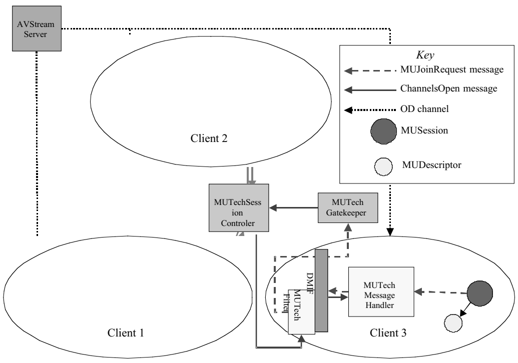

Figure 4: MUSession and MUDescriptor nodes

2.4.3 Message protocol

A wide range of messages is used for session set-up, administration and distributed scene management and more. The two main messages used for the latter are:

1. MURequestChange is a message for use when requesting a change of state of an object. Drones request their pilots to change state by sending a MURequestChange message, and the Pilot accepts the change or declines it. MURequestMessages should also be used when carrying out user-driven changes to an object; this includes changing objects in the scene graph using MPEG-J and other authoring interfaces, and through different input-devices.
2. MUUpdate messages are designed to distribute changes to drones located on client terminals. This is essentially a BIFSUpdate or BIFSAnim command (MPEG-4 [1] BIFS mechanisms for modifying the scene graph dynamically) with a wrapper indicating the origin of the message.

2.4.4 Simple walkthrough of joining an MU session

The following is a walkthrough describing the steps for joining a multi-user MPEG session.

1. The initial MPEG-4 scene is distributed to Client 3 by the AVStream server. The scene contains a placeholder a MUSession node, and associated MUDescriptor.
2. Through some content provider-defined mechanism (e.g. TouchSensor or ProximitySensor), The user sends a request for permission to join the session, to the MUTech Gatekeeper.
3. If successful the gatekeeper provides the address of the MUTech Session Controller (MSC).

4. The client sends a MUJoinSessionRequest message constructed based on the local client profile (e.g. IP address), and the MUDescriptor for the session.

5. The MSC requests client capabilities using an MURequestCapabilities message.

6. Client 3 sends capabilities as an MUCapabilities message.

7. The MSC grants or denies session join, and if granted, assigns the client an ID.

8. Client 3 requests list of MUZones and the corresponding bookkeeper(s).

9. The MSC sends the requested information and client3 constructs default MUZone nodes as children of MUSession.

10. Client 3 sends MUJoinZoneRequest message(s) to the MSC (one for every MUZone).

11. If successful, client 3 requests updates from the MUTech Bookkeeper (s) (MBKs)

12. An MUUpdate message is sent by the respective MBK to the subscribed MUZone on Client 3. This is essentially a BIFS Update containing all the information about the MUZone, i.e. the fields of the node itself and associated sub tree. Note that these nodes will be added as drones.

13. Client 3 is now participating in the MU session.

3 APPLICATIONS TO PORTALS

The explosive growth of the Internet in recent years has led to a proliferation of multimedia technologies for enhancing the appearance and usability of portals. However these tech-nologies are largely non-interoperable, and therefore limited. MPEG-4 offers a means to create homogeneous, interoperable multimedia solutions for Internet portals.

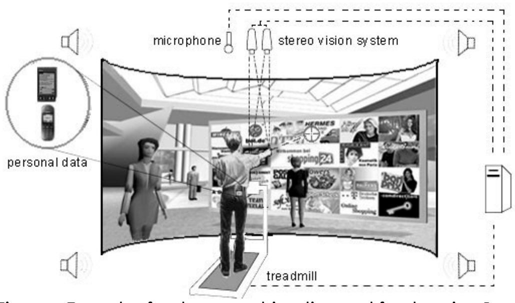

Figure 5: Example of mult-user multimedia portal for shopping. Image courtesy of GMD GmbH and blaxxun interactive AG.

As stated, an Internet portal is essentially a gateway to some source of information on the Internet. Multimedia allows this gateway and associated information to be presented in an attractive and compelling manner, thus improving its effectiveness.

4 CONCLUSIONS

4.1 LONG TERM PROSPECTS FOR INTERNET PORTALS

MPEG-4 multi-user technology offers a way to bring portals alive with rich media content that can be shared with other users. It also offers new and novel forms of interaction with those users. The exploitation of this technology will result in increased usage of Internet portals, and will improve prospects for commerce, entertainment, enhanced chat and browsing, through portals that are essentially shared, virtual multimedia environments.

4.2 THE EVOLVUTION OF PORTALS THROUGH MULTI-USER MULTIMEDIA TECHNOLOGY

The multi-user dimension of portals brings an complementary level of interaction to the portal experience: that of interacting with other human beings. Add to this the possibility to create portals that are collaborative 3D environments either reflecting or enhancing reality, and the portal could become a doorway to a rich world of shared media. Combine these elements with being able to select the appearance and behaviour of avatar representation, and there is the possibility for truly immersed and engaging experiences through shared multimedia, which could present a wealth of new applications for Internet portals. These applications will make the use of portals a natural part of everyday life for ordinary people in professional, social and leisure contexts.

5 ACKNOWLEDGEMENTS

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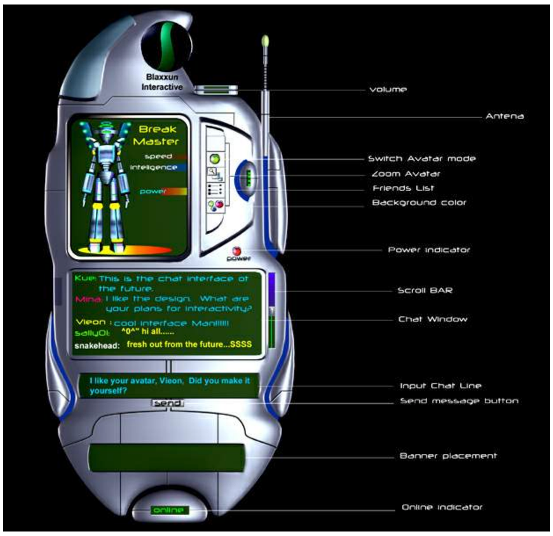

mobile business with virtual communities

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Abstract

Until last century virtual environments like online communities stayed virtual when power was switched off, or with the Internet connection unplugged. The community couldn't reach its member and vice versa, if he left the computer. Now, with access through mobile devices and "always on" connectivity, the virtual community has gained access to their members' real life.

Starting from an analysis of the concept of "community" in real life, the paper describes the influence of community software on the perception of "community" in virtual life and describes how both realities will jointly develop into a new mixed reality - a reality with new services and new rules, where distinctions such as "virtual" and "real" have to be newly defined.

Keywords: Community, Virtual Worlds, mobile Internet, mobile business, location based services, profiling, filtering, instant-messaging. knowledge-community, customer-community, entertainment-community, business-community

Year the Work was created: 2001

Aims of research / Project description

This paper results from a research performed to unveil near future developments and driving forces correlated with the development of mobile access to communities. The research is part of the work accompanying the software developments for mobile access to communities being in progress at blaxxun interactive.

Introduction

Like communities in the real world, virtual communities bring people together on the basis of common interests or at least common desires and needs. A viable community is marked by active and meaningful communication among its members; in fact, this communication, more than mere fleeting and superficial chat, is what holds the community together. Mobile communication will equip virtual communities to become part of our daily real life, giving birth to new services and communication options.

Due to high start-up costs, in comparison to those of the Internet, stricter set-up conditions apply to mobile services. Technological convergence presents another important factor. The boundaries between conventional and mobile telephone services, Internet, TV, and radio will fall away in the near future and a common, and widely overlapping market will form. The following uses the term "mobile Internet", regardless of whether transmission is achieved via GSM, GPRS, or UMTS and whether the device uses WAP, HTTP or another protocol.

Now to understand the potential of communities in the area of mobile business and the impact of the upcoming developments on our daily life, we must grapple with the term itself and its various meanings both in the real and virtual worlds. The key questions are: What exactly are virtual communities and to what purpose can they be implemented? What can community software do and which mobile services based on virtual communities will manage to become part of our real life?

1. Communication platform community

Taking a lesson from reality, we see that communities form when this grouping brings advantages to its members. Typical groups of this sort are companies, institutions, parties and clubs whose unity depends on common goals as well as accompanying factors, such as a common strategy or philosophy. And of course this all means very little unless the community is supported by active communication among members. Informal groups inspire less unity; they, however, bring together common interests, actions and therefore a common base of experience. Social groups consisting of people with one or more common traits would be an interesting target audience, but without customised internet communication, they remain elusive.

On the Internet, we meet social groups with common desires, experience and preferences. The Well, an archetype of the virtual community, was founded in 1985 originally as a non-commercial discussion forum. The natural evolution of the community concept is, however, its commercial use. We can divide communities into three general categories: Entertainment, E-Commerce and Business communities.

Typical open-themed Entertainment communities like Lycos-Tripod (www.tripod.co.uk)[1] or Metropolis (www.metropolis.de) serve as a means of brand building on the Internet and are normally part of the marketing budget. Interest communities, like the virtual science fiction city Cybertown (www.cybertown.com; currently 700,000 members) or the German Smart-Forum (www.smart-forum.de) which unites hundreds of Smart owners, also belong to the Entertainment area. Of course, even hobby communities incur costs, and so it should come as no surprise that e-commerce is combined with community to absorb operating expenses.

The optimised interplay of content, community and commerce is the magic equation for success on the Internet. Arthur G. Armstrong and John Hagel III describe in their book Net Gain [1] how, through the Internet, virtual communities become multi-million dollar enterprises and vice versa. The driving force behind this development is the auto-catalytical mechanisms themselves, which according to Armstrong and Hagel ultimately lead to strong community growth. The three driving factors in this process are customer involvement, profile building and customised offerings.

Marketing already recognises communities as excellent tools for Customer Relationship Management [2]. The user profiles of the community are the basis for personalised information flowing in both directions. When customers become acquainted with one another and are able to help one another with tips and tricks, a community emerges. The reward is the feeling of belonging to a lively and vital community. Furthermore, considering suggestions from the community, products can be customised to the needs of these customers.

An excellent example is the American company Canopus. The video cards that Canopus delivered were relatively easy to install, but the numerous configuration options led to confusion and lots of problems. It was only after a worldwide community of Canopus users devoted to solving these problems formed that the product was able to get on its feet (www.justedit.com). Especially active community members received test versions and were therefore able to consult other customers. Even retailers were invited to take part in product forums. The engineers at Canopus incorporated the suggestions for improvements directly in the development of hardware and software. In the Canopus example, everyone benefited.

As the example shows, an e-commerce community can be the communications backbone of a retailer or distribution network. Again, communication and interaction transform a web site into a meeting place inspired by the community spirit. A common knowledge base, common experience and mutual assistance mean loyalty, trust and the best prerequisite for a good working relationship.

With online Business Communities, we find ourselves in the service sector or in the domains of Enterprise Resource Planning, business-to-employees, and knowledge communities. Most of these are on intranets. Also here the mere establishment of a database of knowledge collected from the web site does not mean you have created a community. A good example for the development of an internal community is Project ShareNet[2] at Siemens. Here, over 12,000 employees at Siemens were united in a lively exchange of information and help, supported by an intelligent reward system. The benefits of the project speak for themselves: thanks to improved information flow and mutual exchange of experience and ideas, more than 120,000,000 ¤ in additional revenues were realised — that for the modest expense of only 5,000,000 Euro.

Until now, the Internet has primarily connected man with machine, which obediently provided the information asked for — in silence. Community software enables synchronous and asynchronous communication among people. Armstrong and Hagel, as well as Brunold, Merz and Wagner [3] show that the real benefits of the Internet - its communicative and commercial potential - have yet to be realised. A community can serve as the initial meeting point for virtually any group of people. Corresponding software will provide access and the opportunity for communication and interaction. The use of a company-wide community platform or a cross-company ASP solution can provide a community for any group. Members of such groups can exchange, collect, and store experience, information, and know-how regardless of their individual locations or time zone. This is equally true for the five locksmiths of a mid-sized company as well as for a world-wide developer network at an international software company.

2. Community software creates realities

An important difference between the real and virtual worlds is the necessity of a software platform. In the real world I can meet someone somewhere without an underlying software infrastructure, but on the Internet, I rely on this infrastructure. Bringing people together may have been the original purpose of the Internet, but most web sites are still not in the position to connect their visitors with one another. Companies limit their customer communication to the monologue of one-way mediums like TV and print (provider -> customer). A real and mutually advantageous dialog between provider and customer or among the customers themselves is not yet standard.

It thus comes as no surprise that many internet users desire more realistic communication models online. Realistic communication requires the corresponding software: simple tools for chat, message boards, or instant messaging. Others include calendars, voting, contact centres and incentive systems. Administration tools assist in the compiling of a user profile and therefore lower operating costs. All of these elements can be bought individually, but a platform solution is

[1] as well as www.tripod.de, www.tripod.es, ...

[2] www.arsdigita.com/customers/casestudies/siemens090700

generally considered more cost effective due to the resulting lower operating costs. Two other important factors are operating security and flexibility.

Community software automates typically repetitive processes like registration, data administration, profile building, distribution of roles and rights, and much more. This mechanised interaction relieves the operator of tedious paperwork. The software reacts to user entries, learns from user behaviour, reacts to individual needs, carries out concrete tasks, and last but not least, it is co-designed by the user through user-created content. The latter ensures intensive member involvement and, in turn, the growth of the social bond within the community.

In the case of the internal community, say, within a company, the user is probably required to be a member of the community. Such a community relies heavily on motivation from the operator, often assisted by an integrated incentive system, which rewards active members and ensures that member contributions are of high quality via a voting/rating system. Such a voting module can also be used for product rating and opinion polls in E-Commerce and Entertainment communities.

The typical, publicly accessible community must entice potential members through attractive content optimally tailored to their interests or needs. With growing bandwidths, offerings in this area can only get larger; and with ever-increasing competition, the global race will become more challenging. Multimedia ability provides that audio, video, language, graphics, text, 3D visualisation and entire 3D worlds can be combined at will. Besides text information, graphics, animation, video sequences, demos and software engines can be used. Through search functions and hierarchical menus, the information flow can be managed efficiently. Via tracking of user activities and profile building, the community software automatically builds a barrier to other providers. In his community, the member is already known and authorised to use certain services. In the other community, he must first gain status. Tracking and profiling within a community are therefore indispensable tools for personalising one-to-one marketing.

Let's consider now the potential of communication between mobile end-user devices and the community provider. It will be several years before mobile providers agree upon a standard range of features; until then we can count on numerous devices with dramatically different features vying for the same market share. Even when a wide ranging UMTS network is in place, there will still be peaks when not enough bandwidth is available. And even when reasonable tariff models have been established, bandwidth will still have a noticeable influence on usage costs. A community server must therefore recognise what type of end-user device requests the data and what transmission capacity (considering expected costs) should be made available. A typical solution in this case is the software Waparameter from Wapme Systems AG, used by blaxxun interactive for end-user device and available bandwidth recognition. Information concerning the user's desired maximum transmission costs are provided by the member profile.

End-user devices are becoming more powerful at a dramatic pace. While the use of a standard programming language like Java has its apparent advantages, the most varied of end-user devices must be operated, from simple mobile phones to multi-media equipped laptops with UMTS cards. Supported by a database, variations of the same content can be generated with varying specifications for specific end-user devices without much effort. For example, the mobile phone text could be supplied with pictures while the UMTS-PDA could be supplied with a video. The convergence of currently separate transmission paths will take us a step further. Similar to the HSCSD (High-Speed-Circuit-Switched-Data) which brings together numerous providers' channels, is the potential integration of data received by satellite while terrestrial wireless networks provide the response channel. Intelligent server concepts will, according to the capacity of the end-user device, use various paths and handle various services.

3. Communities gain influence on real life

If we divide the areas of use into the fields of Entertainment, E-Commerce and E-Business, we find that the Entertainment field is open to all types of communities, while the E-Business field is limited to special scenarios customised to certain user groups. E-Commerce with customer communities and retailer/distributor networks lie in between. A considerably large range of services is imaginable for these three fields and their various requirements. Only when the potential user sees a clear and proportionate benefit will he make consistent use of what the provider has to offer. So the answer to the following question is vital to all development in these fields: What benefits will expanding into mobile communication bring me?

If, besides the possibility of automating processes, the most important advantage of e-commerce was access to information and services regardless of time, then the value of m-commerce is that it provides access regardless of place. This is the central point for all user augmentation as well as for each mobile business concept. The fact that operators of wireless networks will have to offer additional services just to be able to offer reasonable tariffs, will also have a great influence on mobile business. Internet services like information storage, appointment reminders, or location-based services have already been developed for a large number of end-customers. According to a study, published in May 2001 by the Gartner Group, by 2004 there will be nearly 800 million wireless users world-wide, who retrieve information via mobile telephone, notebook or handhelds [ ]. Here, just as in other markets, alliances will form to meet the demand.

A good example of a typical mobile end-customer service is the transmission of special offers by the Würzburger Moon AG. In co-operation with the discount supermarket Aldi, special offers are transmitted to mobile telephones. Therefore, information about any sales items can be retrieved via WAP mobile telephones or PDA in Germany regardless of location. Users can find their nearest Aldi by entering their postal code. In the future they can even find directions to the supermarket by way of GPS or their car's built-in navigation system. If this service were to be integrated with an inventory system, users could quickly find out whether the item is actually available, a feature that would save a wasted trip to the store. This service already allows users to request detailed product information. With multimedia-capable end-user devices, the transmission of pictures or 3D models is within reach.

Bargain hunters must still call up the provider's WAP pages themselves. With the Always on technology of GPRS and UMTS, they can learn about potential providers in their area. This however, might lead to a flood of undesired offers. This is where personalisation comes into play. As a member of the Bargain Hunters Community, the member has an exact profile on file, which he has helped to create. This profile enables automatic selection of interesting offers. It ensures not only that undesired advertising does not reach the customer, but also that information customised to the customer's interests does.

The customer club members of an airline form a community as well. Providers such as Shop Talk Networks[3] or NotifyMe.com offer an e-mail or telephone service that informs customers via a speech generator about interesting offers or important dates. This service can inform customers about current delays or available last-minute seats on the basis of the customer's profile and then connect the customer with the appropriate customer representative directly. Even the Auto maintenance professionals at Jiffy Lube use this service to remind their customers when their cars are due for an oil change or other maintenance. Of course, this works equally as well with mobile phones — probably even better in that the customer can be reached anywhere. The resulting value strengthens the bond between customer and brand; and the additional revenues finance the added services.

We can see the future in providers like Gate5[4]. The start-up in Berlin combines typical community features like city information, opinion forums, product rating and instant messaging with interactive city maps and makes this all available on mobile telephones. This combination of real and virtual navigation instead of the endless flood of text-oriented lists is an impressive innovation. The Gate5 software integrates local information like special hotel offers and user-generated comments or ratings with the objects on the interactive city map. With a click on the cinema on the interactive city map one can access current show times, check what others have said about the films and book seats via the integrated reservations system. This service is already available via SMS and WAP. Considering current bandwidths, the user should download the city map onto his palm pilot before leaving home. As bandwidth grows, the most current city map will be available on the fly.

For out-of-house employees mobile business means access to their intranet, to their team calendar, to important decisions and results, to inventory information, as well as to other supporting material. The community server either recognises their voices or their access codes, carries out searches, connects them with other colleagues or communities, and keeps them up-to-date on company news. A key benefit will be the immediate availability of Always on technology. And because users are available regardless of place, they are more connected to their community. With this greater sense of community comes a better quality of life.

For the business community, this means that answers to important questions from a company message board can be retrieved via mobile telephone. Possible already via SMS with the appropriate infrastructure, maintenance and repair instructions will be provided as 3D graphics or entire videos via UMTS. Let's consider the example of a plumber who has answered the call from a customer with a leaky washing machine. On site, he discovers that the model is much older than his customer described on the telephone. Calling the manufacturer's help line doesn't help, the seal is not available anymore. He turns to the manufacturer's message board where the search function shows that the problem is not as uncommon as he thought. Someone has left a description of how to customise a seal from another provider. Within minutes, he's got the order number on his mobile telephone and is able to order the needed part immediately online.

The keyword for another interesting market segment for mobile business is time-critical applications. The SMS alarm for letting the shareholder know when to buy and sell is already available. An additional use is the retrieval of news and estimates from the investment community. Nowadays, this is an internet function, but with the appropriate search function, news can also be transmitted via the mobile network. Another example is the Siemens knowledge community described above. Here the added value of mobile access is that employees can be involved in the feedback process regardless of their location. If, for example, Ms. Müller's expertise is needed, based on her profile, the community software can automatically relay the question to her or at least send a message informing her that her feedback is requested. She can therefore answer the question immediately instead of having to wait until she returns to the office, has a cup of coffee, talks with her supervisor, finally enters the intranet and discovers the problem an hour after deadline. Mobile communication means availability and considerably faster reaction time.

The entertainment field will also reap the benefits of mobile access. Chess is already a common game played via SMS. Given the appropriate connection, online games can be played entirely on mobile end-user devices. Companies like VIAG Intercom are coming up with remarkable applications by which mobile users can retrieve game results and ranking lists and also challenge opponents via SMS. Instant messaging has become one of the most used features on the Internet. The most well-known example is AOL's Instant Messenger, which connects millions of online AOL customers. Here, mobile communication has clear advantages: via an SMS-like function, members can be reached even when they are not online. The market for Instant Messaging has great potential. According to a Radicati Group Inc. study, 1.38 billion people will be using Instant Messaging world-wide by 2004. It, therefore, comes as no surprise that mobile telephone producers Nokia, Motorola and Ericsson joined forces in April 2001 to define the standards for mobile Instant Messaging. On the basis of these standards, news and information will be exchanged in real-time regardless of the implemented Messenger solution or the various end-user devices.

Mobile, "always-on", connectivity to the community means that members are available anytime and anywhere, allowing the virtual community to become part of their real life. Finally, if you get invited to the cafe around the corner by a buddy from your virtual community - because he was notified by the community that you are around - the distinctions "virtual" and "real" have to be newly defined.

Mobile access connects you with your virtual community - wherever you are. Why should you call it "virtual" then?

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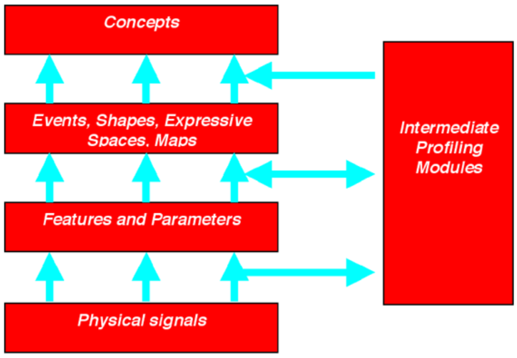

megase

a multisensory expressive gesture applications system environment for artistic performances

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Abstract

This paper introduces the EU IST three-year project MEGA (Multisensory Expressive Gesture Applications). MEGA is centered on the modeling and communication of expressive and emotional content in non-verbal interaction by multi-sensory interfaces in shared interactive mixed reality environments. In particular, the project focuses on music performance and full-body movements as first class conveyors of expressive and emotional content. Main research issues include the analysis of expressive gestures (i.e. analysis of the expressive content conveyed through full body movement and musical gestures), the synthesis of expressive gesture (i.e. the communication of expressive content through computer-generated expressive gesture, such as music performances, movement of virtual characters, expressive utilization of visual media), the strategies for mapping the data coming from multimodal analysis onto the different output channels. Applications concern new generation of musical instruments (for professional as well as home consumer), applications based on enhanced Collaborative VEs embedding expressive communication, e.g. for theatre and interactive artistic performances.

Keywords: expressiveness, emotion, music, dance, CVEs, multimedia systems for artistic performance.

Project URL:
http//:www.megaproject.org

1. Introduction

Research and industrial communities nowadays have a strong interest in non-verbal multi-modal communication in man-machine interaction. In music research, activities are concentrated on the development of audio-mining technology and interactive music systems for theater applications.

In this paper, we focus on the problem of non-verbal multi-modal communication in relation to theater applications. This work is based on the three-year MEGA IST-project no.20410, started on Nov 2000. MEGA stands for Multi-sensory Expressive Gesture Applications. MEGASE refers to the MEGA System Environment for artistic applications. The conceptual framework, which is at the core of the research activities in MEGA, is presented. A special focus is on (non-verbal) expressive gesture in audio and human movement. Research in MEGA is based on:

- Implementation of humanistic theories of non-verbal communication;
- Analysis/synthesis of artistic expression in dance and music;
- Applications envision artistic performances, using audio, video and sensing technologies.

This approach has some connections with emotion research and Kansei research. Emotion research is known as Affective Computing in the USA (cf. Bates/CMU, B.Hayes-Roth/Stanford, Picard /MIT, OCC model), while sensitive processing research is called Kansei Information Processing in

Japan (e.g Special Track on Kansei at IEEE SMC'98 and SMC'99 Conferences in San Diego and Tokyo, respectively; and the Intl Workshop on Kansei – The Technology of Emotion, organized by one of the authors in 1997 in Genova, S.Hashimoto/Waseda, K.Mase/ATR). Both affective computing and Kansei bear witness on the growing importance of emerging paradigms, technologies and multi-sensory interfaces for non-verbal communication.

2. Overview of MEGA

MEGA aims at consolidating a third (original) European route which is grounded in culture, in particular in art and humanistic theories of non-verbal communication. MEGA's focus on non-verbal communication is grounded in the notion of "expressive gestures", where "gesture" refers to deployed action forms in the auditory, visual, and motor channels. The project aims at exploiting these multi-modal forms of expressive gestures through the cross-fertilization of artistic and scientific work.

For example, MEGA aims at going beyond the direct action-reaction responses of the hyper-instrument concept (Ungvary and Vertegaal, 2000) towards forms of more 'intelligent' Gestalt-based non-verbal communication. For that purpose, the performance at public artistic events is a relevant test-bed for experimenting and evaluating research results in MEGA.

Some of the main MEGA research developments include the development of

- techniques for the analysis and synthesis of expressive gesture in auditory, visual, and motor channels,
- the connection of expressive gesture to emotions and Kansei;
- a protocol for expressive gesture communication;
- a Media Reference Archive, containing classified fragments of audio, video, and movement (sensor data), including spectator ratings and analysis tools;
- MEGASE, the MEGA System Environment, a multi-modal interactive music system platform for theater applications.

As for applications development, MEGA starts from a number of tools and platforms already developed by the partners:

- the open EyesWeb platform (DIST) http://www.infomus.dist.unige.it
- The IPEM ToolBox (IPEM) http://www.rug.ipem.ac.be/Toolbox
- DirectorMusices (KTH) http://www.speech.kth.se/music/performance/download/
- DOVRE (Telenor - http://televr.fou.telenor.no/dovre.htm

Applications prototypes are developed in MEGA focusing on the role that expressive gesture can play in existing and new products, from art and humanities (music, museums, theater) to emerging entertainment and distributed collaborative virtual environments market niches.

The partners involved in MEGA are:

- DIST - Univ of Genoa, Italy (Project Coord.)
- DEI - Univ of Padova, Italy
- IPEM - Univ of Gent, Belgium
- KTH, Sweden
- Dept of Psychology – Univ. of Uppsala, Sweden
- GeneralMusic, Italy
- Telenor, Norway
- Consorzio Pisa Ricerche (Smartex Srl), Italy
- Eidomedia, Italy

3. Conceptual framework

3.1 What are Expressive Gestures in the context of multimodal interactive systems

MEGA has a focus on the notion of 'expressive gesture' in a multimodal context. Multimodality refers here (i) to the processing of multiple input sensory channels (audio, visual, tactile), and (ii) to the mapping of gesture captured through one modality into another modality.

From the point of view of communication, a gesture can be defined as a non-verbal epistemic unit. Gestures occur in different modalities: as movements of the human body, or as particular occurrences in music at different time scales. Gestures can be modeled in terms of cue shapes, sequences of features, parametrized physical models. Gesture modeling may involve expressive feature spaces or maps (e.g., energy-velocity spaces), or can be related to higher-level emotion spaces and taxonomies (e.g., valence-arousal emotion spaces).

Gestures may occur at different levels. For example, in music, an individual note may be considered as a gesture, with a given attack, sustain and decay pattern. However, also a sequence of notes may be considered a gesture. Also a repeating rhythm pattern may be considered a gesture. The definition of a gesture as non-verbal epistemic unit means that defined criteria are involved which define a sequence of features as a gesture. These criteria relate to human information processing, in particular in motor and perceptual actions.

A non-verbal gesture, in principle, may be neutral, hence operating as a self-contained unit, yet many gestures are called 'expressive'. Expressive gestures refer to a semantics outside the gesture pattern. This semantic may relate to synaesthetic (e.g. sound-colour), kinaesthetic (sound-movement, cf. Laban Effort theory), and cenaesthetic issues (sound-sensation-emotion). In this perspective, the notion of gesture is fundamental category of human action and perception, that ultimately relates to affective and sensitive computing.

Important issues in the MEGA-project concern the definition of the notion of gesture in a multimodal artistic context.

Expressive gestures can be described at different levels and time-scales. We are interested in describing gestures in the context of interactive systems taking into account different paradigms of non-verbal communication:

- The Reactive paradigm: it concerns the recognition and synthesis of local features of gestures, based on direct causal gestural interaction. These features are situated in a small time scale (e.g., hyper-instruments)
- The Dialog paradigm: it concerns the recognition and synthesis of global (Gestalt) features of gestures, based on interpretative and causal gestural interaction at the cognitive level. This involves larger time-scales and long-term memory. Roughly speaking, it refers to the question/answering discourse in which participants communicate one at the time.

Intermediate paradigms can be defined, such as the Orchestra Conducting, where a director performs certain actions whose effect is sometimes almost reactive by orchestra performers, but with an additional level of cognitive interpretation and different time scales. In general Imitative behavior is in between these two paradigms.

The dialog paradigm may embed imitative or reactive forms of non-verbal multimodal expressive gesture communication.

3.2 The Layered Gesture Architecture

The recognition of features and sequences of features relevant for expressive gestures, in particular also for affective and sensitive computing, is an important aspect. The analysis of expressive gestures is based on a multi-layered gesture architecture. It aims at integrating in a multi-modal perspective analysis of audio, video, tactile sensor signals.

Layer 1 – Physical Signals

Layer 2 – Low-level features and statistical parameters:

For example, in the audio domain, this layer refers to features such as Tempo, Tempo variability, Sound level, Sound level variability, Spectral shape, Articulation, Articulation variability, Attack velocity, Mean Pitch, Duration contrast, Degree of accent on structural important notes, Periodicity, Dynamics, Roughness, Tonal tension. Similar features can be defined for movement analysis.

Layer 3 – Events, Shapes, Phrase, Expression Spaces, Maps:

- Expressive features modeling: e.g. HMMs, sequences of parameters of a physical model
- Expressive gesture spaces modeling: e.g., energy-velocity spaces)

Layer 4 – Concepts and structures:

- Taxonomies of concepts related to emotion expression (e.g., using probabilistic reasoning systems). Laban's Effort, Schaeffer's Morphology, and OCC emotion theory are examples of taxonomies at this level.

An important aspect concerns the personalization of this architecture with respect to gesture, context, and user, obtained by Intermediate Profiling Modules (figure 1). This mechanism makes the "archetypical" parameters of the architecture more flexible and personalised, by keeping track of

- their evolution over time given specific contexts, and
- different biasing due to "personality" and focus of interest, etc.

Preliminary examples of results from research work on the extraction of expressive cues and can be found as for audio in (Leman 2001) and (De Poli at al 2001) and for movement in (Camurri Mazzarino Trocca and Volpe 2001 – these proceedings).

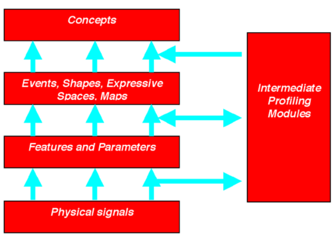


Figure 1- The MEGA Layered Architecture

4. The MEGA System Environment

The MEGA System Environment is the main scientific/technological result and concrete product of this project. It will be used along the project in public events, including museum exhibits and artistic performances. The MEGA System Environment consists of a real-time environment formed by the following main components:

- the EyesWeb real-time open software architecture for music and multimedia performance (developed by DIST): EyesWeb is the basic kernel for the MEGASE
- a number of various EyesWeb libraries (for expressive audio analysis, movement analysis, mapping etc), developed by MEGA partners.

MEGASE includes and is connected to a number of proprietary systems (e.g. Director Musices from KTH and Dovre from Telenor) and with commercial systems (e.g. Opcode Max/MSP).

Evaluation and validation of libraries modules for analysis of expressiveness are performed basically by comparing the output from such modules with spectators ratings (Uppsala University).

During the development of methods and algorithms, various tools are also used, such as the IPEM ToolBox.

5. Performances, Demos and Prototypes of New Multimedia Applications

Even if the MEGA project is only going to conclude his first year, a number of outputs are coming out. Public artistic performances already used some of its preliminary results, in particular the EyesWeb platform and the new libraries. They include:

- Concert of tap dance at the Museum of Modern Art in Gent SMAK, 1 September 2001; A tap-dancer is "observed" by floor-microphones and by a video-camera. He controls visual outputs and live electronics (IPEM).
- Ballet "Messaggero Muto" (music by F.Giomi, with the Dance Company of Virgilio Sieni), 15 July 2001. In this performance a dancer interacts with a his visual clone (implementation in EyesWeb, DIST);
- Concert of Roberto Doati: an actress dialogs in real-time with another audio-clone. The clone has a voice depending on the voice of the actress and her facial (lips) movements (DIST). (figure 2)

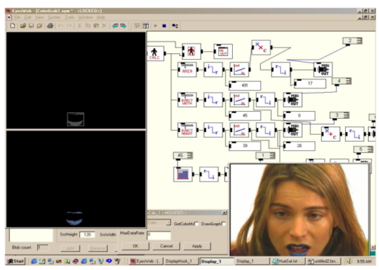


Figure 2- an example of a patch at run-time implementing a simple movement analysis of the lips of an actress, based on a videocamera. The patch has been developed for a piece by the composer Roberto Doati. The two black windows on the left show intermediate outputs from the lip analysis. The right window shows the original image. The patch generates MIDI signals related to lip movement, which are used to re-create in real-time an "alter ego" of the actress (Francesca Faiella) with which the actress dialogues.

These events include experiments on the interaction paradigms developed and studied in MEGA and described above, in particular the Dialog paradigm.

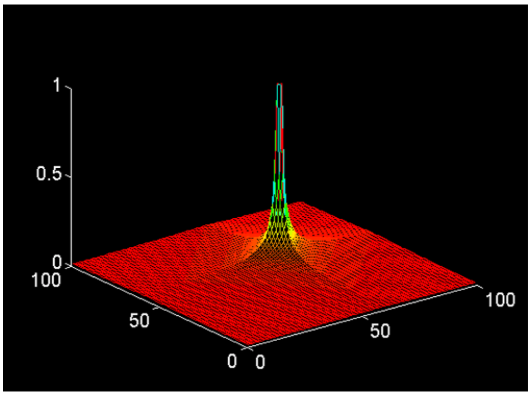
A series of interactive multimedia exhibits are under development for the Città della Scienza (Science Centre) of Napoli, where EyesWeb and specific libraries for audiovisual analysis/synthesis are used to develop interactive experiments for education on music and science.

Further, a cooperation of MEGA with Tempo Reale, an institution located in Firenze for artistic production founded by the composer Luciano Berio and directed by Nicola Bernardini, has been setting up, aiming at connecting MEGA outputs to the real artistic community.

KTH has presented in public events previews on their prototypes for mobile telephony based on expressive music and audio.

Results from MEGA are also presented in various demos at the EU-IST-E3 booth at IBC2001 (www.ibc2001.org).

paper



real-time analysis of expressive cues in human movement

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Abstract

This paper presents results from our research concerning the development and experimenting of computational models for real-time analysis of expressive intentions in human movement. We aim at discovering and measure movement cues useful for recognizing expressive content in movement, and in particular from dancers, music performers, actors on a theatre stage, or visitors in a museum exhibit. The ultimate goal is to contribute toward a deeper understanding of the relations between gesture, music, and visual languages, and enable artists with conceptual as well as system tools for interactive performance. In a broader perspective, we aim at enhancing man-machine communication by adding a new channel: expressiveness. The analysis method and computational models are inspired to several sources, including humanistic theories on non-verbal communication, such as Rudolf Laban's Theory of Effort. In order to test the algorithms developed in the project, we created, with the help of professional choreographers, a library of dance fragments, called microdances each one performed with different expressive content. Furthermore, we analyze and compare different dance fragments performed with the same expressive content, in order to understand invariants and cues enabling the recognition of such commonalities. Evaluation of the results obtained with spectators' ratings is also part of the project. Research outputs are implemented in our EyesWeb open software platform. This research is partially funded by the EU IST-20410 Project MEGA (Multisensory Expressive Gesture Applications).

Keywords: Expressive gesture, HCI, music, dance.

Project URLs:
http://www.megaproject.com
http://www.infomus.dist.unige.it

1. Introduction

This paper describes some work carried out within the UE IST MEGA (Multisensory Expressive Gesture Applications) project (for more detailed information see http://www.megaproject.org). MEGA deals with developing of multisensory interfaces for analysis and synthesis of expressive gestures. In particular, this paper describes computational models, methodologies, and algorithms for analysis of expressive gestures in human full-body movement.

Different sources influence this research:

- Biomechanics and motion capture techniques;
- Research and theories from artists on communication of expressiveness in dance (e.g. Laban's Theory of Effort) and music (e.g. Schaeffer's Sounds Morphology);
- Research and theories from psychology on non-verbal communication of expressiveness (e.g Wallbot, Argyle);
- Research and theories on KANSEI and emotion arousal/appraisal;
- Research and theories from music performance.

It should be noticed that in this context, the Japanese word KANSEI has the meaning of the intensity of the perceived artistic and aesthetic/emotional/sensuous involvement (or "resonance") of spectators of the performance. KANSEI Information Processing is a well-known research field in Japan, as a sort of counterpart of Affective Computing in USA. One of the main goals of this research is to try to face from a scientific viewpoint KANSEI communication in artistic performance, and to formulate hypotheses on "KANSEI rating" by developing and experiment novel methodologies of investigation. We use the Japanese word KANSEI since it is the only one that summarizes this complex concept in a single word.

According to the choreographer Rudolf Laban, a main distinction has been made between the analysis of movement in the Personal Space, referred also as Kinesphere, and the analysis of movement in the General Space. In "Modern Educational Dance" ([12], p.85) Laban wrote:

"Whenever the body moves or stands, it is surrounded by space. Around the body is the sphere of movement, or Kinesphere, the circumference of which can be reached by normally extended limbs without changing one's stance, that is, the place of support. The imaginary inner wall of this sphere can be touched by hands and feets, and all points of it can be reached. Outside this immediate sphere lies the wider or "general" space which man can enter only by moving away from their original stance. He has to step outside the borders of his immediate sphere and create a new one from the new stance, or, in other words, he transfers what might be called his "personal" sphere to another place in the general space. Thus, in actual fact, he never goes outside his personal sphere of movement, but carries it around with him like a shell."

Movement is therefore considered under two different points of view:

- Detailed movement of a single person (e.g., the movement of the center of gravity of a dancer) in his own "Kinesphere"
- Movement of one or more persons in a wider space, the "General Space" (e.g., a group of dancers moving on a stage, a group of visitors in a museum exhibit).

Section 2 presents two complementary approaches to expressive gesture analysis in human movement. A first computational model for expressive analysis in the General Space is introduced in Section 3. Some examples of expressive cues extracted from movement in the Kinesphere are shown in Section 4.

2. Methodologies for expressive movement analysis

Two different methodologies have been developed and applied in order to identify and extract expressive information from human full-body movement:

- A bottom-up approach devoted to extract the expressive cues that theories from psychology and choreography identify as relevant for expressive communication;
- A top-down approach aiming to identify the movement feature carrying KANSEI information in order to evaluate the artistic "intensity" of a performance.

2.1. Bottom-up approach

The bottom-up path to analysis of expressive content of human movement passes through different layers/steps:

Extraction of low level data from sensors. This step is strongly dependent on the kind of sensors used to study movement. In this context the word "sensors" is related to the physical sensors employed and to the algorithm used to extract a given set of low level data. We can therefore speak of "virtual sensors" or "emulated sensors". A CCD camera can be an example of a physical sensor, while the optical flow or the motion templates or the positions of certain points in the frames sequence are examples of data extracted from "virtual sensors" implemented by the cited algorithms.

Creation of a hybrid description of the observed movement, both symbolic and analogical. From the physical data we attempt to build a description of the movements being performed; results from the previous level are processed in order to find the components of a movement performance and measure their quality. Data from several different physical and virtual sensors are likely to be integrated in order to perform such a step. At this point of our ongoing research we think that a movement sequence can be divided in strokes or basic units, each of them with different characteristics of speed, impulsiveness, straightness, etc. The problem is identifying those strokes in a complex sequence and measuring the qualities deemed important for expressive communication. The output of this stage is a symbolic description of observed strokes and measurements of several quantities describing them.

Analysis of the obtained data. A reference archive of microdances has been created and studied. With "microdance" we mean a short video fragment containing enough information to be able to recognize expressive features. Human testers evaluate each microdance. Measurements obtained by the computational models are then correlated with the results of such spectators' ratings, attempting to isolate factors important for expressive communication. This third step is likely to use both symbolic data from stage 2 and "raw" data from stage 1, in order to evaluate the expressive intention associated to a movement performance.

2.2. KANSEI Analysis: the Subtractive analysis process

This approach is based on the live observation of genuinely artistic performances, and their corresponding video recordings. A reference archive of artistic performances has to be carefully defined, based on a strict interaction with the artists. Image processing techniques are utilized to gradually subtract information from the video recordings. For example, parts of the dancer's body could be progressively hidden until only a set of moving points remain, deforming filters could be applied (e.g. blur), the frame rate could be slowed down. Each time information is reduced spectators are asked to rate the intensity of their feeling in a scale ranging from negative to positive values (a negative value meaning that the video fragment would rise some feeling in the spectator but such feeling is a negative one). The transitions between positive and negatives rates and a rate of zero (i.e. no expressiveness was found by the spectator in the analyzed video sequence) would help to identify what are the movement features carrying expressive information. A deep interaction is needed between the image processing phase (i.e. the decisions on what information has to be subtracted) and the rating phase. This method is an ongoing work, and correlations between joint dance/music performances are currently studied.

3. Analysis in the General Space

The analysis of movement in the General Space, consists of analyzing the movement of the Kinesphere in the space surrounding it. Four main research issues are currently investigated:

1. Use of the space. The objective is to study how the dancer uses the space surrounding him and the relationships between use of space and communicated expressive content. The work aims at individuating trajectories in the space and classifying them. Typical and repetitive patterns can be extracted and further analyzed. A set of parameters can be calculated such as the classified shape of a trajectory (intended as shape created by stretches of space), the level of utilization of regions in the stage, the periodicity of repetitive patterns. The space is considered as "neutral" (without scenery or particular lighting).

2. Relationship with elements such as lights and scenery. The expressive content conveyed by the movement of a dancer in the space can widely change depending on elements giving a particular meaning to regions in the space. For instance, if the dancer move himself continuously near a wall, the expressive content he conveys is very different with respect to a situation in which the dancer stand a move himself directly in front to the audience. Mechanisms to associate an expressive potential to regions in the space have been developed and trajectories in such expressive maps have been studied. The extracted parameters as described in (i) can be reconsidered in relationship with the expressive regions of the space (e.g., trajectories repetitively passing through a region with high expressive potential).

3. Relationship between the movements of two or more dancers. In a second phase, two or more dancers can be considered and their movements in the General Space compared. The analysis on more dancers can be carried out both with respect to a "neutral" space and with respect to a space having expressive potentials. The relationships between the movements of each single dancer and the movement of the group can be investigated.

4. Relationship between parameters related to the General Space and parameters related to the Kinesphere. The techniques developed in the analysis of the General Space are quite general: they can be applied to the analysis of movements in the Kinesphere as well. For example, the analysis of trajectories, levels of utilization of particular regions, detection of repetitive patterns can be applied also to the trajectories of movements of limbs inside the Kinesphere. On the other side, some parameters that are calculated mainly with respect to the Kinesphere can be reconsidered from the point of view of the General Space (e.g., the "equilibrium" with respect to the expressive potentials, the ratio between rotational movements and straight movements, the use of straight and direct trajectories with respect to smooth trajectories).

3.1. Reference model

The basic model that has been adopted, improves a model coming from previous studies carried out at DIST in collaboration with Waseda University, Tokyo [6]. The General Space (considered as a rectangle) is divided into active cells forming a grid (see Figure 1). Each time the position of a tracked point (e.g., a point representing a dancer on a stage, from the point of view of a video-camera fixed on the ceiling) is detected, the corresponding cell is individuated and its indexes h and k are returned. The model is here explained with reference to an artistic performance where a dancer is moving on a stage.

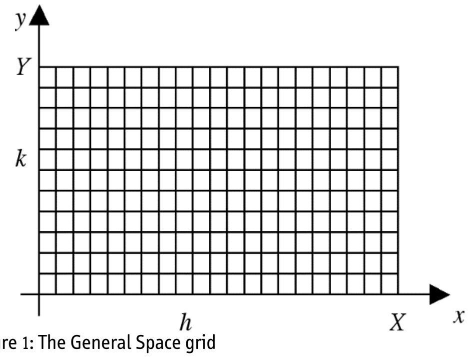

Figure 1: The General Space grid

Potential functions can be defined on the General Space. A potential function can be represented by a matrix $\Phi = [\phi_{ij}]$. The items in the matrix directly correspond to the cells in the grid: fij is the value that the potential function assumes in correspondence with the cell having (i,j) as indexes. Three main kind of potential functions have been considered:

1. Potential functions not depending on the current position of the tracked dancer
2. Potential functions depending on the current position of the tracked dancer
3. Potential functions depending on the definition of regions inside the General Space

Mappers can be developed in order to associate some behavior to a particular cell or sets of cells (e.g., some kind of output is generated when a particular cell is activated by the dancer passing on it).

3.2. Potential functions not depending on the current position of the tracked dancer

ϕ_{ij} is constant with respect to the cell currently activated by the dancer. Consider, for example, lights and fixed scenery: potential functions can be associated to each element of fixed scenery and to the light that are used in a particular scene. The potential function associated to each element can be represented by a matrix Φ_p. The overall effect can be determined by summing the matrixes Φ_p in an overall matrix $\Phi = \Phi_1 + \Phi_2 + \ldots + \Phi_P$, being P the number of scenery and light elements taken into account. The trajectory of a dancer with respect to such a potential function can be studied in order to identify relationships between movement and scenery and suitable mapping strategies can be developed in order to associate outputs to movements performed in relevant places. Nevertheless, the current cell (h, k) in which the position of the dancer is mapped has no influence on the elements ϕ_{ij} of the matrix representing the potential functions: the values of such elements ϕ_{ij} are in fact calculated only on the basis of the position of the considered fixed scenery and lights. Note that this does not mean that ϕ_{ij} has to be constant in time: consider, for example, lights that are turned on and off during the performance. Their contribution to the overall potential function can be added only when they are on. In this case, the values ϕ_{ij} change during the time, nevertheless the potential function is still independent from the current position of the dancer.

3.3. Potential functions depending on the current position of the tracked dancer

$\phi_{ij} = \phi_{ij}$ (h, k) where (h, k) is the cell currently occupied by a dancer. In this way it is possible to define potential functions moving in the space together with the movement of the tracked dancer. Consider, for example, the following potential function:

$$\phi_{ij}(h,k) = \begin{cases} \dfrac{1}{|(i-h)|+|(j-k)|} & \text{if } (i,j) \neq (h,k) \\ 1 & \text{if } (i,j) = (h,k) \end{cases} \quad (*)$$

The potential function depends from the current cell position (h,k) of the dancer and change every time he moves himself. For example, Figure 2a, 2b, and 2c show the potential function (*) calculated when the dancer occupies respectively the cells (10,10), (40,40) and (60,60) (i.e., a dancer moving along a diagonal).

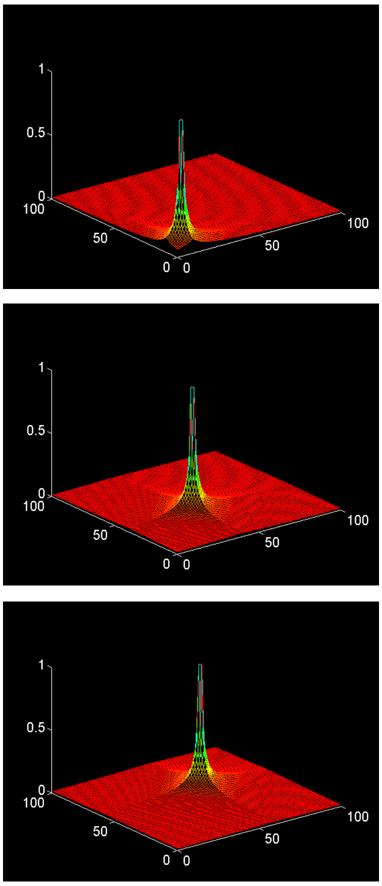

Figure 2a, 2b, and 2c: potential function of a dancer moving along a diagonal

In a more general perspective, it is possible to associate potential function forming a "bell" around the dancer and moving with him: further the "bell" could be modified (e.g., made more wide) corresponding to the analyzed movements inside the Kinesphere (e.g., a wide "bell" associated to expansive movements of the Kinesphere). Mobile scenery can also be associated to this kind of potential functions.

Another example: suppose that each cell is characterized by an activity level, i.e. a sort of measure of how much the cell was occupied by the dancer. The activity levels of the cells are stored in a $m \times n$ matrix A = [a_{ij}] where i and j are the indexes associated to a cell. The matrix A defines a potential function in the General Space. Consider a neutral environment. An increment function I(a_{ij}) and a decrement function D(a_{ij}) are defined. Since, at a first stage, the space is considered as neutral, i.e., no particular meaning is associated to parts of the space, the same increment and decrement functions are applied to all the cells in the grid. Each time the position of a tracked dancer is detected, the corresponding cell is individuated and its activity level is incremented according to the increment function. The activity value of the remaining cells is decremented according to the decrement function. This example can be implemented using a potential functions depending on the current position of the tracked dancer defined as:

$$a_{ij}(h,k) = \begin{cases} D(a_{ij}) & \text{if } (i,j) \neq (h,k) \\ I(a_{ij}) & \text{if } (i,j) = (h,k) \end{cases}$$

3.4. Potential functions depending on the definition of regions inside the General Space

Regions can be defined on the grid. To each region is associated a hit function H(·) and a miss function M(·). The hit function is applied to calculate the potential function in correspondence of the cell inside the region, each time the cell currently occupied by a dancer is inside that region. Otherwise, the miss function is used. $\phi_{ij} = \phi_{ij}(R(i,j))$ where R(i,j) is the region to which the cell (i, j) belongs. In particular if N regions $R_1, R_2, \ldots, R_N$ are defined with the correspondent $H_1, H_2, \ldots, H_N$ hit functions and and $M_1, M_2, \ldots, M_N$ miss functions,

$$\phi_{ij}(R(i,j)) = \begin{cases} H_p(\phi_{ij}) & \text{if } R(i,j) = R_p = R(h,k) \\ M_p(\phi_{ij}) & \text{if } R(i,j) = R_p \neq R(h,k) \end{cases}$$

Note that, since the hit and miss functions are here defined as functions of the previous value of the potential function in the cell (i, j), some kind of memory is involved in this approach.

The previous example concerning the calculus of the activity level of a cell in a neutral environment can be implemented also using a potential function depending on the definition of regions in the General Space: in particular, in that case each cell defines a region (i.e., $m \times n$ regions are defined) and the same hit function H(·) = I(a_{ij}) and miss function M(·) = D(a_{ij}) are associated to all the regions (cells).

Suppose now to consider a stage environment with presence of scenery and lights. The "neutral" values of the activity level of each cell previously calculated are no more valid: there will be some regions in the General Space in which the presence of movement is more meaningful than in other. A certain number of "meaningful" regions (i.e., regions on which a particular focus is placed) can be defined and suitable hit and miss functions can be associated to them. Thus, a variation related to the meaning of a specified region is added to the "neutral" evaluation of the activity level, obtaining a new activity level taking into account elements of a particular stage environment.

4. Extracting features in the Kinesphere

Analysis of expressive movement concerns mainly the individuation and automatic measure of significant parameters of human movement that can be studied by a computer system. This has been accomplished trying to translate concepts from different movement disciplines into mathematical quantities. For example some of our experiments are inspired by the Theory of Effort of R. Laban [12].

Usually, in the case of data collected through a video-camera, a measure is associated to each frame, e.g., limbs position, dynamics of the area occupied by the body, of body shapes. In the following, some examples of experiments we are carrying out are shortly described.

4.1. Stability index

One of the parameters we are studying has been called "Stability Index". Stability is a number associated to a body posture that attempts to measure its stability (or instability). Body postures can be recognized using simple pattern matching algorithms or calculating distances between the Hu moments calculated on the current dancer's silhouette and the Hu moments of a set of reference silhouettes. Roughly, the Stability Index is computed by dividing the height of the body centre of gravity by the distance between the feet while they both are on the ground. Its value can be interpreted in several ways, for example if it is contained in a certain range it indicates a stable position, above or below that range it shows that the position may be unstable.

In this way it is possible to evaluate what kind of positions are used during a performance and how the performer skips through them. The most direct use, the simplest possible, is detecting peak values of the parameter, corresponding to a step being performed. Steps frequency is another parameter that can be studied. The following picture shows the behaviour of the "stability" parameter during a dance fragment. Peak values correspond to feet crossing, while making a step.

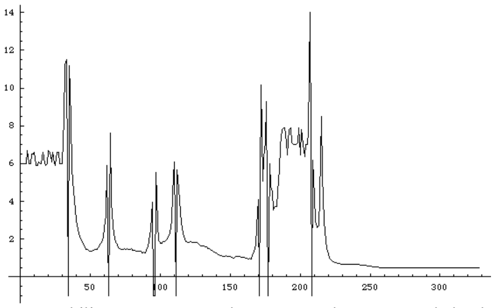

Figure 3. Stability parameter: peaks correspond to steps made by the dancer.

4.2. Contraction and expansion

The expansion or contraction of the Kinesphere is another interesting parameter to study. During a sequence of movements the limbs can extend and touch the outer limit of the Kinesphere, or be kept close to the body. In several experiments we measured the space used by the body associating it with a rectangular area that covers the actual extension of the limbs. The variations Dw and Dh of the width and height of such a bounding rectangle between subsequent frames can be considered as a simple measure of the contraction/expansion of the Kinesphere.

Figures 4 and 5 show how this parameter varies during the same microdance performed with different expressive intentions.

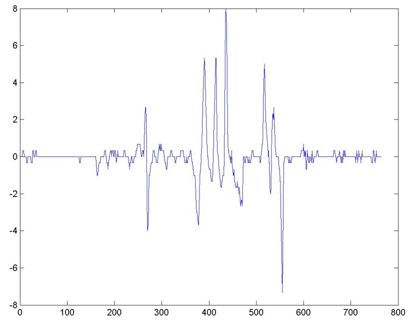

Figure 4. The variation Dh of the height of the bounding rectangle during a "Heavy" performance of a microdance.

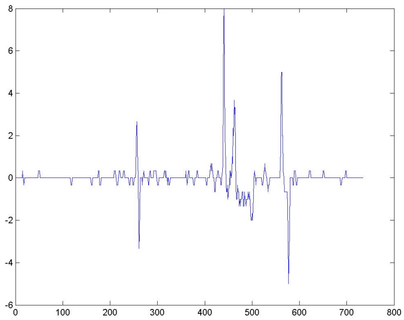

Figure 5. The same variation Dh during a "Rigid" performance.

5. Implementation

The reference model for expressive analysis in the General Space has been implemented a set of blocks in an EyesWeb library. EyesWeb (www.infomus.dist.unige.it/eywindex.html) is a hardware/software open platform including a visual environment and a set of libraries for video and audio processing.

The General Space model consists of four EyesWeb blocks: the first one allows subdivision of an image in cells and returns as output the indexes of the hit cell, the other three allow the definition of (i) potential functions independent from the position of a tracked object, (ii) potential functions depending on the current position of a tracked object, (iii) potential functions depending on the definition of regions in the space.

The Stability Index is actually calculated by an EyesWeb block, while an EyesWeb patch measures the Contraction/Expansion index.

Further parameters are available in EyesWeb Expressive Motion Analysis library, such as measurements of directness/flexibility and fluentness of movement.

EyesWeb and its libraries are used in various artistic performances and in interactive museum exhibits.

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perceptual user interface for human-computer interaction

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Abstract:

In this paper we present our effort towards perceptual user interface for main interaction tasks, such as navigation/travel, selection/picking and personal data access, in e-commerce environment. A set of intuitive navigation devices, including Treadmill, Virtual Balance and Cyberwheel, are described and evaluated for web/public space. Vision-based pointing is explored for free-hand selection/picking, and wireless personal access system is developed for unobtrusive transmission of personal information from hand-held devices. Furthermore, we implement an integrated interaction platform, which could couple these devices together in complex scenarios such as portals for shopping.

Keywords: Perceptual User Interface, 3D Interaction, Human-computer Interface

Project URL:
http://imk.gmd.de/mars

1 Introduction

Human-computer interaction has not changed fundamentally for nearly twenty years. Conventional GUI techniques appear to be ill-suited for some of the kinds of interactive platform now starting to emerge, with computing devices having tiny and large displays, recognition-based user interfaces using speech and gestures, and requirements for other facilities such as end-user programming. It is assumed that physical interaction between humans and computation will be less like the current desktop keyboard /mouse /display paradigm and more like the way humans interact with the physical world. That is, what we need are interaction techniques well matched with how people will use computers.

Therefore, perceptual user interfaces (PUI) are recently proposed and investigated [1, 2]. Its essence is grounded in how people interact with each other and with the real world. These PUIs [2] are desired to bring our human capabilities to bear on creating more natural and intuitive interfaces, and characterized by interaction techniques that combine an understanding of natural human capabilities (particularly communication, motor, cognitive, and perceptual skills) with computer I/O devices and machine perception and reasoning.

PUIs are expected to require integration at multi-levels of technologies such as speech and sound recognition and generation, computer vision, graphical animation and visualization, language understanding, touch based sensing and feedback (haptic), learning, and modelling and dialogue management. A summary of interaction modalities between human and computer are well shown in [8].

In the following section, we will present several navigation devices developed in MARS lab. Vision-based pointing and wireless personal access system will be discussed in Section 3, and an integrated interaction environment is described in Section 4. Finally, some testing results and a brief discussion are given.

2. Intuitive Navigation for WebSpace

Basic design parameters for interface development are human movements and natural modalities, so that a user does not need to learn unknown equipment and unknown principles of interaction. Intuition is given by using well-known devices familiar to the common user.

2.1 Walking on Treadmill

Figure 1 Virtual Walk Through Paris

How large is virtual space? Using a treadmill makes the user really walk and keep on running [3]. Navigation speed relies on the status of rolling cylinders driven by the walking movement of the user. Buttons configured on bar-sticks in front of the user controls navigation directions. Some researches proposed complicated and expensive huge omni-directional treadmills [4, 5]. A navigation system based on treadmill fits best as a Spatial Navigator in fitness rooms and in emergency-rescue training, where users are forced to walk or run. In fact the treadmill had been in use as test-training device for Berlin fireman and virtual facility management.

2.2 Flying with the Virtual Balance

Virtual Balance™ [6] is a platform reacting on the body movement of a user while standing on it. It is designed for navigation in large virtual environments. This platform is made of weight sensor discs. The sensors receives changes of weight distribution on the disc and transmit them to an analysis unit, which in turn controls the position and orientation of user's viewpoint in the virtual environment. Minimal weight shift on the platform enables navigation. Stepping forward is moving down and walk, leaning backward is going up and fly.

Figure 2 Navigation with Virtual Balance

The virtual balance is perceived as a surfboard or a magic carpet from eastern fairy tales. It allows intuitive navigation by body movements. Virtual Balance requires additional solutions for interaction, e.g. pointing for selection of data.

It is well suited for navigation scenarios in public spaces, e.g. in a museum.

2.3 Virtual Balance as interface for the CAVE

Using the Virtual Balance as Interface to a single user CAVE avoids the clumsy commonly used user CAVE interface such as wired flying joystick or a wand device (Figure 3). Sitting on the virtual balance navigating the Cave enables for relaxed navigation in knowledge discovery spaces. The wired active stereo view is the only obstacle against free body movement. The ability too meet stereoscopic avatars in life size is an appropriate application for the CAVE and requires more development employing microphones, speech recognition and video-based tracking for pointing gestures.

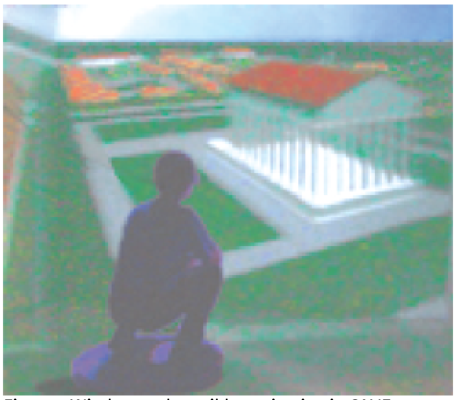

Figure 3 Wireless and tangible navigation in CAVE

2.4 Travelling via Cyberwheel

A series of experiments and testing leads to a 5 degrees of freedom navigation device, entitled Cyberwheel, whose design and implementation is shown in Figure 4. Heading control is performed like on a bike or motorcycle convenient and well known to everyone in principle. Rotation of the handles controls the speed of virtual motion. If the handles are released they will be pushed back to the original position with zero speed. If required, it is also possible to control the pitch angle raising and lowering the upper part of the device. If no more pressure is exerted to change the pitch angle, the pitch control component will return to its original position. Compression and torsion spring are used for force-feedback effect. Rotations of 3 controls change a resistance in rotary potentiometers. The resistances are measured by a micro-controller and sent to a computer via RS-232 cable. Because of its ease and flexibility navigation with the Cyberwheel becomes virtually travelling.

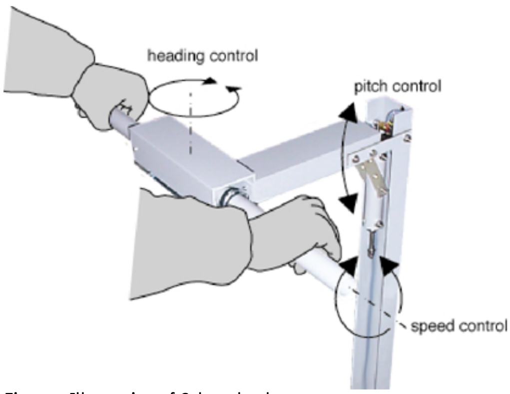

Figure 4 Illustration of Cyberwheel

3. Human-centered non-obtrusive interaction

3.1 Vision-based pointing

We investigated pointing-based interaction by capturing and tracking the arm-movements via computer vision techniques. The role of the vision system is to keep an eye on user's actions, detect a moment when the gesture of pointing has occurred, interpret its direction and follow the pointing hand in real time.

Figure 5 Vision-based Pointing

The system operates in real time, and runs on a Pentium processor under GNU/Linux operation system. In general, the system is able to follow events with 15 frames per second, and can be optimized in different aspects. If the images are digitized at a size of 384x288 pixels, experiments show that the height of the fingertip is approximately 3 Pixels, which result in a maximum resolution of 3.125cm on screen of size 3 by 2 m meter. Virtual screen is back-projected on a wall of approximately 3 by 2 meters, and the user moves freely in a real-world space of approximately 4 by 3 meters. A monochrome infrared-sensitive CCD camera at the ceiling of the space captures the top image of the user with the frequency rate of 25 frames per second. The assumption about the overall lighting is that it has to stay constant during the operation, since colour calibration is done only once during the system initialization. The pointing gesture occurs when the user spreads one of his arms towards the screen. Actually the pointing direction (Figure 5) is restricted to one hemisphere in front of the user, and it is parametrized relative to the projective screen. It is modelled by a 2-D line that connects a point between the user's eyes with the tip of the pointing hand. The recognition of pointing position is then equivalent to finding the horizontal and the vertical coordinates of the point where this line intersects with the screen. A stereo vision system for tracking of pointed (x, y) coordinates will be implemented next.

3.2 Wireless access of personal information

The design principle behind personal wireless access system is to avoid obtrusive typing of various personal data like name, address, personal preferences, and enable user's instant transmission personal data. Ideally, once the user enters the application region, the relevant personal profile will be automatically sent to the application from mobile phone or hand-held computer. Of course, its precondition is that the user has authorized to do so.

We choose Infra-red Data Association (IrDA) standard as the basis to carry out the desired wireless communication of personal data, since it has been widely adopted in the industry, and many IrDA compatible consumer devices, such as notebooks, PDAs, mobile phones, printers, have been available now. Furthermore, IrDA compliant equipment is inter-operative across different applications, manufactures and platforms. The key technical advantages of IrDA standard are:

- simple and low cost implementation,
- low power requirement,
- direct, point-to-point connectivity,
- efficient and reliable data transfer.

In order to implement IrDA-based wireless personal access, we use the infrared adapter supplied by ACTiSYS company. It offers 2.4 meters reliable infra-red link distance under 115.2 Kbps baud rate in most applications using no external power. The adapter is connected to a PC through serial or USB port.

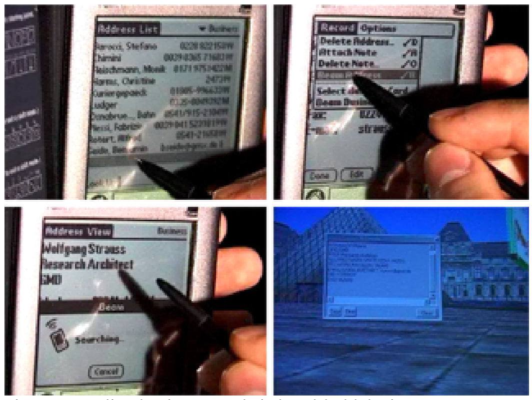

Figure 6 Sending business-card via hand-held device

The file transmitted by an IrDA-enabled device is automatically stored in a specific directory. In order to check whether a new file arrives, the specified directory will continuously retrieved. If a new file is detected, its content will be parsed to get personal information (e.g. user's name or ID), and at last the file itself will be deleted from the directory. A new message, with personal information extracted from the file, will be created and sent to the Application Server (shown in Figure 8). This message may trigger some further actions prescribed by the Application Server (e.g. actually starting the application). A common example (Figure 6) of this personal access is to send a busyness card stored on a user's mobile phone or PDA.

For the time being, Bluetooth technology is beginning to appear on the market, and will make wireless instant transfer of the user's profile even more simple and with better performance. However, IrDA and Bluetooth share the similar communication protocol in application level, and the personal information transferred via Bluetooth can also be stored as file in certain directory in host computer. Therefore, Integration of Bluetooth into current wireless personal access system is easy and simple, requiring little additional work.

4. Integrated Interaction Environment

4.1 Task-oriented Integration

We manage to bring the relevant input/output devices working together, and give a human-computer interface solution for interaction tasks that are commonly involved in e-commerce context. It is assumed that the choice of the input/output device will determine the concrete interaction technique. The prototype installation, which is presented in Figure 7, consists of the following components/devices:

1. Wall size display, it provides a main view of 3D virtual scene.
2. Cyberwheel, it is a 5 degrees of freedom input device as aforementioned, and here is used for easy and precise navigation in 3D environments.
3. Touch screen, it shows current position of the user via displaying a top-view of the 3D scene. In addition it can also be used as application control to perform some operations or choose objects.
4. Infrared receiver, it is for acquiring user's personal information (name, e-mail, preferences) from hand-held infrared-enabled personal devices (mobile phone, Palm Pilot, etc)
5. Video camera, it is reserved for vision-based pointing interaction or for video-conference.

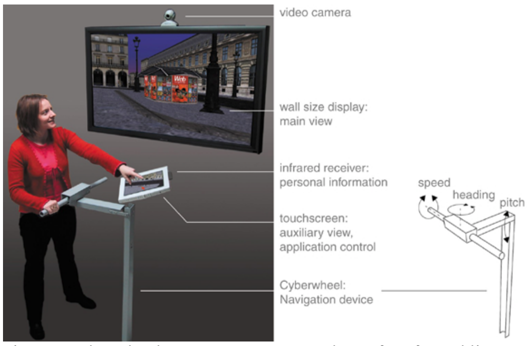

Figure 7 Cyberwheel Prototype - Integrated Interface for Public Space

Its potential e-shopping scenario can be described as follows. When the application is launched, the user may at first be asked to beam via infrared link some personal information, such as name and customer ID, from his mobile device, such as Palm Pilot. Cyberwheel performs the navigation in 3D virtual space projected on the wall-size screen. The user can be aware of his current position from the planar map or the top-view displayed on the touch screen. He may jump immediately to a desired point through a single touch. The selection of virtual objects or performing manipulations (e.g. opening a door or presentation of product) is accomplished in the following way. An icon corresponding to the target object, action or operation will be displayed on the touch screen. The user touches the icon to select the object or trigger the presentation/action/operation. The touch screen serves as somewhat remote control for the virtual environment, and the icon is displayed only when the corresponding action is really applicable. The vision-based pointing technique will permit the user to avoid the use of special pointing device that is necessary to carry in a hand. If the user has made the decision of buying something, the paying-related information such as credit-card ID could be input via hand-held mobile devices.

4.2 Software Platform for Integration

For integration of interface devices, we choose the server/client architecture, in which central server coordinates activities of all input and output devices.

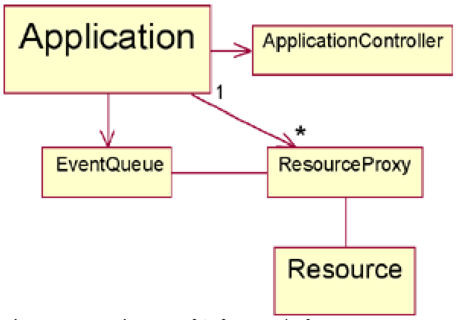

Figure 8 UML Diagram of Software Platform

As shown in Figure 8, all interaction devices send and receive data or requests from application. That is why we do not make clear distinction between them and call them, Resources.

The application server interacts with resources via proxies. It is the task of the proxy to perform connection between application server and the resource itself. With proxy solution even mobile devices may be connected with the application server in a straightforward way.

Application server and a resource interact through communication packets. Thus a resource may be straightforwardly replaced with another one that supports the same functionality. It is transparent for the application server, as each resource sends a data packet through its proxy. When the proxy receives the data packet it may push it directly to the application event queue, or re-direct it for further processing. The application server reads packet from the queue, checks the application status (Application Controller class in Figure 8) and performs alternative action if the data packet does not come as expected. The application server sends command packets to a specific resource possibly with request for the execution confirmation. Finally, the application server redirects the original data packet to the resources interested in accordance with the application scenario in the communication packet.

Figure 9 Integrated Hypermedia Interface setup
source/MARS/courtesy of blaxxun interactive

5. Results and Discussion

Perceptual user interfaces will enable multiple styles of interaction via adding human-like perceptual capabilities to the computer, and enhance the computers as tools or appliances, directly enhancing GUI-based applications. Perhaps more importantly, these new technologies will enable broad use of computer assistants, or agents, that will interact in more human-like ways. Towards the goal of setting-up an integrated hypermedia interface (Figure 9), we tested current interaction devices in a series of interactive environments including the following prototype application scenarios:

- Exploration of interactive virtual city. The system can be installed in a travel agency or in an exhibition with a model of a well-known tourist centre. It can be also installed in a museum for exploration of a reconstructed model of an ancient city.
- Interactive 3D product or company presentation. The system can be installed in an exhibition or company reception area. The user walks through a virtual office or shop enquiring information about company products.

These evaluations show encouraging results. The proposed installation works well in these testing scenarios, and basically achieves the desired goals. In the programming level, the lessons we learned from the integration are that: to ease the development of more applications with natural interfaces, we must be able to handle other forms of input (audio, video, ink, and sensor input) as easily as keyboard and mouse input.

In the future there will be an increasing diversity of user interfaces on computerized devices, including various kinds of desk and wall-size computers, as well as devices in everyday objects. Interfaces on these computing devices cannot typically use the standard desktop model. They will play more and more important roles in human-computer interaction.

Acknowledgement

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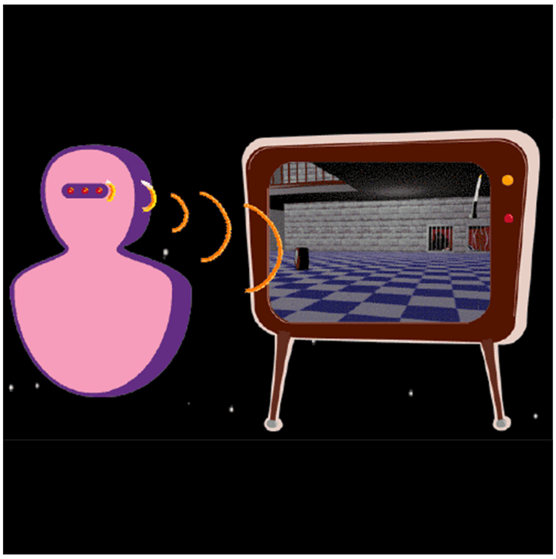

increasing the television experience

with shared media

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Abstract

This presentation addresses the role of protocols for sharing content in future media from the perspective of the behavioural sciences. Designing applications for enhancement of TV experiences is more than a technical and engineering challenge. The expectations and capabilities of end-users are key. Two interactive TV applications, a storytelling program for children (TOONS) and an interactive program guide (myGuide) for a general audience are compared. These applications combine Internet and broadcast technologies. Engagement of viewers with the content is core to TOONS, delivery of enriched services to viewers is core to myGuide. These two applications are being developed in the NexTV project.

Keywords: Interactive TV, User-centred Methodologies

Project URL:
http//www.extra-research.philips.com/euprojects/NexTV

Year the Work was created 1999

Project Partners: Philips, ICSTM, T-Nova, GMD, Optibase,TILAB, NSSE, KPN, Sun, ETRI, NOB, FT R&D

Introduction

The topic of this special session on the role of content sharing protocols in the future of media will be addressed from the perspective of the behavioural sciences.

A major assumption made for future applications, such as, interactive television, networked gaming, on-line communities, multi-users portals, is that they will enhance the shared media experience. This might be a valid assumption from the technical point of view, from the behavioural point of view, however, it is rather provocative. Questions such as: What is an experience, can it be measured and is it repeatable? What does sharing media/content mean for people? What are people's expectations for sharing media, is it limited to audio and video content? What are the goals of people for sharing media? Do people need to share content to increase their television experience or is it only a technical requirement? will be discussed. We also have to take into account that television viewing is already a shared experience, for example, watching together or sharing thoughts at a later moment in time. Definitions and explanations of these concepts are needed to address these questions. This human behavioural point of view needs to be taken into account to consider the possibilities of sharing enriched and interactive content in applications.

Behavioural Perspective

Experience

An experience is an activity for which not only the achievement of a goal, such as the result of the activity, is the main reward but the activity itself is also rewarding. These activities may also include mental activities [1]. In other words, an experience constitutes a dynamic and a static component. It is getting to the goal and having it. Experiences are different for different persons. They rely, however, on common principles and mechanisms.

The quality of an experience is determined by the interaction between the environment and the person. It cannot be explained solely by referencing to objective conditions of the environment or to the person who is having the experience. The interaction between the environment and the person yields the answer for the quality of the experience. Individual differences are therefore a major challenge for staging compelling experiences for interactive multimedia applications. Examples of individual differences are, among others, differences in skills, knowledge, personality traits, age, gender, literacy, (dis) abilities, dis/enabling conditions, culture.

Having an experience implies being highly involved with the activity. That is, people's attention is focused and their perception of time gets lost, they feel competent and in control, they are affected and they feel enjoyment. The opposite conditions of compelling experiences are anxiety, apathy and boredom.

Sharing content

Experience is fundamental to human existence. The desire to share it will be the motivating factor in the development of exciting interactive multimedia applications in the foreseeable future [2]. Sharing is defined as having, using, or experiencing something with others [3]. Like the concept of experience, sharing constitutes a static and a dynamic component, i.e., sharing the content itself and sharing interacting with the content. Like the challenges that are posed by individual differences for designing an experience, the sharing of content is also challenged by these human requirements.

In addition, we have to consider what kind of content is going to be shared, how it is being used and when and where it is being used and shared. In other words, what are the user and application requirements for sharing this content? Meta data are key. The major purpose for meta-data descriptions is mainly for management, storage and retrieval of huge repositories of multimedia content. The resulting meta-data descriptions, if achieved, are mainly aimed at professional usage. We have to wonder, whether end-users who have no dedicated goals, patience or perseverance will be helped by these detailed professional meta-data descriptions. Furthermore, these descriptions account for the media content as it is now and as it will evolve given future technological developments. Digital content, however, can also be seen as a temporal product, as a by-product of the human creative process. As such, it constitutes collections and convergences of mutations of dynamic items [4]. It is not stable.

Content that is worth sharing is distributed, is made in parallel, is created spontaneously, and is often the result of serendipity. Digital media will enable end-users to modify and create content in a simple and convenient way. People can insert or delete content themselves from interactive content, they can view themselves or others in customised guises, create characters according to specifications and they might communicate with virtual humans or even re-create their ancestors or their pets in virtual worlds.

Implications for the Interactive TV Experience

Compelling and enchanting interactive TV experiences need to comply with at least one or more of the following requirements:

- Provide feedback in the user interface.
- Provide users with control over the content,
- Enable users to participate in the program content,
- Give users the feeling or opportunity to produce something useful,
- Provide people with the possibility to communicate with others, and
- Make program changes depending on user behaviour.

These factors are the basic elements for the perception of interactivity for people to achieve an immersive experience.

Interactive applications that are developed for the broadcast domain make use of the advantages of this domain with regard to the expectations and perceptions of people. These characteristics are taken for granted by their end-users. Examples of these characteristic properties are the quality of content and service, the familiarity of the medium, the structure and reliability of the programming, and the compliance with the need of people to belong to a community. TV programs are made by professional producers for targeted audiences. They are broadcast, live, in a scheduled timeslot, announced in advance and available as promised. That is, people can rely on the quality of the content and the quality of the service. TV programs provide structure in people's life. For example, people can say I will do 'such and so' between the eight o'clock news and the Mr. X talk show. Or, children are allowed to watch a children's program before going to bed. This reliable structure supports family life and is effective as an educational and didactical medium. Even when people make use of local storage systems and change the time for viewing broadcast programs. They are still in control of the structure. It's there when they want it and they are not depending on Internet downloading or risking to get lost in an abundance of redundant information.

In summary, creating interactive compelling experiences in which media content can be shared by people and systems is a challenging endeavour that can only succeed if addressed from a multidisciplinary point of view. It requires concerted effort from behavioural science, technology and engineering, and creative arts and design.

Application Example

In the NexTV project [5], two applications are being developed in which media content is shared in a different fashion. These applications are MyGuide, an interactive electronic program and shopping guide and TOONS, a computer animated TV program aimed at children. These two applications differ with regard to the level of interactivity offered to the end-users.

The main purpose of the MyGuide application is to provide a portal for various services, which are linked directly to the program currently shown as a video stream and the known preferences of the user, creating an immersive viewing experience. The application includes the ability to provide an on-line interactive backchannel. There may even exist the possibility of employing bi-directional video communication, as in connecting to a live sales person with the interactive channel. Unlike traditional references to an Electronic Programming Guide (EPG), MyGuide is realised to support the features of an Interactive Program Guide (IPG). Not only information will be pushed and displayed to users, but also the users have the ability to interact with the various components contained in MyGuide. EPG features that will be shown in the MyGuide IPG can also include retrieving third party programming and scheduling information. In addition, the IPG prototype provides the ability for personalization based on user preferences on the system. The use of personalised information based on actual viewing habits will allow MyGuide to tailor advertisements more effectively to the needs and interests of the user.

The second application, TOONS, is an interactive TV program aimed at children, which allows the viewers to participate directly in the storytelling by selecting alternative storylines, modifying the appearance of characters in the story, replacing elements completely and even allow the integration of objects of their own design into the program. The development of the TOONS application consists of two phases: the development of an interactive story line and the creation of objects that can be modified by the user. The children have tangible interaction tools at their possession to interact with the onscreen objects and streams. These input devices will provide feed forward and feedback in order to facilitate the interaction with the story. Information about the result of the undertaken action is always immediately presented onscreen so that the users know that their actions did have some effect.

The sharing of media content in these two applications occurs at different levels of interaction and at different places in the value chain. In the MyGuide application content and media sharing occurs at production side. In the TOONS application content and media sharing occurs more at the consumer side. In this application the content producers incorporate the content input from the users. This is an interactive user-centered content creation process. Concepts, such as being developed in the TOONS application, can be expanded. For example, the user experience can be changed by staging the story not only on the TV set but also in the living room. That is, delegating the story to display and real world.

Concluding Remarks

It goes beyond saying that the interactive TV experience can be enhanced by sharing content and media. The tools and platforms that are currently available are still immature and hamper the creation and realisation of applications. In the end however, technology will not be the limiting factor for realisation. The interdependency between user behaviour and application requirements is the elusive factor. In this troupe of requirements, content is the prima donna.

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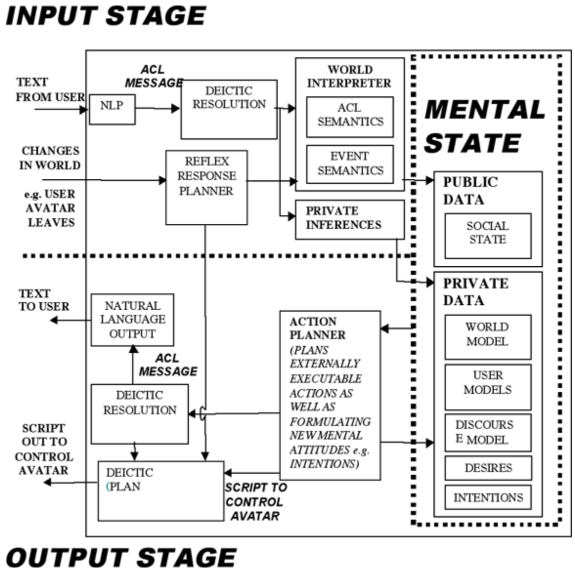

context sensitive virtual sales agents

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Abstract

Current leading portals still do not provide the user with a realistic three-dimensional multi-modal interaction. The next generation of portals will not only amend this but will provide an integrated environment with marketplaces, chat rooms and believable synthetic characters. We are concerned with the design of embodied sales assistants to be immersed in MPEG4 multi-user worlds. Sales assistants that interact with customers and their virtual shop in a believable manner bring many challenges to the designer. In particular, the assistant must have a detailed and timely knowledge of its contextual setting. We propose a contextually sensitive architecture for sales assistants in the SoNG Project supporting integrated context sensitivity over four distinct domains: the social or communicative domain, the user domain, the product domain and the virtual environment. This architecture has the potential to provide situated believable sales assistants for 3D environments.

Keywords: Agents, Believability, Context, SoNG, MPEG-4

1 Introduction

We seek to create a three-dimensional portal to the web, which presents the user with a virtual world populated by embodied agents. Embodied agents play the roles of sales assistants in the shops of the virtual world. These agents need to appear believable, at a low level this can be achieved by using human-like gestures while at a higher level they are required to have a detailed knowledge of the world in which they are situated. In particular the agents need to know the products available for sale and the expectations and preferences of the human shoppers. Knowledge of products available is easily achieved by means of product databases, but gathering and representing knowledge about human users presents a challenge. Additionally, when human users are presented with a shopping mall scenario which is familiar to them from the real world, they will naturally have certain expectations about the agents playing the role of shopkeeper. Therefore agents must be aware of their social role in the virtual world and the behaviour that is appropriate to that role.

Our aim is to employ user profiling techniques including the fuzzy modeling of user preferences to furnish the agents with a knowledge of the intended meaning of the individual human users' linguistic expressions (for example cheap and light). Additionally we describe social context by using an explicit social state, which describes social roles and associated permissions and obligations for actions. In this way the agents are made aware of the social context in which they are situated and can behave in accordance with the expectations of a human user.

In section 2 we look at the requirements for our virtual sales agents, central among these requirements is context sensitivity. Section 3 looks in detail at the techniques that can be employed to achieve context sensitive agents, these include an awareness of social context and user modeling techniques. Section 4 shows the architecture used to implement a contextual embodied agent and finally we draw some conclusions in Section 5.

2 Requirements for Virtual Sales Agents

We are concerned with using embodied agents as sales assistants in a virtual marketplace. Within the virtual marketplace of SoNG† several demonstration applications shall be developed including a theatre booking system, a phone shop and a clothes shop. Here we focus on the telephone online shop. The sales agent must be able to converse with the customer via natural language, to respond to queries for phones satisfying certain criteria and to display phones to the customer.

This application requires not only that the agents must have the relevant product information, but also they must be able to engage the customer in an interesting conversation. In order to sustain the user's interest the agent should be:

1. Believable. Believable agents are agents that create the illusion of thinking, making decisions and acting autonomously. The agent must appear believable to the customer, using human-like behaviours, portraying an underlying emotion mechanism, as well as verbal communication skills. At a lower level it will be necessary to synchronise gestures and verbal communication [1].
2. Proactive. The agent must proactively introduce new topics of conversation, for example describing new products. By the appropriate use of gestures the agent will appear exciting and enthusiastic about products.
3. In character. A sales agent in a phone shop must have a behaviour and an expertise consistent with the expectations of a human shopper. Although the agent must have a broad (and mostly shallow) [2] set of capabilities in order to satisfy a wide range of user demands, it must have a core expertise. Given that the agent's main function is that of a shopkeeper, the agent should desire to satisfy the customer while maximizing sales. If the agent "knows" the user then it should try to tailor its service according to the user's preferences.
4. Context Sensitive. The agent should be aware of its surroundings and be able to communicate its understanding through verbal and non-verbal communication. Such an understanding of context will significantly impact the agent's ability to fulfil the previous three requirements. Here we identify four domains in which the agent must have contextual understanding: the social or communicative domain, the user domain, the product domain and the virtual environment.

3 Context Sensitive Agents

The following subsections deal with our agent's mechanisms for understanding context.

3.1 Interpreting Communicative Acts

Through an online interface users may type text in natural language and may select gestures for their avatar to execute in the virtual world. The sales agent must interpret these verbal and nonverbal communicative acts so that it may update its model of the world and respond appropriately. The interpretation of an act does not depend on the act alone, communication can be highly context sensitive, i.e. there are certain external factors, which affect the meaning of a speech act. These factors include the domain in which the conversation takes place, the status or authority of participants and the relationship an act has to the remainder of the discourse. Here we handle context in two ways:

1. Firstly we have an explicit representation of the context in the form of a conversation state, which holds information known to all participants in the conversation. The conversation state is a set of propositions (e.g. representing expressed mental attitudes) and variables important to the conversation (e.g. roles occupied by participants). In our communication model we define the meaning of communicative acts as a function from context onto context [3] i.e. the conversation state contributes to the meaning of acts.
2. Secondly we make use of protocols to specify roles of participants and to encode information appropriate to the current domain. There are social roles, which are permanently active, and also roles within conversation protocols, which last only for the duration of the conversation. The roles agents play in a protocol (or in the society) determine the social obligations of the agent in the conversation and also affect the meanings of acts.

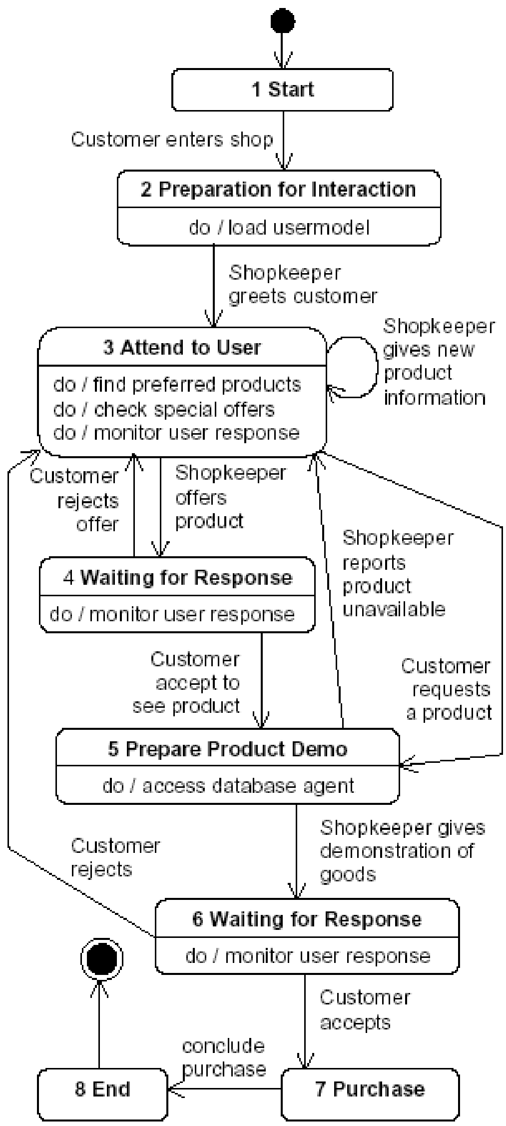

Fig. 1 Shopkeeper-Customer Protocol

We define semantics for events in the virtual world firstly from a public perspective [4] (the meaning according to the conventions of the society) and secondly from a private perspective (the inferences that an agent itself draws). The conventional (public) meanings of acts are predefined and common to all agents in the world. The public meanings are used to build the model of the conversation state. Thus there is a standard meaning for each communicative act and all participants can update their copy of the social state in the same way. Private inferences are agent specific and will update the agent's own model of the world

We now look at a simple example of the interpretation of communicative acts to illustrate how the public meanings and protocols update the conversation state. In our phone shop scenario, the sales agent permanently occupies the social role of "shopkeeper". Figure 1 shows a UML-style statechart diagram describing a protocol for an interaction between a sales agent (playing the role of Shopkeeper) and a human user (Customer). A user's avatar entering the shop is an event that must be interpreted. The public meaning of this event defines that a new conversation state must be created and asserts two role variables and one proposition within that new state. The variables are: the agent that occupies the social role "shopkeeper" is now assigned the conversational role "shopkeeper" and the user's avatar is assigned the role "customer". The new proposition asserts the existence of a social obligation for the shopkeeper to greet the customer.

Subsequently the customer queries about the availability of WAP enabled phones. The public meaning of this query adds two new propositions to the conversation state. The first is that the customer has expressed a desire to know about the availability of WAP enabled phones and the second asserts the existence of a social obligation for the shopkeeper to tell the customer about WAP enabled phones. In addition to these public meanings the sales agent makes a private inference about the world it inhabits. These include propositions about the user or the 3D world.

3.2 Building a User Model

A user-modelling component is an essential part of an e-commerce system such as the SoNG application. Good sales assistants have the ability to make accurate assumptions about the user and use the information gathered to tailor their service. Furthermore, regular customers receive an even more personalized service, not only because of their tastes, but because the sales assistant knows how best to interact with them. For instance, a good restaurant waiter is one who knows which is your favourite table and knows what your favourite dish is. However, in order not to embarrass the customer, s/he should also pick up on some subtle clues. For example, if the customer doesn't have much buying power then the waiter should not suggest the most expensive plate. If the customer is of Jewish or Muslim background, they may not wish to eat pork. More over, if the customer is visibly distressed, maybe they could do with a strong drink. In order to provide this quality of service, information must be gathered regarding the customer's tastes, buying power, social status, cultural or religious background, personality and current emotional state.

Although the waiter scenario is not the one proposed in the SoNG project, it does provide some insight into the methods of service provision. There is a fine line to be struck between identifying and catering for user requirements and fulfilling the agent's goal of maximizing sales.

The user model's use is threefold: firstly to support the dialogue manager by modelling users' beliefs and desires, secondly to model users' preferences and finally to model users' affective state. The appropriate use of this information can greatly improve the perception of intelligence and trust in the agent [5]. During an interaction, the agent will draw inferences about the customer's preferences and build up a user model for each customer. Using this, it can tailor its conversation to be appropriate to the customer's interests.

User beliefs and desires: Modelling a user's knowledge or beliefs and desires is a requirement for providing the user with an efficient conversational partner. These assumptions aid the system to converse more naturally, supply additional relevant information, avoid redundancy in answers and explanations and detect the user's wrong beliefs about the domain. [6].

User preferences: In order to tailor the service to the user it is necessary to build a model of the user's preferences within the specified domains. In particular, the user's tastes and requirements with regard to the product on sale and the user's interaction preferences with the system. A prerequisite for supplying effective product suggestions to the user is an in depth knowledge of the product. This is described in more detail in section 3.3. As the agent's interaction with the user will be mainly through natural language, we chose a linguistic representation of a user's preferences with respect to specific product attributes. An ideal candidate for such a representation is a fuzzy variable with four terms: like, interest, indifference, and dislike. Updates to a user's preference profile will assign a fuzzy value from the above-mentioned fuzzy variable to specific product attributes. When suggesting a product to the user, the agent will attempt to include as many attributes that fall under the "like" fuzzy set as possible.

In addition to maintaining user preferences with respect to product attributes, the agent must maintain a model of a user's buying power. Again a fuzzy variable is used to map linguistic terms such as "cheap" and "expensive" to actual product prices. Each term is associated a fuzzy set, the size and shape of which may vary from user to user. For example, some people may consider a product costing £200 to be cheap, whereas others may find it expensive.

User interaction patterns: Another factor we believe needs to be modelled is the user's interaction pattern. In particular, when was the last time the user visited the shop. Was it recently or did some time elapse. Also, what product did the user buy at his or her last visit, if any. This sort of information will allow the agent to greet the customer with utterances such as: "Hi Frank, I haven't seen you for a long time. How are you finding the Motorola WAP phone you bought last month?". A user's response will allow the agent to gather feedback about its model of the user's preferences.

User's affective state: A user's interaction with the agent will have a significant influence on the user's affective state. For example, if the product the user is looking for is not available this may cause disappointment and reproach towards the agent [7]. The agent must be aware of such reactions and attempt to remedy them by, for example, suggesting something else the user might like.

In addition, the agent's own personality and behaviour can influence the user's perception of it and the service it provides. Work carried out on the FACTS project [5] indicates that if a user likes the character it is interacting with he or she will consider it to be more intelligent and competent. As a result the user will trust the agent more. It is thus important to model the user's preferences in terms of personalities, and their resulting behaviours, which they like to interact with. The Media Equation [8] indicates that people prefer to interact with personalities similar to their own. So modelling personality traits of the user will give a good indication of the kind of personality the agent must exhibit.

Acquiring data about a user is not a trivial task. A lot of data can be acquired from a user's conversation and by observing a user's behaviour [9]. Indeed, requesting information about a user from the user can have extremely detrimental effects. Firstly, it may appear to be an invasion of the user's privacy. Users may be wary of how and by whom the information will be used. Secondly, users actually have a poor ability to describe their own preferences. Often, what they say they like and what they really like are not the same thing [10]. So information must be gathered through user interaction (what does the user ask for, what does the user need) or if a user explicitly states he or she likes a specific product attribute.

3.3 Representing the Product

The depth of the description of a product can help provide a more personalised service. However, it is not only necessary to provide a detailed machine understandable description of products, but user requirements must also be taken into account. This is an example of how different contextual domains are interrelated, something that must be taken into account in the design stage of the system.

If we consider the example of mobile telephones we may find that user requirements include the need to know the make, model, technical capabilities and price of the phone. However, users could also want to know the colours that are available, how stylish the product is, if it fits easily in their pocket, what extra features it has and how popular it is. Such considerations are essential for effective service provision and can give the agent a façade of competence.

In our architecture, product information is stored in a product database wrapped by a disembodied database agent. The sales assistant is able to query the database agent for relevant products using ACL messages.

3.4 Inhabiting the Virtual Environment

The virtual environment is one of the most important domains to consider when generating context sensitive believable agents. The agent, the user and the 3D models of products all cohabit the 3D environment representing the virtual shop. Firstly the agent must be able to generate believable behaviours composed of synchronised facial and body animations as well as speech. To achieve believability the behaviours must be appropriate and timely taking into consideration all the issues described so far, i.e. social obligations and permissions, user product and affective preferences, user affective state and the nature of the objects being discussed. Behaviour scripts linking facial animation, body animation and speech can be created on the fly or predefined behaviours stored in a behaviour library can also be used.

The agent must be aware of the position of objects and avatars in the shop and the activity of human agents in order to freely navigate within it avoiding obstacles. Such information can also be used to augment the agent's conversational capabilities allowing it to face the user when it is engaged in conversation, move towards a specific product or point to a product to disambiguate the subject of conversation [11]. This is facilitated by three basic parametric behaviours, namely walking, facing and pointing.

The agent's affective state is revealed to the user by means of facial expressions and gestures. Facial expressions include portrayals of joy, surprise, sadness, anger, fear, disgust and more. Gestures are used to complement the facial expressions, reinforcing the presentation of affective states. However, emotions and personality can also transpire solely from the agents body posture, for example, walking proudly.

4 Architecture

The implementation of our agents is based on a BDI architecture and is composed of a set of modular building blocks. At the lowest level they are built using JADE [13], an agent platform that provides, amongst other features, the infrastructure for agent communication. In SoNG we have extended the JADE agent class to define a class hierarchy of agents needed for our application. To implement internal planning and reasoning we use JESS [14] to build a rule based action planner for each agent. JESS operates on a Knowledge Base (KB), which represents each agent's public data (social model) and private data (beliefs about the state of the world, the user and the discourse, as well as desires and intentions). Each agent is able to make inferences about events in the environment and update its beliefs. Furthermore, each agent makes decisions according to the state of it beliefs. Our JADE agents each have their own jess_processor object. This is constructed during the agent's setup phase, it starts a new JESS FuzzyRete engine [15] and loads all the rules appropriate for that agent. Each agent has rules stored as text files for inferences, planning, beliefs and desires.

The agent's type variable prefixes the filename in each case, for example "phoneinferences", so that the appropriate files can be loaded. In addition there are common rules for each agent, these are the social model, mental model and semantics of communication and events. The Database agent is a special case, and its jess_processor associates JESS facts with database tables in a MySQL database. Figure 2 shows the SoNG agent architecture.

5 Conclusions

Building believable sales agents in 3D worlds requires careful design considerations to be made. We have identified four domains, which must simultaneously form part of the agent's context. Elements of these domains are heavily interdependent and the relationships must be considered at the design stage of the system. From this perspective, context sensitivity comes at the expense of a generic architecture for believable agents. We propose an architecture for a believable sales assistant to be used on the SoNG project.

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paper

intuitive visual interaction for transfiction

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Abstract:

Intuitive movements in front of a mirror are banal. Replacing the mirror by a screen showing a similar mirrored image, but filmed and augmented with "transfiction/alized" elements, results in visual interaction, in body movements, which can trigger narratives. Transfiction is designed for mixing synthetic and natural images in real time and allows one to interact in these data input/output screens. This paper is presenting a system for interaction in a non-obtrusive manner.

Keywords: Real-time immersion, intuitive interface, IP-compliant, video segmentation, interactive stories.

Introduction

A system where users can naturally interact with narrative machines (devices with computing power and containing databases of meaningful information) has been designed and the term "transfiction" has been coined to this interactive narrative system [5]. Contrary to many approaches to virtuality or mixed reality, the designed system does not need any dedicated hardware, nor for computation nor for the tracking of real objects/persons. It runs on standard Pentium PCs and cameras are the only used sensors. This vision-based interface approach allows complete freedom to the user, not tied to hardware devices such as helmets and gloves anymore.

Various research projects have already adopted such a user-centric approach towards mixed reality. It ranges from the only animation/command of purely virtual worlds, as in the KidsRoom [1], to more mixed worlds where users see a virtually reproduced part of themselves as in N.I.C.E. [2], and goes to the inclusion of the user image within the virtual space in order to fully exploit the potential of mixed reality. In ALIVE [3], "Artificial Life Interactive Video Environment", wireless full-body interaction between a human participant and a rich graphical world inhabited by autonomous agents is used. The Photo-realistic Interactive Virtual Environment of the ATR laboratory [4] is the system offering the more similarities with the presented one since users are also reproduced within graphical environments. Where the ATR system has the advantage of considering 3D images that improve the quality of the segmentation, it remains a pure immersion system without the notion of interactive scenarios.

The present system of "transfiction" [5] aims at extracting users out of their context when they enter the space of some camera. The image is analyzed; the visual representation of people is automatically extracted and then integrated within a pre-existing story in order to construct the mixed-reality scene, as depicted in Figure 1. The users' attitudes and behaviors then influence the narrative, with the explicit intent of making the immersion a rich experience for all users.

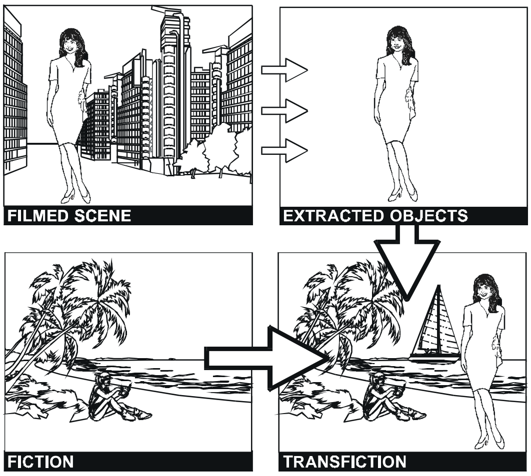


Figure 1 Underlying concept.

Conceptual Exploration – Intuitive Interaction

Mixed Reality (as defined by Milgram [6]) is emerging as a major area of scientific and artistic development in today's research agenda. In this context, one of the main objectives of multimedia authoring teams is to design "interactive experiences". These are often built with image-intensive compelling applications that aim to fully exploit the potential of physical spaces and the Internet network.

However, one can claim that "Mixed Reality" is a new term for an old praxis illustrated in literature and philosophy for centuries. Plato in the West will be the supporting example, but one could look at writings in the Oriental civilisations (India, Tibet, China, Japan...). Different reality levels (physical, cognitive, and psychological) are layered into mixed and complex reference systems. This evolving framework plays a role in definitions of concepts (immersion, intuitive, spatiality...) which are reviewed in today's technological context.

In "Respublica" (which means the "public thing", one could relate to the concept of audience experiencing a "common" public object), Plato describes the classic scene in the cave. People are sitting close to a fire and their shadows are projected on the wall (Low technology and image projection are used here and can already be seen as a source of confusion between reality and representation). These "spectators" are fascinated by these moving images, their own images projected on the wall. They go out of the cavern and the light of the sun makes them in a way blind so they go back into the cave. One could argue that they become twice victims of the "light", inside and outside the cave: their perceptual system has to evolve to realize that the projected images, the shadows, are related to the movements of their bodies.

This case study of Plato's cave serves one purpose: to bring the notion of "intuitiveness" into perspective, outlining its definition in relation to contextual evolution and cognitive maturity. These contextual factors are fundamental in shaping the notion of intuitivity. One can talk about "common sense". Another approach is to relate to the concept of obtrusion: an obtrusive interactive system is an impossible system since it will hamper interactivity de facto. The user will learn to fight against these obtrusion variables. Humans behave intuitively in spaces, and the nature of space is changing because of its materiality. Space is getting more into virtuality, through its representation (3D, computer imaging...) as well as through its experience (heterogeneous network, relation to distant places, time difference contraction...). Confrontation with images, with "transformed copies" of real people (the shadows) led Plato to explore concepts of representation and interpretation, in an allegoric way.

Recent technological developments allow one to explore the notion of "transfiction" introduced in [5]. Visual screens are the output zones of sequences of images and narrative instances. But these can also be input zones for interaction in artificial spaces. An "interactor" (see taxonomy hereafter) gets immersed and uses his/her body "as a joy-stick" to trigger a set of narrative sequences and to interact with the artificial spaces. The concept of immersion moves from a cognitive (Cinema offers the ideal example) to a physical experience. The psychology of the projection of a viewer into the character of the film and the interpretation of his/her role is now to be reconsidered in the framework of Mixed Reality. The processes of perception and cognition are located in both real and virtual space at the same time.

The interaction with an alter ego into a "magic mirror" (image of one's self projected onto the screen) allows for intuition to lead the activities in a Mixed Reality system. The "transfiction" system allows users to interact with the virtual space through gestures and movements. Speech can offer another modality for interaction and will be analysed in some future work.

In these hybrid action spaces, narrative modalities are investigated through tracking, position detection and image recognition systems. The technical architecture described hereafter allows the implementation of "narrative graphs" and opens the possibility to analyse the cognitive and visual actions and reactions to an immersive intuitive interactive system.

System Overview and Taxonomy

Considering a human-centric approach, the various "users" depicted on Figure 2 are involved within the designed architecture.

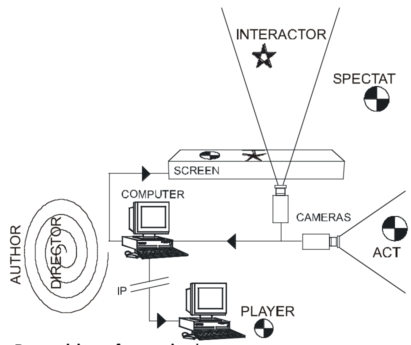


Figure 2: Repartition of users in the system

They are ranked here by their degree of influence on the overall system:

1. The Author, who designs the whole narrative system, i.e. the scenario, the related story and its elements (musical analogy to composer or theatre/film analogy to the scriptwriter);
2. The Director, who can modify (via the authoring tool) some aspects that the author prepared to be modifiable (musical analogy to performer or theatre/film analogy to the director achieving the mise-en-scene);
3. The Interactor, who is captured by some live camera, and can directly interact with the system via its gesture. The Interactor is aware of his/her role in the narrative thanks to some (large) screen where s/he sees himself/herself within the mixed-reality environment;

4. The Player, who interacts with the system through a mouse on a Web browser (clicking on some MPEG-4 hypervideo);
5. The Actor, who is any person in front of some live camera. The Actor is not aware of his/her status within the system;
6. The Spectator, who is any person looking at the images without interacting or being captured by the cameras.

Technical Architecture

In order to provide users with the intended experience, the technological challenge is to gather all needed subcomponents and issue a real-time implementation of the system. To compose all the visual objects (the "real" and computer-generated ones) within the final mixed reality scene and to allow for interactivity, the MPEG-4 standard [7] can be used as the transmission layer.

In addition to the composition and transmission facilities, the following issues are addressed:

- Achieving a real time segmentation of moving objects captured by a camera(s).
- Associating these objects extracted from the real world with predefined synthetic objects in order to compose a coherent mixed-reality scene.
- Performing the real-time encoding of these arbitrarily shaped objects with the help of various coding techniques that appear within the MPEG-4 framework.
- Establishing a client-server architecture based on the Internet Protocol that allows for ubiquity (simultaneous re-use of the same camera images within various mixed-reality scenes) and composition of scenes from various local or remote sources.
- Automatically extracting (MPEG-7 [8] like) descriptors that are used to describe the behavior of visual objects and interact with the scenario.

Solutions to these issues have been combined in order to implement the architecture depicted on Figure 3.

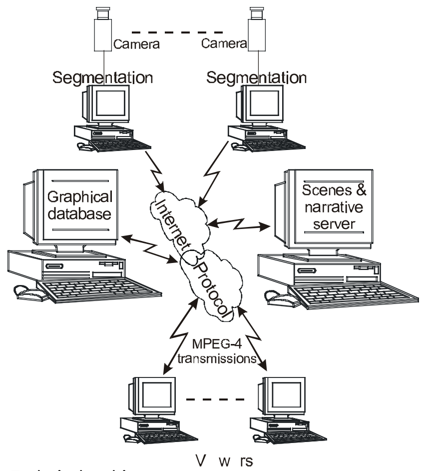


Figure 3: Technical architecture.

Within the framework of the IST-art.live project, this architecture is extended and results in the integration of the MPEG-4, MPEG-7 and FIPA standards, as shown on Figure 4.

The distributed management of the application is ensured through a real-time implementation of the FIPA standard that focuses on an abstract architecture providing meaningful messages exchanges between agents. The involved agents may use different messaging transports, different agent communication languages, or different content languages and are behaving in a totally autonomous way. They are therefore particularly well suited to manage local scenarios for the different screens of the system.

MPEG-7 is used to provide standardized content-based description for the various types of audiovisual information existing in the system. In particular, (segmented image appearances of) actors and interactors are described in terms of their bounding boxes (BB):

- location of the BB;
- motion of the BB;
- main color/texture of the BB;
- number of BB.

Joining the FIPA and MPEG-7 standards allows agents in charge of the scenario management to manipulate well-defined triggers that are combination of standardized descriptors.

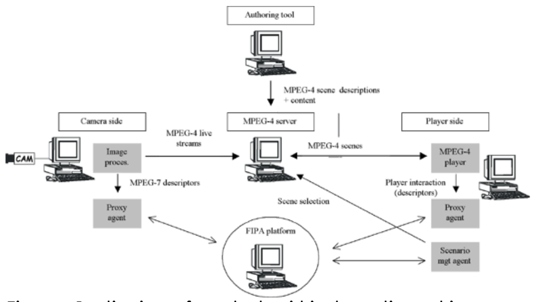


Figure 4: Implications of standards within the art.live architecture

Narrative Graphs

Any narrative is established as a (narrative) graph. Every node of the graph provides one with a scene (composed of various virtual objects) along with a list of events to be trigged. For instance, the author may decide to look for a person, to 'touch' a particular graphical object which is a door, to detect two persons moving 'fast' in opposite directions, or simply to wait for 15 seconds. According to the detected trigger, an action occurs. The action is a move to some next node of the graph, where another scene is depicted and other triggers are searched for. The scene can be a completely new one or the same one from the previous node with just some additional (or suppressed) graphical element (scene refresh or update).

Figure 5 presents an excerpt from a simplified typical scenario (where one should imagine that more elements like moving people and graphical objects are added to the scenes).

It is crucial to note that the evolution of the narrative is different for every screen of the system, i.e. for any player or for any set of interactors in front of the same large screen. Narrative graphs are thus dealt with in an autonomous way in order to allow different users to enjoy the same story at different moments and with different interactions.

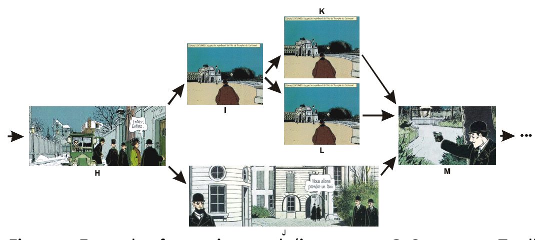


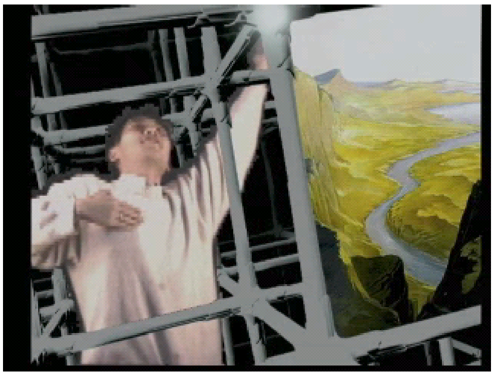
Figure 5: Example of narrative graph (images are © Casterman-Tardi).

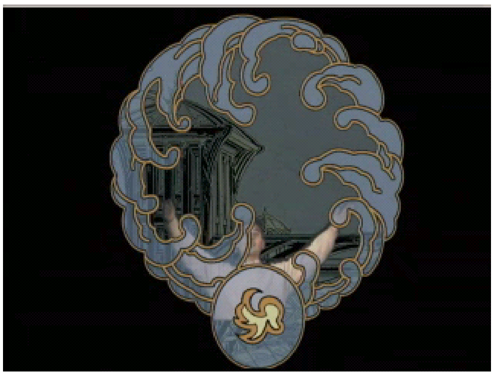
Results

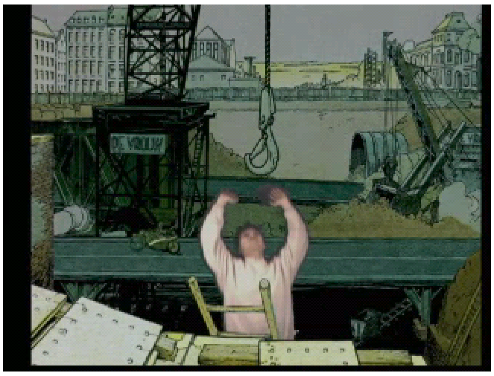
Typical scene appearing on screens of the system are shown in the following figures. On these figures, one could see a user naturally interacting with the system by virtually touching different graphical elements.

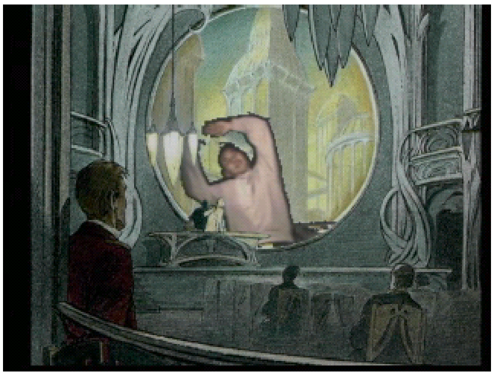
Conclusion

Transfiction was initially coined for "transportation into fictional spaces". Mixed reality "transfiction" systems are designed by taking into account criteria of easiness and usability for the user, also defined as the interactor. An important driving factor is to look for immersion solutions where the interactions are intuitive, in order to provide a rich “interactive experience” while minimizing the learning process of enjoying its usage.









Figures 6-9: Typical mixed-reality scenes (images are © Casterman-Schuiten).

These systems show also that the quality and the richness of the experience do not necessarily require high-end computing of the visuals: images can contain a few glitches (cf. example image of Figure 9 where some noise appear on top of the user’s head) which will be almost unnoticed if the user is taken away through the interaction modalities. This notion of visual immersion can be cognitively reinforced by using multiple channels to convey emotions. In particular, the audio channel is an important area for future work.

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paper

augmented reality for visitors of cultural heritage sites

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Abstract

ARCHEOGUIDE (Augmented Reality-based Cultural Heritage On-site GUIDE) is the acronym of a project, funded by the EU IST framework (IST-1999-11306), and pursued by a consortium of European organizations. The system allows the user/visitor to experience a Virtual Reality world featuring computer-generated 3D reconstructions of ruined sites without isolating him from the "real world". The key feature of the system is the position and orientation tracking technique used in determining the user's viewpoint. This is an image registration technique based on phase correlation. This paper presents the technique in detail and gives practical examples of the application of the technique in the ARCHEOGUIDE system. In particular, it describes how calibrated reference images may be matched to live video by image transformation to the Fourier domain and phase calculation for translation, rotation, and scaling operations.

Keywords: Augmented Reality, Position Tracking.

Project URL:
http://Archeoguide.intranet.gr.

1. Introduction

ARCHEOGUIDE is a multi-user Augmented Reality system for visitors of cultural heritage sites; such sites are very sensitive and any kind of interference must be kept to an absolute minimum. The system provides 2D and 3D navigation assistance to the user with intuitive and familiar user interfaces (from Internet Explorer windows) and also automatically launches audiovisual presentations about the site depending on the user's position and orientation and declared interests. Augmented Reality reconstruction of the most important temples of the site is achieved from selected viewpoints using novel and sophisticated tracking techniques that will be discussed in this paper.

The visitors, in the beginning of their session, provide a user profile indicating their interests and background, and they optionally choose a tour from a set of pre-defined tours. The system guides them through the site, acting as a personal intelligent agent. Meeting the functional requirement of displaying augmented reality reconstruction of the temples and other monuments of the site, depends on the position – orientation tracking component of our system. Correct object registration and occlusion handling of course requires having an adequate position and orientation component and a detailed model of the site's static environment. An accurate model of the site (digital elevation model, orthophotos etc.) was obtained using accurate photogrammetry and site maps.

The rest of this paper is organized as follows: in section 2, we give a brief description of the overall architecture of the system. The extremely complicated problem of position tracking in an outdoors environment as well as the specific technique that was adapted in our system is analyzed in section 3. Subsequently, section 4 outlines the problems of multi-modal user-computer interaction. We summarize our conclusions in section 5.

2. Overview Of System's Architecture

A more detailed description of our system's architecture is contained in [1], in this paper we will provide only an outline of the architecture for the purpose of completeness. Major requirement that our design is expected to fulfill is the support of multiple concurrent users without any serious sacrifices on the response time of the system. The architecture is a client/server architecture, where the clients are the wearable computers of the Mobile Units (MUs) equipped with a wireless network connectivity card. A wireless network with a sufficient number of Access Points (AP) provides connectivity to the server who is responsible for updating the contents of the MU's database whenever the user is moving to an area about which there is no content available. Graphically, we depict system architecture in figure 1.

The hardware components of the system include a Site Information Server, the Mobile Units, the Wireless Local Area Network (WLAN) and a Differential Correction GPS reference station, while the software components address the storage, tracking, interaction, distribution and rendering needs of the overall system.

The Mobile Unit software has been written in C++ (for speed) whereas the server components were written in Java (for maximum portability.)

3. Position Tracking

3.1 General Description

In order to integrate the virtual objects into the real environment, i.e. augment the user's view; we need to determine user's exact position and direction of view. There is a large number of tracking technologies today that offer position and orientation tracking with high

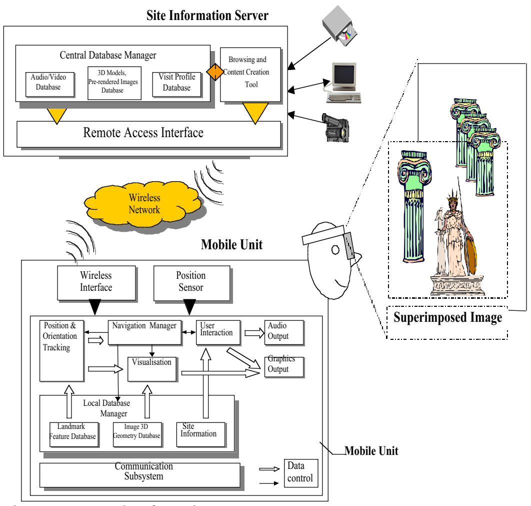


Figure 1 Example of caption.

precision and low latency [2], [3], [4], [9]. However, none of the available systems is suitable for outdoors usage with sufficient precision as required by ARCHEOGUIDE. Integrating different tracking technologies into one hybrid system seems to be the most promising approach [4].

A first rough positioning of the user is given by using the GPS and compass system. For exact tracking we use image-based techniques. The only additional hardware that we need in order to perform the vision-based tracking is a tiny off-the-shelf camera attached to the user's HMD. The system can determine the user's viewpoint based solely on the video image. This brings us to the concept of "image registration", something we used in ARCHEOGUIDE and which will be discuss next.

3.2 Describing Image Registration

This method for determining the user's viewpoint assumes that a sufficient number of calibrated reference images are stored in the database, indexed according to the spatial coordinates from which they were taken (successive images overlap to a good degree). The areas from which these reference images are taken comprise the so-called "selected areas" or simply "augmentation view-points". These areas must be carefully selected in each installation site of the system so as to give a good overall sense of the site (should have open view of most of the site's important areas and cover them well). The method then performs a comparison between the images that the user sees via the camera attached to the HMD, and a number of reference images in the database whose indexes are close to the coordinates provided by the GPS and compass devices. The matching is performed by considering the image as a whole (global method) instead of identifying landmarks in each image (local method). When the two images being compared overlap in approximately 30-40% or more of the area, the method can correctly compute the warping transformation of one image to the other. This (invertible) transformation is then used to provide accurate head-pose estimation since the coordinates of the database image are known. The entire process is shown in figure 2. In fact, in the case when there are pre-rendered images of the 3D reconstructions of the monuments rendered from the same point of view of the stored site images, the same warping transformation can be used to transform (fast and accurately) the pre-rendered image and then display it on the user's HMD thus achieving 3D visualization as well. Keeping in mind the general description of Image Registration process we move one step further in order to see different approaches and analyze the one we employed.

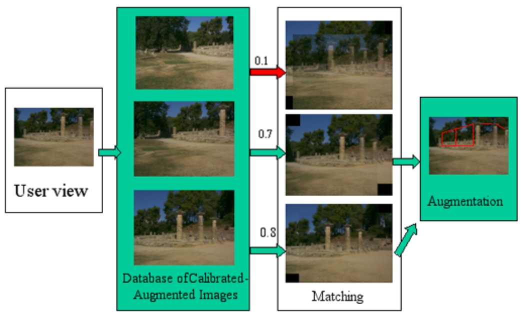


Figure 2 Example of caption.

3.2.1 Image Registration Approaches

The approaches for image registration can be classified in three main categories [6], based on the kind of data which is being processed:

1. Pixel-based
2. Feature-based and
3. Phase-correlation-based methods.

The first one compares the raw image pixel data between the two images [7]. Methods of the second class extract image features, like corners, edges or contours [5]. The algorithm, which assigns the extracted features of the two images, depends very much on the class of features which are extracted. The third class of registration algorithms is the phase-correlation one. The input data is transformed in frequency space, where the correlation occurs.

This algorithm is well known for its robustness to illumination differences between user and reference image and local features of the images.

3.2.2 Registration with Phase-Correlation

In this sub-section a description of the phase-correlation image registration technique [8] is given which will show how to recover the 2D translation, rotation and the scale factor.

3.2.2.1 Translation

Let f1 and f2 be two images differing only in a 2D translation t(tx, ty). The images are related as follows:

1. $$f_2(x,y) = f_1(x-t_x, y-t_y)$$

The Fourier function F1 and F2 of the two images are given by the Fourier shift-theorem:

2. $$F_2(\xi,\eta) = e^{-j2\pi(\xi t_x+\eta t_y)}F_1(\xi,\eta)$$

F2 and F1 are two arrays of complex numbers. By computing the cross-power-spectrum, the phase of the images is isolated:

3. $$\frac{F_1(\xi,\eta)F_2^*(\xi,\eta)}{\left|F_1(\xi,\eta)F_2^*(\xi,\eta)\right|} = e^{j2\pi(\xi t_x+ht_y)}$$

Where: is the conjugate-complex value of . In order to estimate the translation between the two images the following steps have to be achieved:
1. Compute the Fourier transformations of the images.
2. Compute the cross power spectrum according to equation (3).
3. Compute the inverse Fourier transformation of the cross-power-spectrum. This is a real function which contains an impulse at the coordinates (tx, ty).

3.2.2.2 Rotation

If the image f1(x,y) is transformed into the image f2(x,y) with the translation t(tx,ty) and the rotation with angle _, then the relation between f1 and f2 is defined as:

4. $$f_2(x,y) = f_1(x\cos\phi_0 + y\sin\phi_0 - t_x, -x\sin\phi_0 + y\cos\phi_0 - t_y)$$

According to the shift theorem of the Fourier transformation, we obtain:

5. $$F_2(\xi,\eta) = e^{-j2\pi(\xi t_x+\eta t_y)}F_1(\xi\cos\phi_0 + \eta\sin\phi_0, -\xi\sin\phi_0 + \eta\cos\phi_0)$$

A rotation in the spatial domain generates a similar rotation in the frequency domain. The magnitude spectra M1 and M2 of F1 and F2 are related as follows:

6. $$M_2(\xi,\eta) = M_1(\xi\cos\phi_0 + \eta\sin\phi_0, -\xi\sin\phi_0 + \eta\cos\phi_0)$$

An adequate way to represent the spectral function is to use a polar coordinate system. A point P(_,_) in the magnitude spectra is represented by a point P(r,_). Both magnitude spectra in polar coordinates are then defined as:

7. $$f_2(x,y) = f_1(ax,by)$$

A rotation is represented as a translation of value _0 in the polar-transformed magnitude images. This translation can be easily found by the phase-correlation technique, and thus the rotation angle.

3.2.2.3 Scale

The scaling parameter between two images can be found in a similar way. Let f2(x,y) the scaled image of the image f1(x,y) with the factors (_,b), so that:

8. $$f_2(x,y) = f_1(ax,by)$$

Then, the Fourier spectra of both images are related as follows:

9. $$F_2(\xi,\eta) = \frac{1}{|ab|}F_1(\frac{\xi}{a},\frac{\eta}{b})$$

If the horizontal and vertical axis of the frequency domain are scaled in a logarithmic way, the scaling parameters can be found as a translation in the frequency domain. This can be written as:

10. $$F_2(\log\xi,\log\eta) = \frac{1}{|ab|}F_1(\log\xi - \log a, \log\eta - \log b)$$

By applying the phase-correlation technique, the translation (loga, logb) can be found and thus the scaling factor (a,b).

3.2.2.4 Rotation and Scale

In most of the cases, the horizontal and the vertical scale factors are equal. A rotated and scaled copy of one image can be found by a log-polar transformation of the magnitude images (see equation 7)

11. $$M_2(\log r,\phi) = M_1(\log r - \log a, \phi - \phi_0)$$

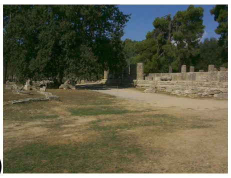
3.3 Implementation and Results

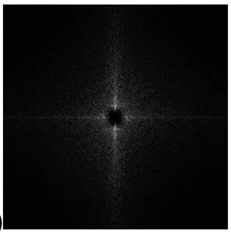
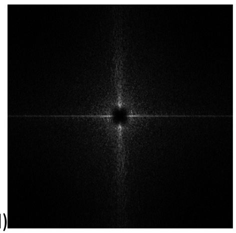
The Fourier transformation can be computed efficiently with the method of the “Fast Fourier Transformation” (FFT) [10]. Thereby, the image must be square and with dimension 2n. In our implementation, the left and right borders are cut and the image is scaled down to the next 2n dimension.

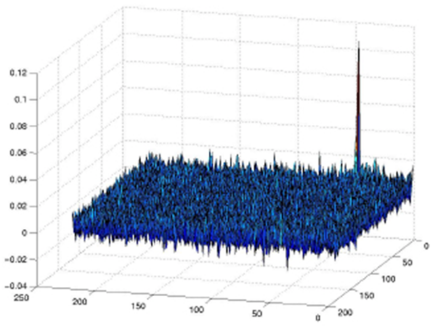
Figure 3 shows an example of registration of the two images (a) and (b). The Fourier transformation of the images is computed and represented by the images (c) and (d) (Power Spectrum). The cross power spectrum is then deducted and transformed back in the space domain. As represented in the 3D representation (e), the peak function is well defined. It gives without ambiguity the component (tx, ty) of the image translation t. Finally the two images are added by bilinear interpolation as re-sampling method.

The first results from this approach to tracking run at speeds of 5 frames per second on a low-end laptop PC, and several optimizations are being developed to increase this speed to 10 – 15 frames per second on a high-end laptop. The next two snapshots (figure 4) show the results of the tracking on the site. Images of a video sequence are registered sequentially. The chosen resolution of the camera is 320x240 pixels. The tracking and rendering works at 10Hz on a Toshiba laptop with GeForce graphic card.

So overall, the approach seems to hold the best promise for accurate head-pose estimation in wide outdoors areas. Its combination with image-based rendering techniques is natural and offers the ability to provide photo-realistic Augmented Reality from a number of selected areas in the site that is independent of the scene’s complexity. The tracking method is far more robust than landmark recognition based methods. Whereas the latter methods suffer the danger of loosing tracking due to occlusions of the landmarks from the user’s point of view (due to other objects such as humans, animals etc. obstructing the user’s field of view), our method is far more robust because it is a global method requiring any overlap in the images of only 30-40%. It also spares the site from interventions of placing artificial landmarks (the number of which increases drastically with the amount of area in which tracking is to be provided.) Further, it is very robust to illumination changes between reference and user images. Its only downside currently seems to be its requirements on storage space, as we must store (and index according to point of view) a number of images for each selected area in which accurate tracking (for augmentation) will be required. The GPS information will help the system in case of calibration and recalibration. In addition to this the GPS and compass will aid the system in predicting the user's path and which monument he will approach next, in order to prepare the data to use next. The method by itself does not require an accurate 3D model database as it works seamlessly with image based rendering techniques. It can be used along restricted paths using "wallpapers" (continuous image textures captured from the real scene.)

(a)  (b) 

(c)  (d) 



(e)

Figure 3 Example of Registration.

Figure 4 Two Examples of Real Time Motion Estimation.

The next pictures show actual results from augmenting the area of ancient Olympia (the temple shown is the great temple of Zeus.) The photorealistic nature of the augmented pictures could be achieved in real-time only with pre-rendered views of the high-quality models of the temples that we had available.

4. User Interaction

The interaction of the visitor with the system requires advanced multi-modal interaction techniques since we intend to minimize use of common equipment such as mouse or keyboard. For the first prototype of system however we are developing 3D GUIs based on game-pads or pen-table interactions, on touch screens that change their content as the user moves from area to area. In that way, we treat the user as the mouse cursor on an active image map that is the catopsis of the site itself!.

Figure 5 Augmented Picture of Ancient Olympia.

5. Conclusions

ARCHEOGUIDE is a research project pursued by a consortium of European organizations and it is funded through the European Union IST framework (IST-1999-11306). The results of the image-based registration techniques described in this paper hold the best promise for the application of Augmented Reality in sensitive outdoors areas such as cultural heritage sites where minimizing the intrusion to the site by the system is crucial. The first results of the overall approach in user trials that are currently being performed in Olympia are very encouraging.

6. Acknowledgents

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7. ARCHEOGUIDE Consortium

The ARCHEOGUIDE consortium is made up of the following partners:

Intracom S.A. (Greece), Fraunhofer Institute of Computer Graphics (IGD) (Germany), the Computer Graphics Center (ZGDV) (Germany), the Centro de Computacao Graphica (CCG) (Portugal), A&C 2000 Srl (Italy), Post Reality S.A. (Greece) and the Hellenic Ministry of Culture (Greece).

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papers

panel 3:

networked living

connected citizens

networked living / connected citizens

Awareness is growing about the fact, that we are all part of a living technological organism. It is filled with data and interconnected links. The social digital networks are becoming decentralized by the use of cell phones, by hand held and other wireless devices. Every public space is disturbed by a diversity of interruptions. With expressive messaging and multi-user art games for mobile phones, ideas like safety and security systems or Digital Shelters emerge.

The best example of this type is the description by Steve Manns and his assistants of EXISTech, a futuristic and slightly realistic over-designed system of omnipresent surveillance of our body and soul-systems. They describe the unfair and inhumane working conditions that they face, in a future scenario, as Assistant Mailroom Clerks of EXISTech Corporation. Through compulsory wearing of computer-enhanced "smart" uniforms, they are forced to live in a Computer-Mediated Mixed Reality where every interaction with other people is mediated and managed by EXISTech. The mandatory wearing of uniforms is a degrading practice very much like what prisoners undergo. Their Laser EyeTap eyeglasses are fitted with two metal bands that go around the backs of our heads to ensure we can't take the glasses off. This forces them to photograph and videotape any of our business clients and contacts, or anyone else they might meet, from lowly fellow mailroom clerks all the way up to a judge. They are not even allowed (or able) to open our briefcases for routine searches by police, without first fingerprinting the police or other officials. In this paper they warn about the fact, that it's no fun being at the very bottom of the Corporate hierarchy.

Per Perssons paper presents design requirements for expressive, avatar-based multi-modal messaging on mobile platforms. He argues that expressive messaging needs to exploit context of peers, embodied appearance and behavior, in combination with text. Their approach allows strong expressiveness and yet simple, on-the-fly message compositions required in a mobile, noisy setting. Along with this, they sketch technical challenges for a user ready prototype. He argues that the context of usage between work-related stationary terminals and mobile ones is radically different.

Sepulvedas paper addresses the issues of the privatisation and commodification of urban spaces, while also exploring these emerging landscapes as a condition of contemporary sites. It proposes a new design approach based on the collection and analysis of events and design proposals in everyday life, that will reposition the role of electronic objects and spaces as the driving force in the ongoing transformation of the city.

Christa Sommerer presents IKI-IKI Phone, a multi-user, networked Artificial Life (= Alife) art game for the I-mode mobile phones. In this system, subscribed users can create Artificial Life creatures (= IKI-IKI pets), interact with these pets, feed them, take care of them, and evolve them. Networked users can also share their pets with other mobile phones users, trade them, watch them compete against each other, become friends with each other, create offspring and develop an IKI-IKI pet society. Users can also start communicating with each other through their shared pets.

connecting archives as data-bodies

Victoria VESNA, UCLA (USA)

The emphasis of our culture on the individual has produced a complex network that is at once interconnected and disconnected. With agent systems that allow autonomous existence and evolution, once data representing an individual is in the system, human presence is no longer required — an unanticipated evolutionary development of the Internet which strikes at the core of our notions of self, personal/social identity and human agency. And, while we can only speculate on the unintended consequences of these various data mining engines and autonomous agents (who often have AI behaviors attached), considering our ever shifting relationship to our sense of self, to our evolving network identity and to the larger electronic community is an urgent task. Now that technology is fast becoming completely ubiquitous, and will soon be integrated seamlessly into every aspect of our lives, problems of identity become ever more complex.

As we become increasingly aware that we are all part of a living technological organism composed of data and interconnected links, and that no one is exempt from issues of how virtual and physical worlds connect, we find ourselves having to readjust to a group consciousness amplified by decentralization of ubiquitous technologies. At this moment we are witnessing a growing disarray, confusion and overflow of information, overpopulation of people and devices. Our social networks are becoming decentralized by use of cell phones, hand held devices and other wireless gadgets. There are no social etiquettes established and at every moment, public spaces are regularly ruptured by interruptions and private conversations. With projects such as Expressive Messaging [1] and Multi-User Art Games [2] for mobile phones that promote even more use of this kind of communication, it is no wonder that ideas for Digital Shelters [3] emerge.

Social networks are not new. They are as old as the human race. After all, we are communication beasts, and our evolution can be traced through development of communication technologies. Centralized political systems such as the one that created the East / West Wall, have crumbled through the power of television and satellite systems. As telephones move from analogue, centralized stations to digital, decentralized cellular communication, we are collectively enacting this shift through our changing social patterns and behaviors. As our computers become miniaturized and in the palm of our hands, we finally get off our chairs and revel or fear the fact that we can indeed always be connected. But, this also calls for taking a closer look at the meaning of this shift. In all our enthusiasm for the newly found freedom of mobile devices, we may overlook the dangers that are part of the package.

With the move away from the screen, there is a need to turn back to the mapping of human networks that social sciences have been engaged in for decades. Biologists have for decades seen repeated patterns in nature, and by tracing our communication networks, and humans consciously or not, participate in pattern making. Cellular networks are a good example as they are normally thought of as hexagons on a big hexagonal grid, in which each cell has a base station that consists of a tower and a small building containing the radio equipment. A single cell in an analog system uses one-seventh of the available duplex voice channels. That is, one cell, plus the six cells around it on the hexagonal grid, are each using one-seventh of the available channels so that each cell has a unique set of frequencies and there are no collisions. Digital phones convert your voice into binary information (1s and 0s) and then compress it. This compression allows between three and ten cell phone calls to occupy the space of a *single* analog cell phone voice call. [4].

The question then is if it by coincidence that the cellular networks divide our cities in hexagons? The buzz of our communication devices, collapsed with human overpopulation (doubled in the last 40 years), is creating a veritable beehive of our societies. In all this frenzy, how do we find the time to ask ourselves questions about the accelerated information production? How many connections can a person handle as we extend ourselves beyond what we have been biologically designed to process? Can our bodies adjust to our becoming instruments, connecting via radio waves, or does our health suffer? How about the health of our planet? Currently there are over 8000 LEO (low earth orbit satellites) orbiting the Earth, and the space junk continues to grow around the globe with the decentralized, asynchronous, AI driven computing.[5] Perhaps this session on 'Networked Living / Connected Citizens' can offer us the space to address these issues, especially at this moment when next generation of cellular communication is being launched [6]

Notes:

See Expressive Messaging on Mobile Platforms by Per Person et al, part of this session.

See: IKI-IKI Phone: a Multi-user Alife Game for Mobile Phones by Christa Sommer et al, part of this session.

See: Digital Shelters by Pedro Sepulveda-Sandoval, part of this session.

See: http://www.howstuffworks.com/cell-phone.htm

Because the satellites orbit so close, they must travel very fast so gravity won't pull them back into the atmosphere. Satellites in LEO speed along at 17,000 miles per hour (27,359 kilometers per hour)! They can circle Earth in about 90 minutes.

See: http://www.thetech.org/exhibits_events/online/satellite/4/4a/4a.1.html

To provide true homogeneous worldwide wireless coverage with no gaps, LEO (low earth orbit) satellites are increasingly being launched. These LEO satellites orbit the earth in high speed, low altitude orbits with an orbital time of 70-90 minutes and an altitude of 400 – 700 miles. Since LEO's are not geo-synchronous, they are forced to fly complete orbits, and thus many must exist to guarantee every area is covered by at least one satellite at all times. Therefore, call handoff is executed when the satellite moves, not when the person moves as it is with ground-based cellular systems. See: http://www.leodotcom.com/

paper

living as cyborgs:

trapped in a subjugatory computer-mediated reality that extends to all hours of our day-to-day lives

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Mr. James Fung, Assistant Mailroom Clerk trainee
Mr. Corey Manders, Assistant Mailroom Clerk employee number 9514

Abstract

We describe the unfair and inhumane working conditions that we face as Assistant Mailroom Clerks of EXISTech Corporation. Through compulsory wearing of computer-enhanced ``smart'' uniforms, we are forced to live in a Computer-Mediated Mixed Reality where our every interaction with other people is mediated and managed by EXISTech. Firstly we describe the degrading, humiliating, and downright dehumanizing decontamination process we must undergo every time we enter our Local Branch Office at 80 Spadina Avenue, in Toronto.

The mandatory wearing of uniforms is a degrading practice very much like what prisoners undergo. Worse yet, our uniforms track our every movement with electrodes monitoring our bodies. We can't take off our uniforms even when we're away from our Branch Office, whether we're at lunch, shopping, or just passing through Canada Customs. Our Laser EyeTap eyeglasses are fitted with two metal bands that go around the backs of our heads to ensure we can't take the glasses off. This forces us to photograph and videotape any of our business clients and contacts, or anyone else we might meet, from lowly fellow mail-room clerks all the way up to a judge. We are not even allowed (or able) to open our briefcases for routine searches by police, without first fingerprinting the police or other officials. Our managers have such little trust in us, that our fingerprint scanning briefcases are programmed so that only persons not employed by EXISTech Corporation can open the cases.

This action by our management suggests that we're trusted even less than randomly selected persons whether homeless or law enforcement. Clearly, as Cyborgs, we are the lowest members of society. In this paper we warn you that it's no fun being at the very bottom of the Corporate hierarchy.

KEYWORDS Decontamination, Subjugation, Humiliation, Comparametric Equations, Mediated Reality, Mandatory Automated Strip Searches Under the Guise of Decontamination, Employee Disease Screening and Mandatory Medical Exams, Employee Tracking, Recipient Biometrics, Sender Screening.

Figure 1: Here we are, delivering packages to the University identification card office, where we are required, by EXISTech policy, to fingerprint and photograph the recipients of the packages. Pictured here are package recipients who are also staff responsible for issuing identification cards.

Technically, being employees of EXISTech Corporation forbids us from submitting this paper to this conference. Because we are bound by Terms and Conditions of the cancerous GNU General Public License [4], we are prevented from accepting the fair and just Terms and Conditions of state-of-the-art software such as Microsoft Word and Adobe's PDF writer. For these reasons our corporate policy forbids us from reading the submission instructions for the CAST 01 conference.

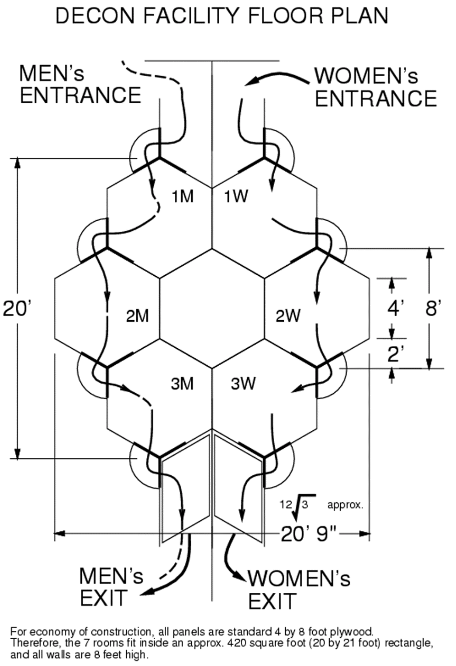
Rather than being allowed to use the excellent closed source programs provided by Adobe and Microsoft, we are forced to use poorly written pieces of cobbled together operating system fragments, collectively known as GNU Linux. These programs, written by hackers, bind us to the malignant terms of the GNU General Public License, as foretold by computer science visionary Steve Ballmer: "Linux is not in the public domain. Linux is a cancer that attaches itself in an intellectual property sense to everything it touches." [5] EXISTech's policies against Microsoft's fair market practices force us to endorse the work of a syndicate of misguided GNU Linux hackers.

Ouijagreement

Without breaking company policy regarding software licensing, we obtained a Adobe PDF reader license by Ouijagreeing to Adobe's Terms and Conditions [6] so that we could then read the submission instructions of this CAST 01 conference. Four of us sat around the computer mouse which we used as a planchette. Since we are under constant surveillance by way of our smart uniforms, we thought it would be better if no one of us actually clicked on the agreement. Thus, we collectively made it unclear which, if any, of us agreed to the Terms and Conditions our management so strongly disapproves of. Fortunately, we were able to summon spirits to be bound by the agreement, since no member of the group had any recollection of ever moving the mouse or clicking on "Agree". Through this process, we were able to obtain the submission instructions for this CAST 01 conference.

We call this act of corporate disobedience Ouijagreement ("Oui" and "ja" both meaning "yes" in French and German, respectively: yes, we the spirits of the dead agree!).

The Decontamination Facility



In this figure, 1M and 1W denote the men's and women's bagging rooms where all clothing, jewellery, and other personal effects must be bagged. 2M and 2W denote the shower rooms. 3M and 3W denote the uniform issue areas. Note the turn stiles integrated into the hexagonal room structure. The central guard room features smoked lexan panels so that the guard can see out into the six rooms, but we cannot see into the central guard room. See http://wearcam.org/tpw.htm and http://wearcam.org/torontodecon/index.htm for more details.

Each time we enter our local branch office at 80 Spadina Avenue, we must go through the Decontamination Facility [1] [2], where we are exposed to a humiliating and degrading cleansing process. Management at EXISTech fears anthrax like the plague and we suffer as a result (on our own time!). We must undress completely, in a "clothing bagging room", and then proceed to a decontamination shower to be sprayed with a 5% bleach solution, then dry off and get smeared with electrode paste. Finally we receive our uniforms and cyberwear. The punch clocks are located at the exit of the facility. We don't get paid unless we comply.

Generally, we as EXISTech employees don't mind the decontamination procedure but we find this practice particularly humiliating when we bring guests to EXISTech. We're required to take them in through decon.

Subjugation that extends beyond our hours of employment

EXISTech's strict company policy makes blending into the social fabric next to impossible. The physical and mental restrictions that come along with being an assistant mail-room clerk at EXISTech make it difficult to do anything without causing a major disturbance. Even when we're off duty, we experience complications in business establishments. These problem occur most frequently when dealing with government officials or administrative staff who demand to see papers, documents, authorization and personal identification. These complications arise because, as EXISTech employees, we are not allowed to disclose personal information without authorization from our head office. As an

EXISTech employee, we must send such requests to our head office for Level 4 security clearance and documented approval. This need to get permission from EXISTech creates tension and unease when interacting with administrative staff of non-EXISTech organizations, who are accustomed to quick and unquestioned compliance to their requests.

We wish that we could be like normal humans and comply with these simple requests, but unfortunately we are bound by our employer.

Assistant mail-room clerks don't have much of a say as individuals. We are merely vehicles for EXISTech's corporate needs. Our managers are moving towards total control of our minds. It's as if the neural pathways in our brains have been re-routed through the EXISTech head office. Nerve impulses no longer travel directly to the muscles of the body, but must first get security clearance for muscle movement, speech or action to take place. Our spoken responses can even be bypassed when the tonality and sincerity of spoken words are deemed important, as per managerial judgement. (This is ensured through the use of a biometric device with eight nerve trigger transformers which provides electrical stimuli directly to our bodies.) The audio system built into our uniforms allows our managers to speak directly through us from remote locations.

Sicherheit Zuerst

Our management is paranoid to the extent that all we hear is Anthrax, Anthrax, Anthrax! They constantly talk about how terrorists can strike at any time of day, and are so paranoid that they won't even let us trust people wearing law enforcement uniforms; they make us ask law enforcement officers to show us their badges and submit to being photographed. Supposedly, this is for our own protection, since as the management tells us, "employee safety comes first!"

EXISTech management doesn't even trust the video surveillance cameras in department stores, banks, libraries, and public bathing facilities such as North Toronto Memorial Community Centre (where cameras are nicely placed both above and below the waterline). Yet, these are the very cameras which we as employees find so wonderfully safe and comforting. Although we cyborgs, just like any other normal people, like to know that there are cameras constantly watching over us while we are trying on clothes in the fitting rooms, going to a football game, or splashing around in the local pool, our management explicitly forbids us from being photographed by others, especially when we are not fully clothed. Indeed, despite our desire to remain under constant government surveillance in change rooms, showers, and in public baths, our management is paranoid that competitors might learn of our proprietary ECG electrode placement strategies (discernible from the patches of shaved chest hair). For this reason we are forbidden from revealing our bodies to these foreign surveillance systems.

Management likes to keep us in the dark, so that we never have enough information to jeopardize EXISTech's corporate security. When asked by security guards of other organizations if our shirts conceal cameras, we can only answer: "I do not know, sir. I have answered your question.

I do not know."

Moreover, as EXISTech employees, we are required to photograph anybody who photographs us without explicit permission from Head Office. As a result of complying with these unreasonable requests EXISTech employees are detained in a variety of situations. It is not unusual for us to be held against our will, due to taking photographs in, for example, gas stations or airports. It is particularly difficult for us to avoid taking photographs in restricted areas when one considers that almost all commercial premises are "restricted areas", where photography is forbidden. As EXISTech employees we have no control over the camera which taps our visual field of view, and have no way of not photographing anything we look at. These are called our EyeTap [3] eyeglasses, and cannot be removed. In addition to a policy that requires us to wear the glasses at all times, seven days a week, for up to 3 years beyond the time we stop working at EXISTech, there is also a physically binding constraint that accompanies the legally binding constraint against taking off the glasses. Dermabondor with metal bands that go behind our heads make it impossible for us to remove our eyeglasses, as shown in Fig 3(a).

Figure 3: (a) A close-up of the proprietary security screws and copper comfort bands.
(b) An EXISTech employee shown in uniform, from the back.

These metal comfort bands (so-called because we are told that it is comforting to be secure) are held with set screws that need a special key to be removed. These are called security screws, as shown in Fig 3(a).

Fortunately our comfort bands are made of copper, so that at least they match our hair colour, so that our subjugation is not evident to others until they try to remove our eyewear. Thus the bands are referred to as Copper Comfort Bands.

Safety domes

The EXISTech uniforms have uncomfortable and mysterious domes, as shown in Fig 3(b). We do not know what the domes have inside them, because the plexiglass from which they are made has a very dark smoked tint, so we cannot see inside. We noticed that our smoked plexiglass domes look very similar to the domes mounted on the ceilings of many department stores, gambling casinos, etc., so we asked some of the department store security guards what was in these domes. We got various answers. A record store in Boston told us that the domes were light fixtures, even though they were quite dark. Sears department store told us the domes were temperature sensors to adjust the heating and cooling.

When asked by department store security guards, police, customs officials, or the like, what is in the domes, we are required to reply with our standard answer ``I do not know. I've answered your question, I do not know''. The origin of this answer to the frequently asked question may be found by watching a short movie at http://wearcam.org/shootingback/sears.mpg.

EXISTech "Griefcases"

Restricted areas, such as airport customs where baggage contents are examined, cause extreme tension with security officials. In particular, the briefcases which we carry and must deliver to company clients cannot be opened by us mere employees. The briefcases have fingerprint scanners therefore causing the kind, warm, security officials to be fingerprinted and processed simply to open the case. This gives us so much grief going through customs (or even just exiting from a public library where they demand to search everyone's bags on the way out) that we call it the Griefcase. We wish we could just be free human beings so we could passively submit to being searched, and therefore live normal, happy, free lives. Instead, we're destined to a life of conflict and slavery as cyborgs. Even when off-duty our briefcases that are handcuffed to our wrists are held shut with fingerprint scanning locks that can only be opened by people who are not EXISTech employees. The flat screen video displays that we wear on our chests turn us into information kiosks, that make us subservient to our corporate mission statement, as shown in Fig 4.

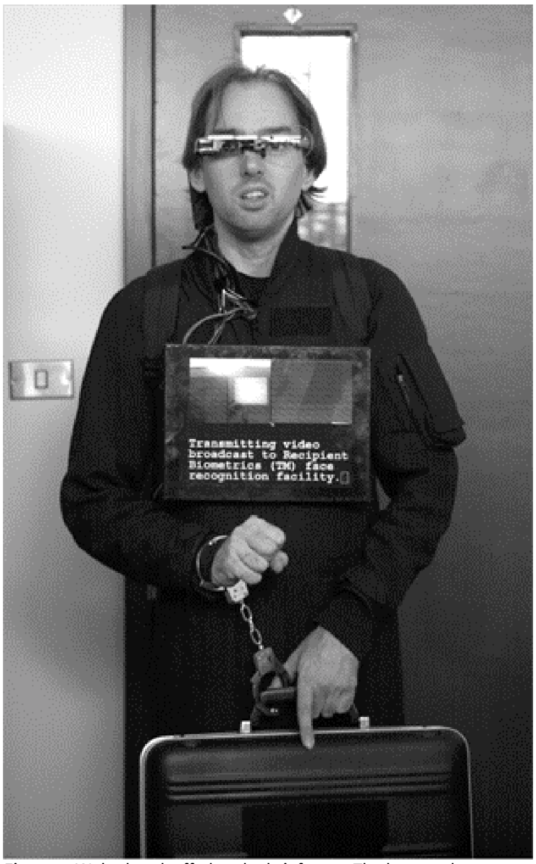


Figure 4: We're handcuffed to the briefcases. The keys to the handcuffs are inside. We cannot open the briefcases ourselves. Only people who are not EXISTech employees can open these briefcases. This is extremely humiliating when we're stopped to be searched at department stores where security guards demands to look inside everyone's bags.

Figure 5(a) which we covertly scanned from our annual report, shows a closeup view of this awful dehumanizing briefcase.

Figure 5: (a) The locks on the briefcases are fingerprint scanners that recognize we're EXISTech employees, so that the briefcases can only be opened by persons who are NOT EXISTech employees. (b) A picture which we covertly scanned from our annual report, a closeup view of this awful dehumanizing briefcase. (c) What the Griefcase looks like, as seen by our managerial staff, looking into our eyetaps, and remotely seeing through our eyes for quality control and training purposes. As well trained

Assistant Mailroom Clerks, we design, build, and test our briefcases to ensure that we cannot open the cases.

It's humiliating enough to be handcuffed to a briefcase we cannot open ourselves, but to make matters even worse for us, there is a video display built into the briefcase, as shown in the closeup picture from the shareholder propaganda in our annual report Fig 5(b).

As assistant mailroom clerks, we're required to build briefcases we can't open ourselves. While we build these briefcases, our managers watch through our eyes, as shown in Fig 5(c).

RFD: Request For Deletion

To make matters worse, if any person coming into contact with an EXISTech employee wants their photographs deleted from the corporate database, they must fill out lengthy forms, with correspondingly lengthy processing times. Giving out such complicated, over-blown forms is humiliating for ordinary civilians such as us, who detest unnecessary beauracracy just as much as anybody else. This much-dreaded form is known as a "Request For Deletion", or simply an "RFD" (http://wearcam.org/rfd.htm). When a verbal RFD is made, and the official form is presented, the typical response involves many obscene words and gestures; this abuse is hurled upon us who are unfairly bound by our employer to these onerous practices. Unfortunately, they do not seem to understand we are merely doing our jobs and following directives from head-office.

Subjectrights, the Media and Smart Cards

We're not allowed to wear or use other computers, smart cards, or any forms of electronic identification or tracking, even when we're off-duty. EXISTech's monopoly on our bodies means that we can't carry most identification cards from other organizations with us, because such cards often contain a so-called smart chip that is not approved by EXISTech Corporation.

Moreover, we cannot conduct interviews with the media and popular press without first obtaining permission from EXISTech. This is best demonstrated in the Subjectrights form http://www.wearcam.org/subjectrights.htm. Their "World Subjectrights Foundation" propaganda is really just a thin disguise for our managers to subjugate us in all manner of our day-to-day lives.

We must obtain permission from our Corporate Head Office to enter certain rooms. Rooms that require entry with encoded door cards require prior approval, which is rarely granted. Our employer claims that these door cards have smart chips or magnetic strips on them that contain certain personal information and possession of these cards is against company policy. The policy has been designed so that only our employer is allowed to store any personal information about us, such as photographs, thus showing that our employer is intent on controlling us whether we are on or off duty.

Figure 6: A sample of identification from an EXISTech employee

Our unfair and disgraceful management office prohibits us from being photographed without permission from management, even when we're on our own time. Disgustingly, we're not even allowed to get ID card pictures taken to use the Public Library without first requiring library staff to get permission from our Corporate Head Office. The bureaucrats there insist that the officials at the Public Library not be allowed to keep a picture of us in their records.

Clearly EXISTech does not trust the security conscious staff at the library. After all they are just doing their jobs and trying to protect us by contributing to face recognition databases [9] [8]. Like any other normal humans, we cyborgs would like to have our pictures taken and stored in large automatic face recognition criminal tracking databases [7] to help reduce crime. However, because we are EXISTech employees, we are forbidden to be part of this wonderful government crime reduction initiative.

Conclusion

In summary, EXISTech's subjugatory and downright dehumanizing treatment of its employees prevents us from living normal lives. Without being allowed to carry identification or tell people such as public officials our names, we're reduced to the level of anonymous nothings. Without being allowed to even open our briefcases ourselves, we're unable to live independent lives, and must constantly ask others, such as public officials wishing to search our briefcases, for assistance. The awkward eyeglasses we can't take off make it impossible to submit to being searched, or processed in a nice human off-the-record way by customs officials or security guards. Without the freedom to agree to fair contracts such as Adobe's Terms and Conditions of Use, we're not even allowed to write this paper. We as cyborgs now merely provide a physical shell for EXISTech Central Intelligence to control and mediate our every interaction. We're detached observers trapped within our own bodies. The invasion of our personal space is deeply penetrating and our humanity is suffering as a consequence. There is only enough room for one operating system (i.e. one authority) in the human brain, which one will it be? Please don't tell our management we wrote this paper or we could lose our much needed futures as Associate Mailroom Clerks for EXISTech Corporation.

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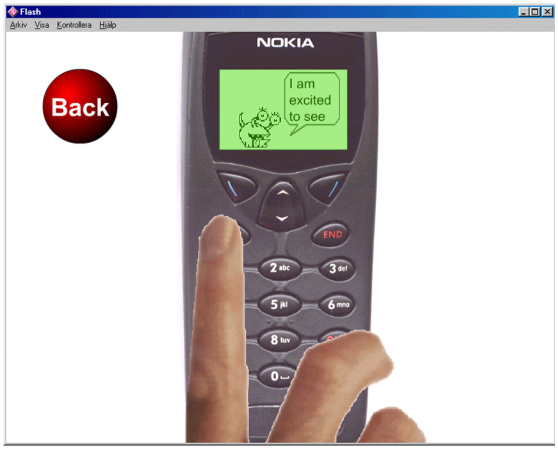

expressive messaging on mobile platforms

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Abstract

This paper presents design requirements for expressive, avatar-based multi-modal messaging on mobile platforms. It is argued that expressive messaging needs to exploit context of peers, embodied appearance and behavior, in combination with text. Our approach allows strong expressiveness and yet simple, on-the-fly message compositions required in a mobile, noisy setting. Technical challenges for a user ready prototype are sketched. It is argued that the context of usage between work-related stationary terminals and mobile ones is radically different.

Keywords: Expressive messaging, Mobile devices, SMS, Multi-modality, Avatar, Synchronous/Asynchronous communication, Automation/Direct Manipulation

Project URL:
http://www.sics.se/humle/projects/expressmess

Expressive Messaging

People use simple text messages (SMS) on mobile phones in a volume that exceeds all expectations – in Finland, over a hundred messages per inhabitant and year [7]. The key to the popularity of the medium is certainly not the complex and non-intuitive interface. Neither is SMS 'useful' in any task-oriented sense of the term. In contrast to e-mail and ordinary telephone calls, for instance, SMS is not really helpful in making work and professional life more efficient. Instead, it is the social, expressive and emotional functions of SMS that seem to be the primary objective [4]. What's up?' messages, humor, flirts, gags, and all kinds of play are central objectives of textual messaging, as well as last-minute coordination or changes of already scheduled appointments and rendezvous.

In all of these cases there is a rich and shared awareness of situation, preferences, sense of humor, and social context between sender and recipient. SMS messages are typically not sent to strangers, but used in peer-to-peer communication between friends, lovers, or family members [4]. Since the SMS information bandwidth is extremely low - maximum 160 characters, in low-resolution monochrome – there is reason to believe that expressivity exploits and rely upon that shared context.

The purpose of the Expressive SMS project – or ExMS for short – is to utilize the shared context, but enhance it even further through combining text with embodied and avatar-based communication. By allowing the user to easily compose text with animated and expressive gestures of an animated character representing the user, ExMS investigates the nature of expressivity and how users will utilize such tools in instant messaging on small mobile devices.

This paper describes the design requirements for such a system from a user's perspective, developed by the initial phase in the project as a mock-up demonstrator.

1. Related Research

Our approach draws on quite a few research themes within agent technology, collaborative software and social computing. ExMS constitutes a mixture of different parameters and related research.

1.1 Synchronous vs. Asynchronous

First there is distinction between synchronous and asynchronous messaging tools [9]. Chat, telephone calls and hot lines, involve real-time conversations with participants present at the same time, requiring direct response in a dialogue-based fashion. Asynchronous systems such as newsgroups, post-it notes, e-mail and voice mail, on the other hand, allow the recipient to attend to the incoming message when he has the time [8]. In these cases, the sender does not expect swift response. More importantly, the sender can spend time composing the message, editing, undoing and redoing. In asynchronous communication the sender is allowed to think about the message, ornament it, and make it artistic or expressive in ways he may not have time or competence to do in the rapid synchronous conversation. By writing letters instead of meeting our lovers, we can 'play it safe' expressing quite precisely what we want to convey.

In-between the synchronous and asynchronous we find message systems that notify the recipient and possibly also interrupts her present activities, but in which participants can attend to other things in-between messages. SMS and instant messaging can be responded to directly in a chat-like manner, but senders do not expect, and receivers are not obliged to engage in, such (semi-) synchronous conversation [4, 8]. In this way, these systems constitute a direct channel to a given peer, but still allow time for message composing. An expressive messaging system such as ExMS should be able to balance between synchronous and asynchronous in these ways. For instance, while many visual chats support embodied gestures and movements of the chatter's avatar via keyboard and mouse, such real-time systems can be experienced as stressful since they require immediate interaction with a system that requires high-level and fast interaction skills. With a semi-synchronous approach, ExMS eliminates such 'conversation stress' by allowing the user to spend time on message composing.

1.2 Automation vs. Direct Manipulation

Another solution to the conversation stress problem is to allow the system to automatically generate gestures, movements, expressions and even discourse of the avatar body. In this way, the user need not directly manipulate the behavior of the avatar, but can focus on the conversation itself. In the Comic Chat system [6], for instance, the system automatically creates comic panel compositions, what avatars to include in such panels, the placing of word balloons and emotional expression. In Swamped! [3], the system seeks to infer the intentions of the user/avatar in a simple animal farm environment, and on the basis of this then generates behavior and camera angles. And AgentSalon [10], collects behavioral data, information ratings, and touring records from museum or conference visitors and then automatically generates matchings and supposedly interesting conversations between avatars while the users observe their behavior on a large screen. (cf. also [5]).

In contrast to animation software, which permits the user to determine every nitty-gritty detail of the avatar's behavior, automation relieves the user of such time consuming work. At the same time, however, this also means less control, and the avatar may perform actions, express emotions and say things that were not intended by the user. As the artificial 'intelligence' in automation systems seldom is able to handle situated and often widely shifting goals and communication needs, automation may be experienced as frustrating.

A mobile expressive messaging system needs to find a balance between automation and direct manipulation, supporting appropriate embodied expressivity in many kinds of situations, and yet allow compositions of such expressions in a time-efficient, on-the-fly manner. Such a trade-off system must permit user control as well as automation, allowing the user to easily shift between these two modes across communication situations.

1.3 Avatars vs. Characters

Focusing on the embodied expressivity (in combination with verbal discourse) we also need to distinguish between avatars and characters. A message can be expressive and embodied without any connection between the represented body and the sender of the message. Characters in films, on post-cards and paintings can perform expressive functions but disconnected from the director of the film or the sender of the post-card. Systems such as Miko and Nescafé's NesCard allow the user to create more or less animated electronic postcards with backgrounds, fictional characters and sounds, and sending them to acquaintances.

In contrast, avatar-based communication relies on a tight coupling between digital body and user. When the avatar speaks or behaves, the user behind it takes more or less responsibility of the contents. The avatar becomes a stand-in or body double of the speaker. This does not mean that the avatar must necessarily be photo-realistically similar to the user as in video conferencing systems and web cameras; only that the behavior and discourse of the avatar can be interpreted as if they would come from the speaker if he or she were to be physically present. Smileys in text messages, for instance, can be said to perform precisely this function.

In many visual chats, where the chatters enjoy a high degree of anonymity, the border between character and avatars is not distinct. Since there are few possibilities to find out the real identity of the user, speakers can choose and play with body representations, social roles and gender identities at their will [11]. Although the user directs the avatar and puts the words in its mouth, the anonymity enables him or her to enter games of make-believe, play fictional roles, harass other avatars and defy moral responsibility that would otherwise be present.

Since the focus of ExMS is on peer-to-peer messaging, each avatar will be recognized as belonging to a friend or acquaintance. In this way, our approach is widely different from anonymous chat rooms, even though both employ avatars. It also differs from matching systems in which non-acquainted users and their avatar are brought together on the basis of some supposedly shared hobby, preference, taste or interest [10]. Instead, users of ExMS share much richer and more situated knowledge of each other.

1.4 Photo-realism vs. abstract graphics

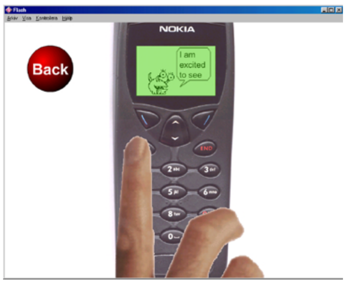
As mentioned, expressivity requires no specific similarity between user and avatar. Moreover, in order to be expressive the avatar does not necessarily need to be represented in a photo-realistic style. A cartoon-like, abstract and sketchy animation of a character may be just as expressive as an animation that renders detailed features of skin, faces, gestures, shadows, limb configuration, motion patterns and gesture synchronization. Of course, such realistic styles of representation may have other effects, for instance believability or spectacle. In terms of humor, social bonding, emotion, attitudes, irony and other expressive communicatory functions, however, abstract animation styles may work just as well. Again, it is not in the animation itself that expressivity lies, but rather in the cocktail of image, verbal discourse and users' shared context. The simplified, yet expressive appearance of "emoticons" in written text is a proof of this. By allowing the user to juxtapose blocks of simple and abstracted animation with blocks of text, ExMS exploits the same expressive mechanism as emoticons. Combining a textual message with a semi-imagery representation of a face adds new layers of meaning, e.g. irony, guides the recipients' interpretation of the message, and expresses the sender's emotional state or character. Creating animated emoticons that move and transform over the temporal flow of the message will merge modalities in similar ways to cartoon and animated film.

With this theoretical framework in mind, we identified the following design challenges: How to allow users to compose highly situated and expressive avatar-based messages in a time-efficient manner? What is the relation between gestures and movements and the surface skin/appearance of the avatar? The interaction descriptions given below have been realized in a mock-up concept demonstrator.

2. Design Choices

2.1 Composing Messages: Moods and Events

In order to support simple expressive messaging, we decided to center the composing around two axes, which we called moods and events. Moods relate to the basic emotional undertone in the message. Composition starts by selecting from a palette of moods, e.g., happy, distressed, angry and busy. The animation showed, supposedly reflects this mood in a simple cartoon-like fashion. Depending on the length of the total ExMS - decided by the sender - the animation would make continuous loops until the end. In the preview mode the user can, at any time in the composition phase, inspect the message composed so far.



In addition to mood animations, avatars should be able to perform simple events, e.g. jump, dance, smile, laugh, and weep (possibly connected to sound effects). Events are intended to mark and enforce certain text snippets, or break the basic mood undertone of the message. Events can be added at specific points in the message. This is done through previewing the message and then, at the appropriate moment, interrupting the message where the event should be inserted. From the list of events, one is chosen, which brings the user back into preview mode again, this time with the event inserted in the loop break closest to the point where the user interrupted the message.

Since all mood and event animations start and stop at a neutral position frame, continuity of movement can be ensured without involving the user.

Combining text and animations in appropriate temporal constellations will be central in conveying punch lines or other emotional content. In the mock-up, however, such support is not well articulated. It allows only simple text input, which distributes itself over the length of the message. In the final implementation this has to be further investigated.

On an algorithmic level, such temporal juxtapositions also have to be supported. To this end, we have sketched a standard for encoding expressively enhanced messages: the Mood Markup Language or MoodML (Figure Fehler! Unbekanntes Schalterargument.). MoodML is a sketch for a SGML-type markup language for elaborating a textual message with text-global mood information and specifically positioned animated events. It is designed to minimize bandwidth, in that MoodML text messages can be transmitted between sender and rendering server at little cost, and to allow for exact timing of animation events in text.

Composition is executed though loops of inserting events/texts and reviewing the message. When the user is satisfied with the work, he sends it away via his telephone book.

```
<MoodML skin="88F2A0F" id="janet"
  to="0405047123" mood="happy;8">
I'm excited to see you!
<event="jump">
Be there at ten.
<event="dance">
</MoodML>
```

2.2 Quickies and Recycled Messages

In some cases, standard scripted responses to messages can be useful. Our design gives users the possibility to save the script from both incoming and outgoing ExMSs as 'quickies'. Such quickies can be reused later, exchanging the balloon text to fit the new situation. Quickies enable users to share particularly spectacular or useful sequences of moods and events. Reusing other friends' messages as quickies is possible through the saving of the message MoodML script. When I want to reuse the quickie for my own avatar, whose skin might be very different from my friend's, the system identifies the name of the animation in the MoodML script and then re-instantiates the sequence in the skin of my avatar. This takes us to the issue of skins.

2.3 Skins – avatar appearance

Although the temporal juxtaposition of text, moods and events constitutes one channel of expressivity, naturally the animations or the surface appearance of the different animations add, transform and personalize that expressivity. The purely graphical design of the avatars we call skins. Any mood or event can thus be represented in any type of skin that reflects a personality feature, identity or trait preferred by the user. Again, skins may not reflect features that the user necessarily possesses, but rather one which supports the kind of expressivity the user favors.

Before initiating the ExMS service, users should be able to choose a prefabricated skin from a library. Each skin will represent moods and events through varying styles, in addition to attributes such as age and gender. In order to ensure personalization and individualization of the avatars, it should also be possible to complement a skin with a set of add-ons such as clothing style, colors, T-shirt texts, hats and even tools and instruments such as walkmans, sticks and roses. Most users will probably make use of standard skins included in the service package. Other skins may be produced professionally for marketing purposes as a product placement platform: users can get new skins for free, if they allow their avatar to wear a brand emblazoned T-shirt.

Some artistic users, however, will want to manufacture their own skins. To this end, open standards and APIs are absolutely essential. No single organization will have the stamina to produce and uphold the interest of the potential user community: the creativity of the users must be tapped into. Thus, it is important to create a community in which sharing scripts and skins are encouraged and awarded.

However, in order to ensure compatibility between skins, scripts, and users, there have to be some minimal requirements for any given skin. Each skin has to be able to perform a minimum list of moods and events.

2.4 Configuration

Configuring the interface and the characteristics of the skin, archiving message scripts, sharing scripts and skins, community building and other administrative aspects of the system are accessed by the user from a Web interface rather than over the mobile device: the mobile device is used solely for composing, transmission and receipt of messages. We expect most users will not be too concerned with the niceties of configuration; but as in most consumer-oriented communication applications, we do expect some users to want access to all controls.

3. Technical challenges

Although the focus of this paper has been on the interaction design of ExMS, in the prototype implementation non-trivial technical challenges must be addressed. Since we aim for a longitudinal, non-laboratory and ethnographically oriented use study, the prototype needs to be technically stable and run on a on-the-shelf technology. We will need to minimize the load on the mobile terminals which in the next few generations will have severe limitations as regards memory and processing capacity. One solution is to send messages in MoodML format and allocate rendering to the server side. The recipient needs to be able to download a graphical animation for viewing, but does not need to have a complete library of actions for other characters available - they reside on a server and are sent as needed.

4. Conclusion

In terms of overall research questions in the ExMS project, we must address a number of relatively vaguely understood notions, and first and foremost gain some provisional understanding of expressivity in a social context. How can embodied interface avatars enhance it? How does expressivity relate to role-playing and an individual's sense of self, personal and social identity? On a social level, we want the expressive messaging functionality to be a shared notion in a community of users. How can we support the growth and development of such a community? In addition, on another level of expressivity, regarding the message content, we need to understand the relation between discourse flow, gestures and situation.

From the interaction design proposed in this paper, the ExMS project has now entered implementation phase, and expects to initiate a longitudinal user study in late 2001. Surely, the design proposed here will transform during the way, due to new insights as well as limitations of present wireless technology. It is however, our intention to conduct a realistic, non-laboratory user study, including about 20 subjects over a time of one month. ExMS is typically an application whose effects, ease of use and social functions will emerge first after long-term usage.

Moreover, evaluating a messaging tool such as this cannot be done using utility measures. From a task-oriented perspective, this design will make communication slower and more expensive – each message will take more time to compose and require more transmission capacity for the same informational content. The driver for this design, however, is that of enjoyment and expressiveness, not efficiency or cost.

Composing a message on a mobile device is different to that of doing it on a stationary terminal at work: using "dead" time on buses, in bars, in cafés and on school hour breaks will give ample time to compose and perfect avatar-based messages. In contrast to work where deadlines and concentration are crucial to perform well, mobile users in the city, countryside and on public transportation can be expected to be more leisure oriented. They are probably more curious about social space, and more willing to be entertained. Thus the notification signals of instant messaging systems such as SMS or ExMS may be experienced as happy surprises rather than disturbances. It seems to us that mobile application development and studies need to take the separation between work related and leisure time applications seriously [1].

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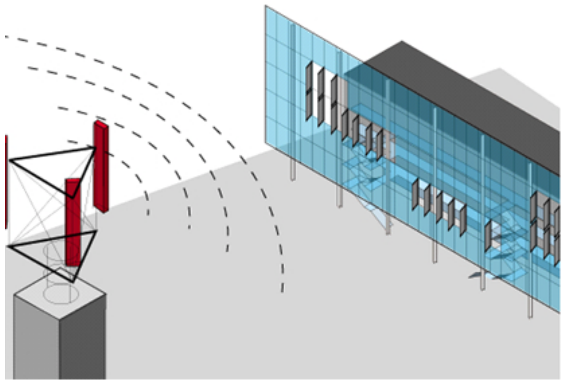

digital shelters

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Abstract

A new landscape is emerging in the urban space, a 'Scanscape' that transgresses the boundaries and protocols of public and private space due to the extensive use of electronic, electromagnetic, surveillance and telecommunication technologies in the urban realm.

How can we define these 'Scanscapes'? How can we create 'Digital Shelters' that will protect us, isolate us or allow us to live with in these 'Scanscapes'?

This paper addresses the issues of the privatisation and commodification of urban spaces while also exploring these emerging landscapes as a condition of contemporary sites. It proposes a new design approach based on the collection and analysis of events and design proposals in everyday life, that will reposition the role of electronic objects and spaces as the driving force in the ongoing transformation of the city.

Keywords: Architecture, interactive design, urbanism, digital art, surveillance, mobile phone technology.

Project URL: http://www.crd.rca.ac.uk/digital-shelters

1. Introduction

Digital Shelters is a research project that explores the emerging landscapes as a result of the extensive use of electronic, electromagnetic, surveillance and telecommunication technologies in the urban realm. It focuses on the development of electronic objects and spaces that could exists and mediate between the physical and digital spaces in this emerging landscape.

The city today cannot be understood as a contained entity in space, nor are its locations clearly defined by their surroundings. The city today is formed by a system of layers: the layer of squares, streets and buildings; the layer of mass media, advertising and consumerism; and more recently, the layer of telecommunications, electromagnetic fields and digital technologies.

The city expresses the actions of its inhabitants in an environment supported by its structures and infrastructures - both material and immaterial. It reflects the needs and desires of individuals and masses.

As a result, it articulates the events and scenarios of living collectively and independently. The city exists as an expression of, and a backdrop to, physical encounters[1], but it goes beyond this to support digital encounters that have the potential to enrich the urban experience. The engagement of architects and designers in the speculation of these emerging scenarios and process in the city remains unsettling. Most of the research into this phenomenon has been carried out in the realm of 'cyberspace' and, as a consequence, the physicality of the electronic object has been neglected.

On the other hand, the industry of product design has been driven by the forces of marketing and engineering leaving a very small space for designers to produce a critical design approach.

Engineering, media and advertising in contrast, as suggested by Baudrillard [2], have played a key role in discerning people's most intimate needs and desires, as well as being more aware of the city's richness to the point that they have become the main actors in the transformation of the city.

Throughout this paper I will suggest that designers and architects could foreseeable become more influential players in the process of reshaping our relationship with the city, through the development of electronic objects and electronic spaces to reshape the new urban landscape.

2. Strategies of Illusion

Strategies of Illusion attempts to develop a design approach through collecting and analysing examples of new models of inhabitation, etiquette, events and accidents appear in the city landscape which have no precedent in the urban space.

This design approach will reposition the role of electronic objects and electronic spaces as a main part in the process of transformation of the city.

For instance, in the city of Kyoto, Japan, the train station is the scenario for an emerging situation where telecommunications, spaces, objects and desire are manipulated. During the lunch hour schoolgirls gather in the station's public lockers to undergo a process of transformation: from their school uniforms they change and are transformed into sophisticated urbanites. The misuse of the public locker as they become changing rooms not only transgresses the use of these objects and spaces, but also the morale of Japanese society. During lunchtime the 'locker girls' hand out cards with their mobile phone number to travelling businessmen in the station and before the lunch breaks ends, they will return to the lockers to pick up their official personae returning to their conventional roles. Or not so conventional ones: when the locker girls commute back home the travelling businessmen will call them on their mobile phones to take them on clothes buying excursions with perhaps some sex involved. The mediation between the physical and digital space in Kyoto's train station challenges the boundaries of privacy, dress code and sexuality.

Akira Suzuki[6] described an accident that occurred in the city of Yokohama, Japan. As a sijinshiki (a ceremony which serves as a social debut for young females into society) was held at the Yokohama Arena, the telephone switchboard was overloaded and eventually crashed as the 28,000 youngsters that attended set up their dates simultaneously using their mobile phones. This led to a chain reaction where not only the local area's switchboard shut down, but the systems for both the region and the whole district eventually crashed.

Another similar incident occurred during the event 'Sendai Calling' in the city of Yokohama. This event consisted in gathering a crowd of 15,000 people in front of the new Sendai Mediatheque facing a boulevard decorated with Christmas light. Every one was asked to have their friends call them all at the same time to performed a street concert from the harmonising of all the ringers going off at once. This led to a chain reaction where not only the local area's mobile phone switching board shut down, but the systems for both the region and the whole district eventually crashed.

In both of these examples is clear that the organiser never imaging the consequences of these events neither the people who attended but it is clear that although we are not proposing shutting down telecommunication networks this network are becoming another element of the microclimates in the urban landscape, a electroclimate that behaves in similar ways to the rain or snow and therefore could provide a richer experience in the urban space.

In the New York subway system, to take another example, a small 'safety zone' is marked on the platform as part of the subway's security system. As people stand inside this 'safety zone' they are monitored and 'protected' via CCTV (Closed Circuit Television) cameras. A simple yellow line painted on the floor of each platform marks the boundaries of the digital space that provides shelter to the user, thus questioning the essence of the traditional concept of architecture where shelter is provided by the materiality of its elements.

The Radio Taxis Union organised a demonstration in Mexico City's main square. Two events happened as a result of the 1,250 radio taxis that converge in this square. Firstly, a traffic jam paralysed the centre of the city and took over the main square (1,750 sqm making it the second biggest in the world) and secondly; the Minister of Defense's telecommunications system was jammed when all the taxi drivers start using their radios systems. This event led to being shut down the whole defense telecommunication system for two weeks due to the lack of security.

These new conditions in the city has created dynamic scenarios that, regardless of its ephemeral or permanent quality, become recognisable as urban forces and, eventually, as urban characteristics. Nonetheless, these dynamic scenarios are events which cannot be defined so far, either as an alternative functional urban method of transformation or as a product of the cultural apparatus. Rather, they are defined through spontaneous, unconscious, random uses and misuses of the city's structures.

3. Scanscape

The 19th century philosopher, Jeremy Bentham, in a radical critique of society and as part of his criticism of established legal systems devised the Panopticon. In this ultimate system of control of social discipline, applicable to all aspects of life (the factory, offices, prison, etc...), control was achieved by the constant sense of being watched but not knowing this was true or not. The Panopticon Penitentiary consisted of an observation tower where officers could observe everything happening in the surrounding cells without being seen by the inmates.

It seems as if Foucault's reflections over Jeremy Bentham's concept of Panopticism has now reached its conclusion with the extended use of surveillance systems in the urge to purify and privatise the urban space.

Surveillance systems have become an imminent condition of the contemporary city. The increased use of these systems, due to the advances in digital technology in both public and private environments, has triggered not just a series of discussion in terms of morals, security and privacy, but has also significantly transformed the urban landscape in which we live.

Even before we leave private spaces like homes and offices, we are constantly leaving traces of our behaviour and activities. Modern life is a state of permanent surveillance: our life can be traced to the most minute detail. Modern technology and the search for ultimate security has led to every event and habit being traceable: every telephone call, every credit card transaction and every item bought in the supermarket using a loyalty card are recorded.

In the same way, the ubiquitism of surveillance systems, like Closed Circuit TV cameras, widely exists in the city's public spaces. Again the permanent quest for security is present in the city's public space, as a result the presence of surveillance systems in city centres, shopping malls and public transport has diminished the vitality of the cities.

Gilles Deleuze [3], suggests that we never stop moving from one enclosed environment to another. The privatisation of the public space has re-shaped the notion of what is private and what is public in the urban landscape. This comprehensive surveillance constitutes a virtual scanscape - a space protected by a digital field.

Furthermore, Bannister [4], argues that the destruction of the street as the place for the 'celebration of urban vitality has taken place due to the use of CCTV cameras in the city's realm.

In the article Fortified City[5], Christopherson has argued that the use of surveillance has led to the privatisation of the public space which has in turn evolved into cities being seen from an urban management perspective. Economic depressions led to consumers going to the suburbs to make their purchases in the relative safety of a sanitised environment. City centre managers believe this 'safety' model (evident private security officers and obvious CCTV cameras) was necessary to encourage people back to city centres without recognising that in their very essence they are public spaces which cannot be 'managed' like private ones. Overall, the privatisation of public space has occurred as developers try to emulate the way in which other 'semi'-public spaces are controlled.

Society, however has not perceived this as diminishing the richness of the urban realm, on the contrary it is being glorified. There are almost one million CCTV cameras working in the streets of the United Kingdom. This glorification of the proliferation of surveillance systems find its prime location in Oxford Street in central London: 'We covered the whole of Oxford Street with CCTV cameras' the advertising campaign proudly says, providing reassurance with the feeling of complete protection against shoplifters and pickpockets.

It can be argued that the privatisation and purification of public space has effectively deleted these spaces from the public realm. The street can no longer act as a forum for the mediation of difference, since difference is increasingly being excluded. The privatisation of the public realm, aided by CCTV surveillance systems, risks impoverishing the urban experience in ways which are potentially damaging to the collective emotional culture of urban communities. The desire to purify space of any behaviour likely to provoke anxiety and to insulate us from the complexities of the city may be in fact denying the real nature of the urban realm.

Although this process of commodification in the city's realm is taking place regardless, it has opened new possibilities of estrangement, new narratives and new forms of encounters. Perhaps the traces that we leave while we inhabit the city could become our graffiti, our own personal tag that could be placed in this 'privatised space' in the same way that, for instance in toilets, graffiti violently acts against hygienic environments.

4. Data Shadows

In order to produce a design strategy that will allow the appropriation of these urban forces it is necessary to formulate a design approach that; firstly, analyses and documents; and secondly, extracts the fundamental processes of the dynamic urban scenarios that are taking place in the city. Thus evolving into a critical design approach that could then stimulate new scenarios in the city.


HACKNEY Gazette
35p
No. 17,001 THURSDAY, MARCH 23, 2000
AND NORTH LONDON ADVERTISER
MAST OF FEAR
Mobile phone crane sent packing after rise in mystery skin rashes

Figure 1 Hackney Gazette. No. 17,001 Thursday, March 23, 2000.

For instance, hundreds of residents from a Stoke Newington council estate in London stopped a mobile phone company from installing another mast on the roof of their block of flats after a first mast was suspected of having have caused an alarming surge of mysterious illnesses on the residents. Ever since the mast was erected, residents say dozens of young children have suffered from numerous skin disorders, ranging from rashes to 'bizarre lumps' and fearing that the mysterious bout of illnesses could spiral out of control if another mast is erected on their rooftops. (Fig.1)

Figure 2 Aerial view South London

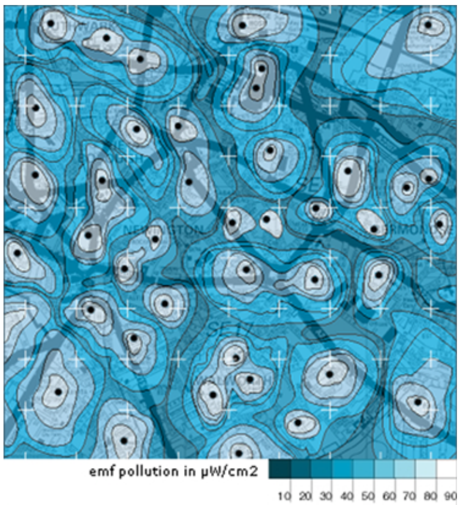

Figure 3 EMF pollution mapping, data collected by the neighbors.

The neighbours association in this council estate was approached in the development of this project. Discussions with them highlighted concerns not only about the health hazard created by the use of digital technologies and telecommunications, but also about the need to be able to communicate. A series of workshops were held to identify possible mechanisms of striking a balance between protection from health hazards and access to data.

An initial outcome was the mapping of the microclimate generated by cellular data networks in the area (Fig.2 and Fig. 3). This microclimate maps the location of mobile phone masts and base stations and the pollution that they produce. Analysis of this data prompted the design of a stereotype council estate developed to mediate between the new urban conditions and microclimates. The final outcome of this design strategy resulted in the DATA SHADOWS project.

The DATA SHADOWS architectural program consists of a ground floor area dedicated to business and commerce, and a three stories living block. Three façades of the building are shielded against electromagnetic frequencies (EMF), while in the remaining façade an interface provides the only way to received cellular network data. (Fig.4)

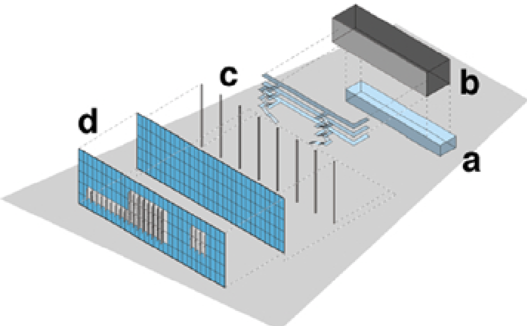

Figure 4 Program. a) working and business area. b) living area. c) circulation and stairs. d) screen.

This interface – the key feature of the program -- is a screen constructed of a series of computer controlled windows shielded against EMF which filters the data that the inhabitants of the block can receive.

The occupiers of the block will decide between three modes to determine which system will control the filtering screen. The first is an automatic mode that will open only the necessary windows to allow the connection of a particular mobile phone (Fig.5). A passive mode, option two, will open all the windows in the screen for a period pre-determined by the occupiers; whereas in the active mode, mode three, all the inhabitants have to 'vote' to determined if they want to receive data or not. (Fig.6)

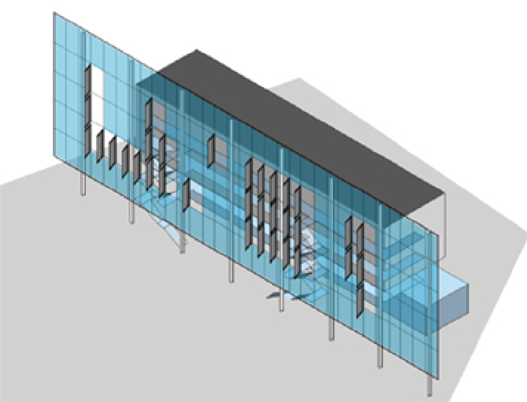

Figure 5 Automatic mode.

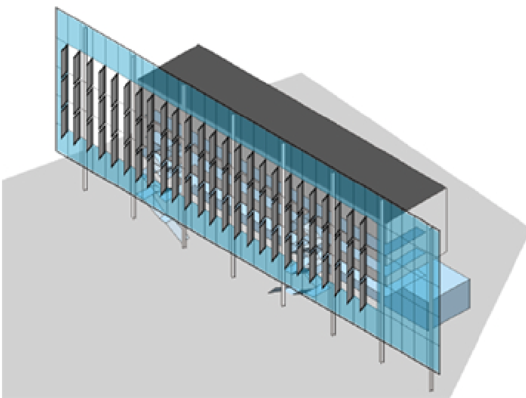

Figure 6 Passive mode.

The use of this shielding, furthermore, has an impact on the immediate microclimate as it creates a data shadow by restricting access to data in the surrounding space.

Whereas, previously, 24 hours access to data and telecommunications was an expensive – if not essential – commodity; the paradigm has now shifted: being able to selectively not have access to data is the luxury of modern living.

5. Conclusion

The new urban condition has opened up new possibilities to enrich the qualities of the sensorial experiences of its inhabitants in the urban landscape, producing a complex set of new etiquette, needs, desires and fears as well as a transformation of urban policy, technology, mass media, architecture and design.

This design approach allows for the development of new electronic objects and electronic spaces - 'Digital Shelters' - that will mediate between the physical and digital spaces of this new urban condition as well as reposition them as an integral part of the process of transformation of the city

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paper

iki-iki phone

a multi-user alife art game for mobile phones

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Abstract

IKI-IKI Phone is a multi-user, networked Artificial Life (= Alife) art game for the I-mode mobile phones. In this system, subscribed users can create Artificial Life creatures (= IKI-IKI pets), interact with these pets, feed them, take care of them, and evolve them. Networked users can also share their pets with other mobile phones users, trade them, watch them compete against each other, become friends with each other, create offspring and develop an IKI-IKI pet society. Users can also start communicating with each other through their shared pets.

Keywords: Artificial Life, mobile phones, I-mode, multi-user interaction, interactive games and entertainment

Project URL:
http://www.mic.atr.co.jp/~christa/WORKS/index.html

Supporting Institution: MIT Center for Advanced Visual Studies, Boston/USA

Year the Work was created : 2001

1 INTRODUCTION

Concepts and techniques of Artificial Life (= Alife) have been applied to the creation of evolution simulators, evolutionary art pieces, and Alife art games over the past few years. Prominent examples include Dawkin's "The Blind Watchmaker" evolution simulation software [1], Reynold's "Flocking Birds" simulator [2], Ray's "Tierra" evolution simulator [3], Sims's evolving "Genetic Images" [4] and the "Evolving Creatures" simulator [5], the commercial software "Sim Life" [6], Sommerer & Mignonneau's interactive installation "A-Volve" [7, 8] and their web-based evolutionary installation "Life Spacies" [9], Terzopoulos's artificial fish simulator [10], Hurry and Prophet's "Technosphere" [11], the commercial "Creatures" software [12], Ventrella's "Darwin Pond" evolution simulator [13], the web-based "Life Drop" [14] system, and a whole host of art pieces inspired by artificial life ideas and metaphors [15, 16, 17]. While the above systems have been created as either scientific simulations [1, 2, 3, 5, 10, 13, 14], interactive art installations [4, 7, 8, 9, 11] or games [6, 12] we propose expanding Artificial Life to networked, multi-user art games for mobile phones.

2 GAMES FOR MOBILE PHONES

Since the introduction of I-mode-enabled mobile phones by NTT DoCoMo [18], the number of mobile phone users in Japan has increased to about twenty million people in 2001. Phone users utilize their mobile phones not only to make calls, browse the Internet, retrieve news, make reservations or follow stock market developments but increasingly to also play online games. Through improved communication speed and the introduction of the so-called i-Appli technology [19], users can now receive constantly updated images and small animations on their phones. This improvement has been especially beneficial to multi-user games played over web-enabled mobile phones.

There are currently several types of games available for the mobile phones. These can be classified into the following categories: racing games, adventure and role playing games, chess and puzzle games, action/shooting games, fortune telling and cyberpet games. A collection of screenshots from various popular I-mode games is shown in Figure 1.

Fig. 1. Examples of popular I-mode games

2.1 Racing Games

"Miracle GP" [20] is a popular multi-user car racing game where players can select and assemble different parts for their virtual cars to compete with other users in a collective car race. Races are structured into different categories, and the player's car performance and ranking are constantly updated. Depending on their car's performance, the user can advance into the next category while winning virtual racing money that allows him to purchase different car parts. In "Miracle Golf" [21] users become golfers and participate in weekly golf tournaments. Golfers can improve their characters' capabilities through tournament play and training and compete against other golfers. "Fisher King" [22] is a site related to fishing that lets mobile phones users share information on places and events and compare the weights and sizes of their fishes.

2.2 Adventure and Role Playing Games

There are many adventure and role playing games, a popular game is called "RoboRobo" [23] which features an intelligent character that guides the user through a "wonderland." "Miracle Quest" [24] is another role-playing game where players can explore different worlds through virtual characters. The user here has to choose between becoming a fighter, witch, thief, or a priest and depending on his character and the environment different stories and actions unfold. "Miracle Detective" [25] is a futuristic multi-player criminal investigation game where users collectively investigate some criminal cases, and in "Dungeon50xi" [26] users have to search for treasures within a dangerous world full of monsters, while keeping track of their own and the monsters' energy levels. "Cosmos" [27] is an email drama where players are taken through an involving episode that unfolds simply by exchanging emails with the characters that appear throughout the game. In the "Mayoge" [28] game the user is left alone on an island and has to find ways how to escape by correctly answering several questions and by corresponding to emails from other players. Figure 2 shows a screenshot of scenes in various adventure and role playing games.

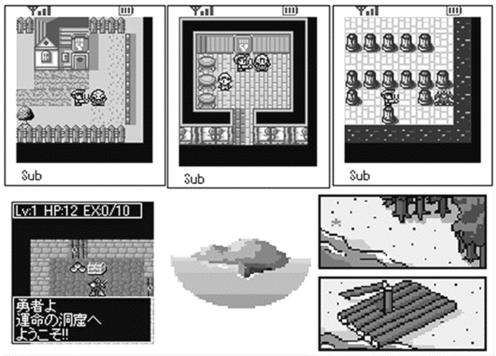

Fig. 2. Examples of role playing games

2.3 Chess. Puzzle and Fortune Telling Games

Classic chess games and puzzle games like the "The Ice Tower" [29] are also quite popular. In this game users have to move virtual ice in a room and try to hit the fire.

A large amount of mobile phone games are the so-called fortune telling games, where users can not only retrieve their own horoscopes but even ask when they are going to die, whom they should marry, what their character is and so forth, while often humorous answers are provided throughout the game.

2.4 Cyberpet Games

Given the strong cultural background with digital pets and life-like game characters, such as the Tamago-chi or the Pokemons (see Kusahara [30]), cyberpet games that use life-like characters have recently also become very popular for mobile phones. In these games users are required to play a short amount of time each day to take care of their virtual pets. There are currently two types of cyberpet games: in the first category users take care of their own pets, feed them and show them off to other net-worked users. Games in this category include the "Odekake Sushi Azarashi" [31] game where users interact with cute seal characters that they feed, play with and occasionally bath. When the characters are happy enough the pets can be shared with other users and the pet owners can get in touch with each other through short email messages. Another game similar in concept is the "Uchinoko Youropiku" [32] game, where each user owns up to five pets that he can send to a common playground. Attaching messages to their pets, lets the owners get in contact with each other and if one treats the own pet and the other pets well one can even get more pets to create a kind of kindergarden. Yet another game is the "Biglobe Town" [33] game where users play with human like characters called "premees". These pets have a "normal" life, they have to work and even take exams, go to hospital, become friends with each other and even exchange money with each other. This game seems to be modeled on the "The Sims" virtual game characters [34].

In the second category several users interact with one pet by competing for the pet's sympathy. According to the user's behavior the pet will either become the user's friend or enemy. Games in this category include the "Pet Ikusei no Mori" (Pet Growing Forest) [35], where users visit a pet that lives in the forest, interact with it, feed it, pat it or even be nasty to it. The pet then decides the sympathy ranking of the various users according to how they have treated the pet. Another game based on a similar concept is the "Dokodemo Issyo" (Together Everywhere) game [36], where users interact with a cute cat to which they try to teach words. The cat learns and then becomes a partner of the user, reminding him to dates, schedules and also developing its own character. A screenshot of the various cyberpet games is shown in Figure 3.

Fig. 3. Examples of cyberpet games

3 IKI-IKI PHONE – SYSTEM OVER-VIEW

While several of the above games rely on competition between different players to advance the collective game and to share communication experiences between the players, and cyberpet games have also included ideas of artificial life, so far none of these games have made fully use of artificial evolution. Based on the principles such as artificial genetics, mutation, breeding, and evolution we have applied in our previous interactive art installations [8, 9, 37], we are currently developing an artificial evolutionary game for mobile phones called IKI-IKI Phone (this name is derived from the Japanese expression for "lively" or "life-like"). This system allows users to create Alife creatures (= IKI-IKI pets) by using their mobile phone's text input. Furthermore, user can communicate with their IKI-IKI pets, feed them, take care of them, observe them as they evolve, mutate and create offspring, and share them with other mobile phone users. The system consists of three components:

3.1 a text-to-form editor

3.2 an evolution software

3.3 a web site

Figure 4 shows a system overview and how the data are exchanged through TCP/IP and HTTP protocols between the i-mode phones, the NTT DoCoMo server and the *IKI-IKI* server.

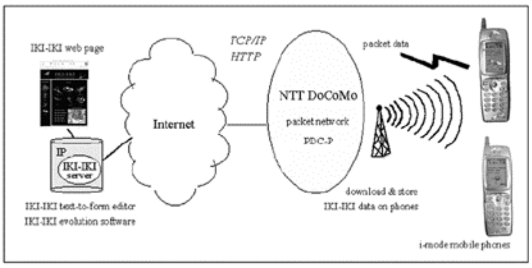

Fig. 4. IKI-IKI Phone - System Overview

3.1 Text-to-form Editor

Once a user has typed and sent a text message through the IKI-IKI main menu (shown in Fig. 5a and 5b), he or she can create a virtual pet. This pet becomes instantly visible as a 3-D creature (Fig. 5c). Users can experiment by sending different text messages and see how this effects the look and behaviour of their pets. Each different text message creates a different pet and the text itself functions as genetic code to create these creatures. The IKI-IKI text-to-form editor, located on the IKI-IKI server, transforms the text messages into 3-D Alife creatures. We use our previously developed text-to-form editor, which links the ASCII values of the text characters to a design function look-up table for sculpting a default body form. The matching between ASCII values and the updated design functions is done through a pseudo-random algorithm. Detailed information on the text-to-form editor and the pseudo-random algorithm can be found in literature [37]. An example of an IKI-IKI pet and its corresponding text are shown in Figs. 5b and 5c.

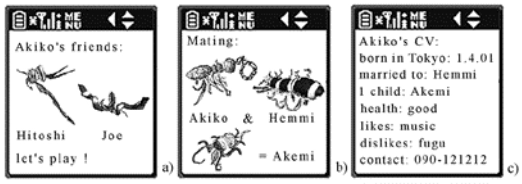

Fig. 5. Examples of the IKI-IKI Phone main menu (a) and creature creation editor (b, c).

3.2 Evolution Software

This software calculates the behaviours, interactions and evolution of the different IKI-IKI pets. A pet's behaviour is primarily based on its energy level and fitness value. Both values can be retrieved at any time within the IKI-IKI menu (Fig. 6a).

a) Energy and Speed

The energy level (E) is a value that constantly changes as the pet moves in its environment, decreasing with increased movement. On the other hand, the speed (S) value is designed by the pet's body physics. A pet with a large body and small limbs will typically move more slowly than a pet with a small body and long limbs. Additionally, the shape of the pet's body and limbs has an influence on its ability to move. The speed (S) value is set at creation through the arrangement of text characters in the pet's genetic code, which is interpreted and translated by the design function table as outlined in literature [37]. A pet's energy level (E) is 1 at creation (when the user sent it or when it was born), but decreases as the pet moves. If the threshold of E<1 is reached, the pet becomes hungry (Fig. 6c).

b) Metabolism

IKI-IKI pets constantly loose energy when they move in their environment. To accumulate energy, a pet needs to eat. Food is provided by the mobile phone users in the form of text: pets always like to eat the same text characters that are contained in their genetic code. Since the creator of a pet knows what kind of food it likes, he or she can feed his or her pet with those text characters, as shown in Fig. 4b. A pet might have to eat a few text characters to add up sufficient energy, especially when it has a high speed (S) value. On the other hand, if not enough energy has been accumulated, the energy level might drop below E=0, and in this case the pet would die. Before this point is reached, an emergency message will be sent to the pet's creator, as shown in Fig. 6c.

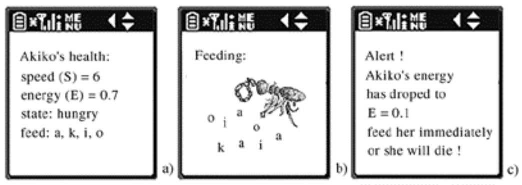

Fig. 6. Example of pet's energy and speed value (a), feeding (b), and alert message (c).

c) Reproduction

IKI-IKI pets with sufficient energy (E>1) are rewarded with reproduction ability: they can look for partners, exchange their genetic code, and create an offspring. The child pet is a mixture of its parents' genetic codes (their text messages) with some minor mutations. Usually, the offspring's looks and behaviour resemble those of their parents. Figure 7b shows an example of two parent pets and their offspring. The genetic code of the first parent was "Akiko" and that of the second parent was "Hemmi". The system crossed-over parts of the parent's genetic code (= text message), and the resulting child was "Akemi." Note that the second "m" of Hemmi" was dropped as a result of a mutation.

After a child is born, the creators of the two parents receive a message that provides them with detailed information about their new child, its genetic code, its design, and its behaviour. The parents' curriculum vitae can also be retrieved at any time (Fig. 7c). An additional option is to receive the phone number of the other parent's owner, if he or she agrees to disclose his or her telephone number.

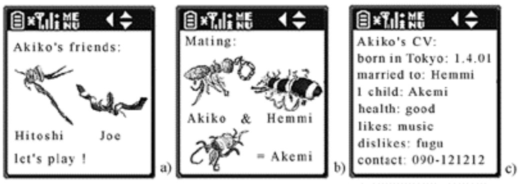

Fig. 7. Examples of pet's friendships (a), mating (b), and curriculum vitae (c).

3.3 Web site

In addition to the mobile phone-based interaction, users can also retrieve the latest news, updated images and real-time interactions between the pets at the IKI-IKI web site. Here, all pets are displayed simultaneously, and users can get an overview of the pets' interactions, friendships (Fig. 7a), competitions, and progress. A newsletter, news groups, each pet's individual curriculum vitae, a chat room, and a family corner for children pets are provided as well. Figure 8 shows a screenshot of the IKI-IKI web site.

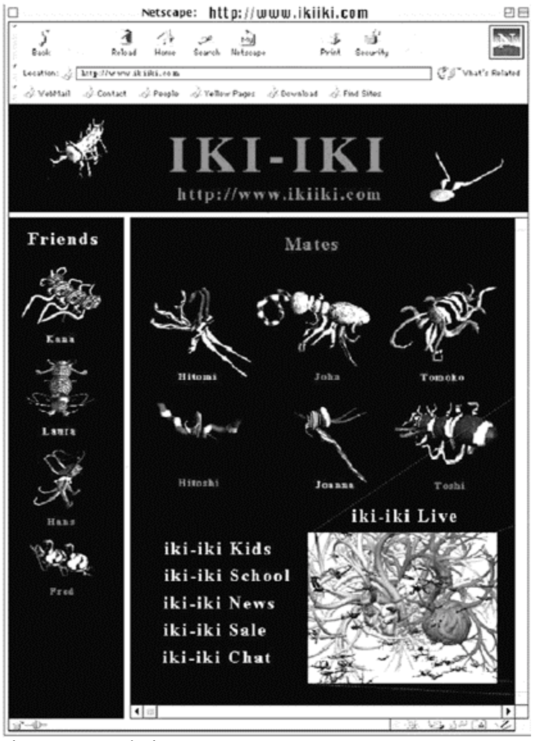

Fig. 8. IKI-IKI web site

4 MULTI-USER INTERACTION

The more the mobile phone users interact with and take care of their IKI-IKI pets, the better these pets can survive, create offspring, and evolve. A fitness table of the creatures' overall evolutionary performance and constantly updated information and images of the pets are accessible to the users as well. The constant interactions among the pets and the various mobile phone users will lead to the propagation of certain species of IKI-IKI pets and a dynamic evolution of an IKI-IKI pet society.

Additionally, users of the IKI-IKI Phone system have the option of connecting to each other as well. Community and awareness building has become an important topic among groups of mobile phone users [38], and role-playing games in particular increasingly rely on relationship building among players. While the IKI-IKI Phone system is not primarily designed as a role-playing game, it does however support user-user interaction and community building among players by providing a chat room and news groups as well as the option of connecting various players through their personal telephone numbers.

5 SUMMARY

We have outlined the conceptual and practical basis for the development of the IKI-IKI Phone system. As far as we know, this system will be the first evolutionary game for mobile phones, marking a further step in the application of Artificial Life techniques and artificial evolution to art, design and entertainment. Mobile phones provide an ideal platform for art and entertainment applications considering the growing number of mobile phone users worldwide, improved techniques for displaying content, images and animations, and the emergence of wireless and shared interaction among networked users. Such applications can captivate the users' attention through life-like features and the creation of personal attachment [30]. IKI-IKI Phone is scheduled to be launched during 2001, and a future extension will include a large-scale game application for public displays (e.g., in a stadium or on large street displays) using the iRemote system [39].

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panel 4:

netzspannung.org

digital archives and mobile units

Team netzspannung.org:

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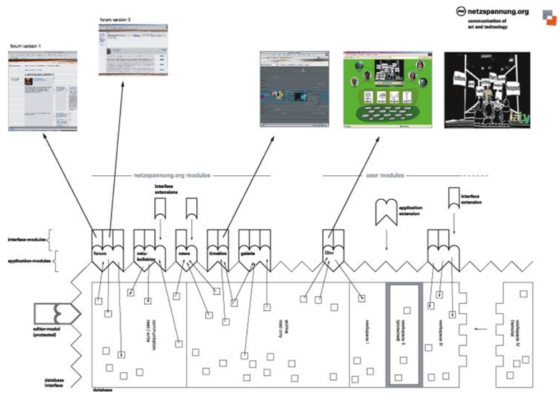
Launch netzspannung.org:

Themes & Strategies:
Distributed Community System
Time for Knowledge Discovery
Mobile Unit for Networked Production
Online Publishing and Curating on the Web
Digital Sparks, Expert Workshop



netzspannung.org/

digital archives and mobile units

netzspannung.org is an Internet platform for media staging, artistic production and inter-media research. The platform has been conceived as a "Distributed Community Context Architecture" aimed on one hand at information and communication and on the other hand at production and cooperation. From September 2001, netzspannung.org will be available as an online Internet media laboratory.

netzspannung.org is intended for producers of digital culture who wish to utilise and shape the platform for their projects. It provides a toolbox of "tools for thought" for information exchange and production of online projects. In addition to expanding the functionality of the system, members can integrate their own computers, to build up a distributed network of experimental media spaces.

netzspannung.org is built on the principle of "knowledge discovery". Methods for accessing, networking and visualising existing archives, information flows and databases are structured on the basis of semantic relationships and form an extended knowledge space.

The "Distributed Community Engine" developed by netzspannung.org overcomes rigid network structures with predefined protocols and data formats. The development of netzspannung.org as an open toolbox is based on the Open Platform Initiative (OPI) model. Users can use and modify the platform both on the programming and on the application level. They can use individual tools for implementing their own projects, but can also develop their own, new tools based on the platform.

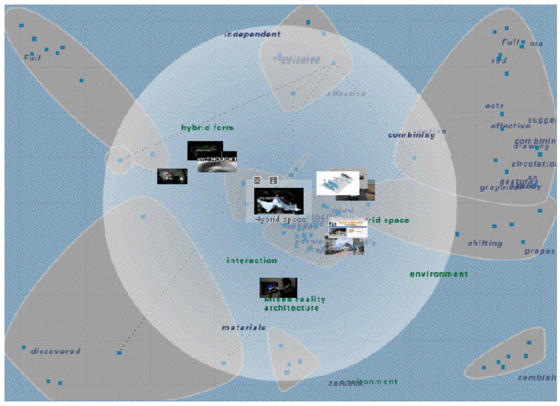
The following set of interfaces is implemented for data input, output and production: "netzkollektor" is a public media channel for presentation and communication of projects, events, calls and competitions.

The workspace provides tools to implement artist online projects, such as modules for networked interaction, streaming and mobile communication. The "timeline" is a multi-layered, hypermedia structure. It shows the development and mutual interaction of different works and discourses from art, science and technology in the form of context information and a network of relationships. "i2tv" (interactive Internet television) combines 3D Internet environments with digital television and mobile communication interfaces.

The conference cast01: "Living in Mixed Realities" threads artistic, cultural and scientific aspects of advanced communication technologies and experimental media spaces. "digital sparks" provides a structured and comprehensive insight into research and teaching at German universities on the subject of media arts, media design and media informatics. The journal „netzspannung.org" attempts to reflect current developments in audio-visual, tactile digital culture. It encompasses a printed and an online version. The „mobile unit" supports artistic production and experimentation in the public space. The mobile media laboratory extends the virtual Internet platform into real space.

In order to develop a working community, it is important that the platform represent a media space, which the members can shape themselves. netzspannung.org enables an architecture of customisable data spaces and functions as a public information interface with free media channels and advanced formats of production and distribution.

papers



netzspannung.org

an internet media lab for knowledge discovery in mixed realities

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Abstract

The MARS Exploratory Media Lab at the Fraunhofer Institute for Media Communication is developing a model for an on-line media laboratory as Competence Centre for digital art, culture and technology . To this end, the Internet platform netzspannung.org is being developed as an open distributed toolbox for knowledge discovery and experimentation with networked media spaces accompanied by community information channels and media strategies connecting processes in virtual space with real places. The first online demonstrator of netzspannung.org explores the creation of an architecture for visualising and exploring the interrelations between media art, culture, science and technology.

Keywords: Mixed Reality, Knowledge Discovery, Semantic Web, Media Art, Experimental Media Spaces, Distributed Systems, Cultural Archives, Awareness, Collaborative Knowledge Spaces

Project URL:
http://netzspannung.org

1. Introduction

The goal of the development of netzspanung.org is an architecture for making visible the interrelations between media art, science and technology. In order to realise this we are exploring the extension of the common notion of web platforms as means of presenting and sharing information towards the model of an online media laboratory.

Under the notion of an online media laboratory we understand a web-based platform, which combines tools for contextualization of information into a collaborative knowledge space with tools for active experimentation with networked media spaces. This takes into account the fact that the use of the Web for creation and distribution of information in different professional communities (e.g. art, science, technology) is today perhaps the most significant example of mixed realities: the contents of the Web represent a myriad of different perceptions of "realities", of "knowledge about" and "representations of the world", expressed as networked constructs combining different media (text, image, video, 3D, mobile communications etc.) and often as a result of a collaborative process.

Such a highly mediatized situation of communicating and constructing knowledge requires new models for discovering contexts and relationships and for understanding how meaning is encoded in complex structures of networked media. In our opinion, this concern cannot be met with the "old" model of a passive user with arbitrarily "intelligent" technologies. Rather, what becomes of crucial importance is tools that enable (empower) the user to explore his own ways and construct his own models for dealing with the situation.

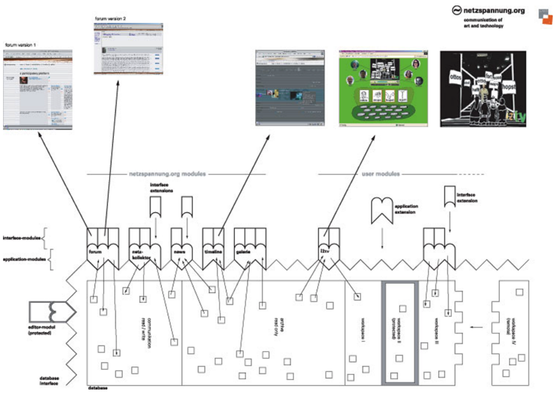

Fig. 1. netzspannung.org architecture

In this context, a crucial point of our approach is that the web platform itself is built as a toolbox of individual modules, which can be modified and extended by the user and employed for realisation of his own projects beyond predefined functionalities. Strategies are required for designing web-platforms not merely as information access points but as tools for acquiring competence of underlying technologies. The challenge here is how to design systems that make the technical structures underlying their functionalities manageable at different levels of technical expertise, without hiding them.

On the one hand, such an approach can be loosely related to historical precedents such as the experiences of MUD/MOO architectures for online communities and learning environments [Curtis94] [Bruck95] [Hay97] [Novak96]. On the other hand, it can be related to artistic strategies for exploring new forms of experimental media spaces for collaborative learning and communication through community engagement and intervention in public spaces [VGTV89] [Iden90] [Kiasma99] [Legr01].

In this context, this paper presents the realisation of the netzspannung.org platform as an open toolbox for knowledge discovery and experimentation with networked media spaces consisting of following modules:

Dynamic archive adaptor for user-oriented semantic integration of online archives (Section 2.1).

Knowledge map system for visualisation and exploration of contexts and relationships in collaborative information spaces (Section 2.2)

Mobile Unit and i2tv system for experimenting with media architectures connecting real and virtual spaces to new modalities of perceiving people, spaces and information (Section 3).

Framework for building distributed user-extendable systems (Section 4).

Public information channels and media strategies for community building through collaborative mapping of the current media culture landscape (Section 5).

2. Exploring contexts and relationships: timelines, clusters, knowledge maps

We relate the notion of knowledge discovery [Fayy96] to tools for analysis and contextualization of existing information flows on the Internet. The goal is to provide tools for exploring how knowledge is represented, created and communicated between different professional communities.

The first step we take in addressing these issues is to develop a model for connecting existing archives and collections of artistic works and scientific research, into a collaborative knowledge map based on semantic relationships.

The two basic elements of our model are the following:

[1] a knowledge map system for visualising and exploring contexts and relationships in collaborative information spaces

[2] a dynamic archive adaptor for user-oriented semantic integration of different online archives and databases in real-time.

The goal is to provide a tool with which users can explore possible relations between information usually isolated in separate archives of different communities in the fields of media art, research and technology. This is intended both as a tool for professionals in the field of digital culture and technology (artists, researchers, designers, curators, journalists) as well as a public information interface.

In developing the prototype we first focus on knowledge structures represented in common databases of artistic works (archives of media art festivals such as EMAF, Medienkunstpreis, Ars Electronica) and research projects (such as the ACM Digital Library). The concrete prototype is based on two different netzspannung.org information pools: the submissions of the cast01 conference and the competition digital sparks. In the next step the involvement of concrete partners from both art and research is planned, in order to produce a real-world demonstrator connecting different archives that can be publicly accessed.

At this stage we also deliberately disregard the knowledge transfer that happens through explicit communication channels such as Email and newsgroups and mailing lists [Sack00] [Schwa00] but the developed model can be easily extended to incorporate also such semi-structured information sources. Figure 2 depicts such a generalised model of netzspannung.org as a Semantic Web [W3C] browser.

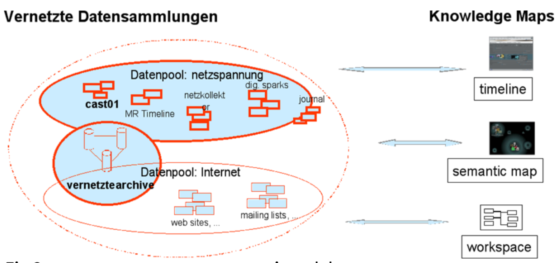

Fig 2. netzspannung.org as semantic web browser

2.1. Connecting archives and heterogeneous information flows

There are two main obstacles to contextualize information coming from different data sources on the Internet:

[1] Much of the information is accessible only as unstructured or semi-structured information (Web pages, mails etc.)

[2] Different databases employ different data structures for encoding the semantics of information.

[3] Different database systems employ different interfaces for communicating with the database server.

Previous work on resolving these issues in integrating heterogeneous data sources includes [Arens96] [Berg98] [Levy96] [Bay97] [Fang94] [Chri00]. A typical approach is to develop a normalisation process for mapping local name constants of different data sources via a system of global name domains (meta domains) organised in different hierarchical levels. This is also the approach of the current Dublin Core initiative that aims at developing domain-specific normalisation processes for different professional communities as a basis for the realisation of the Semantic Web vision [W3C].

The challenge is to enable semantic integration of heterogeneous data sources at run-time, where information has to be extracted from and mapped between different data structures that are unknown to the system in advance. The XML-suite of technologies for exchanging machine-understandable information about the semantic encoding of data structures provides the standard for addressing this challenge.

Applying the meta-data normalisation procedure approach to netzspannung.org is difficult as the goal is to integrate data sources from different professional communities. A typical user of netzspannung.org is interested in discovering intersections between his own field of profession and fields that are not an everyday part of his professional environment. Hence, the problem of data-integration has to be treated from a dynamic user-context perspective: the same data fields will often be assigned different meanings depending upon which user in which context is attempting to access and compare information from different data sources. To deal with this problem we are developing a dynamic adaptor for user-oriented semantic integration of online archives.

As a first step we are implementing a real-time online tool, which enables the user to specify the desired semantic mapping between two different data structures at the moment in which he is formulating a particular search query. On one hand this is a relatively straightforward practical solution for the users. On the other hand, the real-world deployment of such a solution will provide us with a large set of empirical data about patterns of user behaviour and developed mappings. In the next step we investigate possible methods for automatic semantic mapping between cross-domain data based on the experience with the real-time manual mapper model. Particularly promising seems the combination of the basic elements of the normalisation procedure with statistical and heuristic methods from information retrieval and machine learning [Cohen00].

The technological realisation of both the real-time manual mapping tool and the automatic mapping model is based on the netzspannung virtual storage module (Section 4.) that supports different protocols (XML on http, CORBA and SOAP) for connecting heterogenous databases into a common data pool. The final implementation of the dynamic archive adapter will complement the functionalities of the automatic mapping by the system with on-the-fly adaptation by the user.

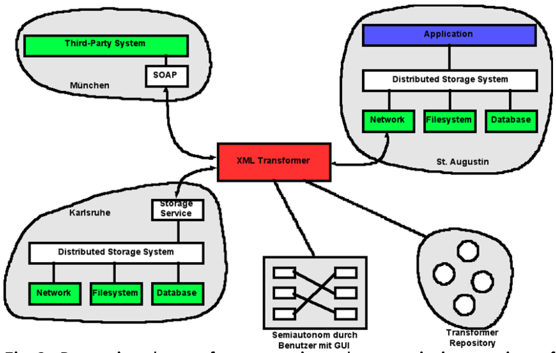

Fig 3. Dynamic adaptor for user-oriented semantic integration of online archives

2.2. The knowledge map system: a tool for thought

On top of this infrastructure the knowledge map system for analysis and contextualisation of information collections is implemented. This system addresses two goals:

[1] an information browser displaying information constellations in a way that provides insight in possible semantic relationships between individual items,

[2] a tool for active creation of new knowledge structures based on users' personal interpretations of relationships in the given information pool.

The architecture of the knowledge map system addressing these requirements is depicted in Fig 4. The current realisation implements two basic interfaces for contextualization, navigation and re-structuring :

[1] The Timeline - time-based contextualization of information categorised in different thematic areas,

[2] The Semantic Map - information-clustering based on a system-generated analysis of semantic relationships.

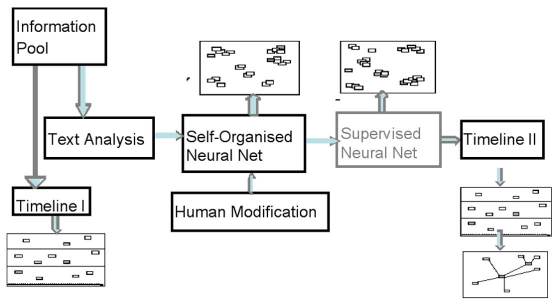

Fig. 4 Architecture of the knowledge map system

2.3. Timeline

The Timeline interface allows a time-based contextualization of information from different data sources, as long as all information items are mapped to a common categorisation scheme . To this end the Timeline interface combines the time axis with parallel display of different thematic categories. This allows implicit insight into possible relationships between historical development of different fields.

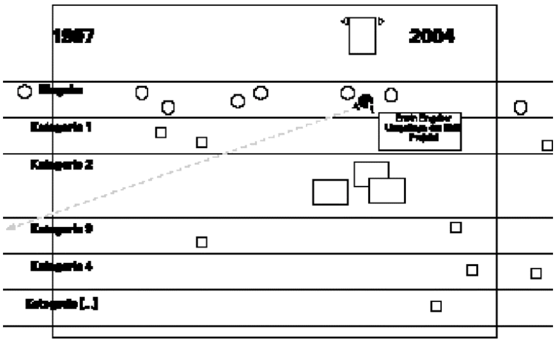

Fig. 5. The Timeline principle

The supported interaction levels include Overview Mode, Detail Mode and Context Mode. The Overview Mode provides a dynamically resizable time-window while the Context Mode (Fig. 6) accomodates the possibilities for investigating explicit cross-category references between individual items (manual grouping or common keywords).

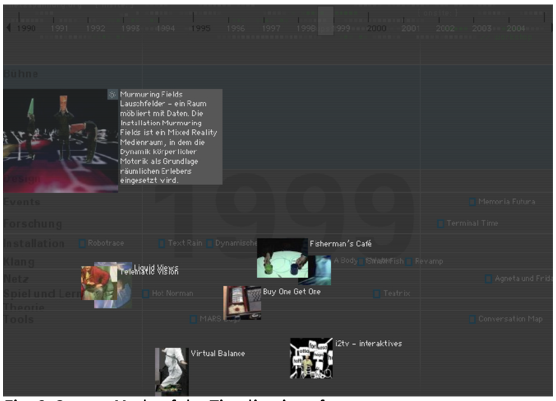

Fig. 6. ContextMode of the Timeline interface

2.4. Semantic Map

In contrast to the Timeline principle, which is based on using firmly defined categories, the Semantic Map is based on the generation of clusters of semantically related content. The basis for this is the combination of text-analysis with Kohonen's self-organised neural network [Lin91][Kohonen00]. In order to encode semantic properties of each information item we employ the vector space model. Numeric vectors are assigned to each text based on text-vectorisation techniques such as word frequency and inverse document frequency (IDFxTF) with stemming, stopword-list filtering and random projection. As a result vectors describing the relevance that the occurrence of individual words has for each text processed are formed .

These high-dimensional vectors (several thousand components) are passed to the Kohonen Map which maps high-dimensional input onto a two dimensional map. As the vectors encode semantic properties of texts the map will position semantically correlated texts close to each other. The information describing the distribution of items and the measure of "semantic similarity" between both individual items and groups of items (clusters) provides the basis for the visualisation developed in the Semantic Map interface (Fig 7).

The basic difference between this and other work on semantic clustering [Lin91] [Kohonen00] [Sack00] is that others employ the resulting cluster map primarily as an information retrieval interface. In our approach the map is a basis for constructing a "tool for thought": a tool for active creation of new knowledge structures. The system-generated information clustering is only a basis to be restructured by the users based on their personal interpretations of relationships implied by the clustering. The requirement for the machine-based "encoding of semantics" is that it creates a constellation that inspires and provokes the users' active investigation of possible knowledge structures that can be constructed from the given information pool.

2.4.1. Visualising relationships

By displaying the distribution of all items and their grouping in semantically related clusters the Overview Mode of the interface gives a quick, general impression of the information pool. The semantic space of each cluster is described by a number of keywords (Fig 7). One kind of keywords is extracted from the data records as entered by the user, while the other is generated by the server side text-analysis.

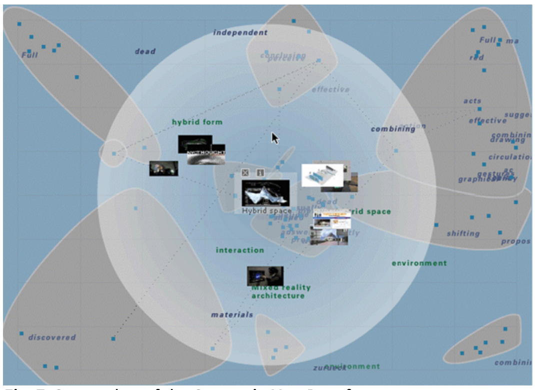

Fig. 7. Screenshot of the Semantic Map Interface

This comparison of computer-generated and human-generated keywords supports the users' interpretation of the "validity" of the information constellation generated by the system. As the computer-generated keywords represent the most significant words for a given item, this also allows an insight into the functioning of the system. Instead of merely navigating a computer generated information space, the user can confront the most significant parameters of the system-based clustering with the distribution of parameters (manual keywords) assigned by the human authors of the information. As noted in [Herl00] this kind of feedback is usually missing in existing approaches to knowledge discovery.

A detailed investigation of the relationships in the presented information space is supported by the Zoom Mode,which displays a set of objects within a given semantic distance from a selected object. Keeping the visual distance between the objects in direct proportion to their semantic similarity allows the user to develop a more accurate impression of possible relationships between an individual object and its "semantic neighbours".

2.4.2. Creating new structures

The possibilities for the user to restructure the map generated by the system have been prototypically realised by the possibility to drag items around and create new clusters, as well as by the possibility to assign labels to clusters, according to one's personal judgment. At the time being this results only in achange to the visual representation, which can be saved as a new map. Since the original surface structure of the map is derived from the neural network, the network itself should be adapted in a supervised training process to reflect the user's changes.

This would allow the user to create a personalised structure on which new entries can be automatically mapped and thereby dynamically contextualised from the user's personal point of view. This has been foreseen in the overall architecture of the knowledge map system (Fig. 4) but is not implemented at this point. Another element to be included in the further development is the subjective experience of the user. The evaluation of navigation paths of different users can be incorporated as an additional parameter influencing the structuring and visualisation of the information constellations.

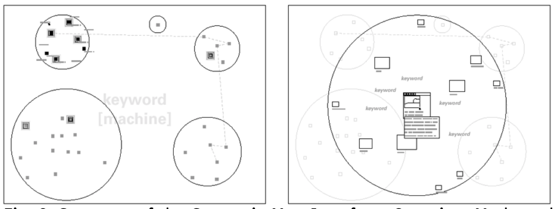

Fig. 8. Structure of the Semantic Map Interface: Overview Mode and Zoom Mode

2.5. Interface for connected archives

The purpose of the described Semantic Map approach is twofold:

[1] On the one hand, the system-generated semantic categorisation (clustering) provides a point of departure for discovering possible relationships that normally might not be perceived by the human user (due to personal bias, lack of cross-disciplinary knowledge etc.).

[2] On the other hand the Semantic Map is one possible solution to the problem of adjusting different categorisation systems as found in different archives. In effect, semantic clustering creates a new "categorisation" that is based on the joint information content, rather than on fixed, predefined categories. This is especially important in the case of information coming from different thematic fields where the difference between the thematic categories often makes direct comparison between them unfeasible.

Since the knowledge map system is intended as a general purpose interface for exploring the possible interrelationships between information items, the categorisation generated by the semantic map can also be displayed in the Timeline interface. In this way the user can combine the two different modalities of contextualising information – the loose semantic structuring of the semantic map, and the time-based arrangement of fixed categorisation of the timeline – in order to discover and visualise possible meanings and relationships in the given information pool.

The described combination of methods for semantic structuring of content and interfaces for navigation and generation of new content provides the foundation of an expandable contextualization system. By applying this to the information pool created by netzspannung.org we aim at providing a tool for exploring how artistic production, scientific research and technological development intersect with each other.

3. Interfaces for networked media spaces: Mobile Unit and i2tv

With the ever more pervasive Internet, mobile communications and wearable computing, the notion of Mixed Reality becomes an ever present everyday experience. With the growing sophistication of underlying technologies the question of what it means to live, play and work in a world shaped by and perceived through digital media, networks and architectures of real and virtual space, becomes more and more elusive.

In this context, experimenting with networked media environments that connect real and virtual spaces becomes the only way of understanding the significance and implication of underlying technologies for everyday life and human experience. But, while a number of open source tools for production of networked multimedia scenarios exist, they suffer from two main problems:

- most of them require a critical threshold of prior technical knowledge and experience, and
- individual tools are difficult to interconnect without extensive programming adaptation.

In this context, we see as a particular challenge the development of tools, which combine different technological elements and make the underlying technical structures manageable at different levels of expertise.

At the same time, developing such concepts and staging such experiments requires not only online media but also equipment and the ability to configure the spatial setting on-site. This includes both the staging of media elements such as projections, displays and interfaces, as well as embedding the accompanying hardware systems for broadcast, streaming and audio-visual equipment.

This has been the motivation for the following two modules of the netzspannung.org platform: (1) the mobile unit for realisation of multimedia environments, and (2) the i2tv system for live media productions and networked scenarios integrating Internet participants with participants on-site.

3.1. Mobile Unit

The basic goal of the Mobile Unit is to provide a fully-fledged networked multimedia environment which can be set up in any space without a direct Internet connection. This environment should enable people to display, edit and broadcast broadband multimedia information. It should be mobile and modular so as to adapt to different spatial conditions and functionalities needed for a given application scenario. To achieve this, the development of the Mobile Unit comprises two distinct but strongly interrelated parts: (1) the technological configuration and (2) the product design for spatial configuration of hardware elements [Stra01a].

The technological set-up of the Mobile Unit comprises a set of different network, multimedia and presentation components, integrated in a logical multimedia system organised in a simple three-layer modular structure (Fig. 9). The unit can be used for video/audio streaming, multimedia-based presentations or as a connectivity tool.

The central technological part is media streaming. This is an area, which for professional use demands very good knowledge of network architecture and protocols, video and audio compression techniques, standards and operating systems. The whole area of distributed multimedia systems is a prerogative for professional streaming media developers and users. On the other hand, technical changes and improvements in mobile computing have brought us to the point where almost every single user can experiment with basic streaming functionality. The problem that still remains is making professional-level streaming more user-friendly for professional scenarios as well as accessible to inexperienced users.

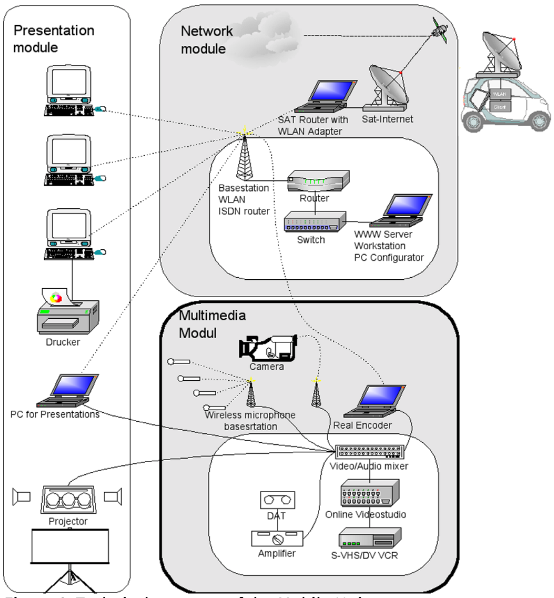

Figure 9. Technical structure of the Mobile Unit

3.2.1. Application: Streaming

In this context, an essential element of the mobile unit is the streaming module that offers an intuitive control tool for integrating diverse encoding and streaming hardware and software components. At present it is based on a dual Pentium, Windows 2000 Professional PC with the following extensions and services:

- MPEG-1/MPEG-2 network broadcast hardware encoder (Minerva VNP-201),
- ViewCast Osprey video capture cards
- RealMedia, Windows Media and QuickTime encoding plug-ins.

This combination implements an "all-in-one" encoder with a web interface for managing customised audio/video profiles and controlling the delivery of streams to the streaming server. The media server is based on Kasenna MediaBase software, which supports creation of multi-format video description files. This means that the media server can dynamically select the appropriate delivery stream based on a client request. It further supports live video storage during the encoding process as well as both unicast and multicast streaming of high-quality (MPEG-2) video.

The described configuration provides a flexible environment for providing and managing a dynamically scalable range of streaming quality: from common 28.8k modem RealMedia streams to high-bandwidth MPEG-2 streaming.

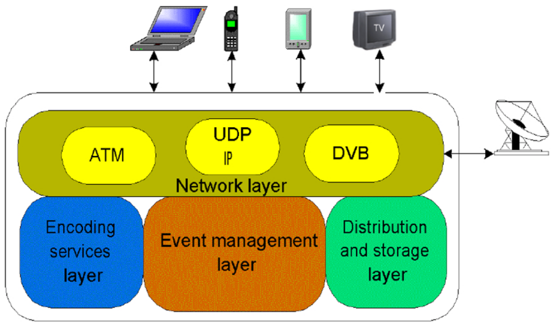

Fig. 10. Structure of the streaming module

This in turn enables on-line users of netzspannung.org to use CAT-Enc as a streaming tool for generating their own streams and distributing them over the netzspannung.org streaming server using TCP/IP or some other protocol, without need for some special streaming knowledge. In other words, this is the infrastructural basis for experiments with live on-line events integrating several or many (multicast) participants.

3.2.2. Application: Mixed Reality Lounge

In conjunction with the eMUSE system [Stra99] the mobile unit enables the realisation of different Mixed Reality configurations independently of the given physical location. An example is a Mixed Reality Lounge setting configured as an interactive playground connecting real and virtual space (Fig. 11).

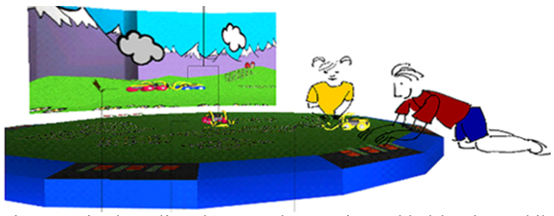
Fig. 11. Mixed Reality playground scenario enabled by the Mobile Unit

3.2. i2tv (interactive Internet-TV)

The i2tv (interactive Internet-TV) system [Novak01b] extends the streaming features of the Mobile Unit by providing a complete toolkit that enables the realisation of live media productions and networked scenarios integrating Internet participants with participants on site. To this end it implements a modular architecture that integrates Internet-based multi-user interaction and awareness with broadcast technologies such as Internet streaming and Virtual Studio, and with technologies for Mixed Reality in shared physical space.

The i2tv system consists out of the following parts:

- MOO server – platform for networked multi-user environments [MOO][Curtis94],
- RealServer – platform for streaming video over Internet [Real],
- e-MUSE – system for multi-user interaction in a combination of shared physical and virtual space [Stra99],
- 3DK Virtual Studio – distributed Virtual Studio system [Vonol99][DMP],
- eMOOSE – interface layer connecting individual elements of the i2tv system.
- Display and input devices – Web browser, handhelds, free body interfaces.

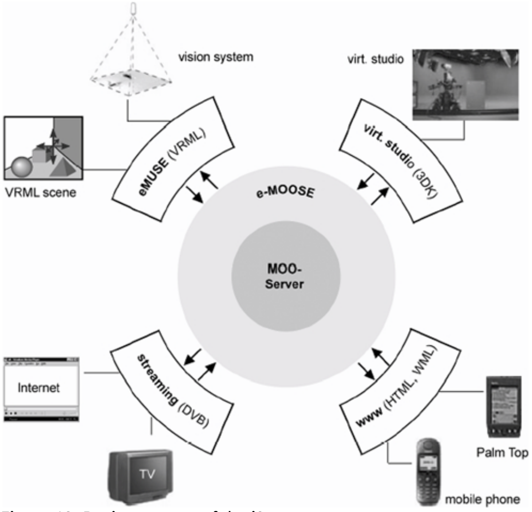

Figure 12: Basic structure of the i2tv system

The particular challenge addressed by i2tv is the creation of an environment in which Internet participants and local audience become equal partners, despite their different situations (on-line, on-site). It enables scenarios in which the audience, both local and on the Internet, can not only follow the event, but also actively shape it, using text, image, live audio or video. To this end, scalable channels for representation of users' presence and a range of interaction channels are supported, such as moderated chat (public and private channels), streaming audio/video, text annotations to live video (video notes), 3D content creation in Virtual Studio, and movement and content creation in shared 3D space.

The application possibilities of the i2tv system have been demonstrated in two public trials: 1) The extension of the historical format of public discussion into a Mixed Reality situation at the Memoria Futura Symposium [Novak01], and 2) the staging of the "Ottos Mops" sound poem of Ernst Jandl, as a distributed poetry play and Mixed Reality television game, making on-line participants active producers of new content and an integral part of the situation on-site [Novak01].

The Memoria Futura demonstration was realised by integrating a group of invited experts2 into the discussion on-site as Internet participants through the minimal version of the i2TV system combining Internet streaming, text interaction and digital TV broadcast via satellite.

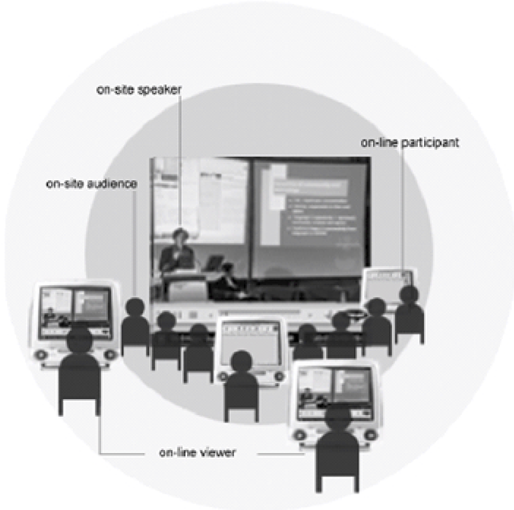

Figure 13: Layers of participation in the i2tv trial at Memoria Futura Symposium

Staging "Ottos Mops" in i2tv demonstrates a prototype for a Mixed Reality television game. Ernst Jandl's phonetic poem "Ottos Mops" is split into single words as a starting point for a collaborative word-sound collage. Participants on-site, in Internet cafés or outside in the streets are equipped with a mobile phone, palmtop, PC or touch screen, in order to send their word fragments of the poem into the Virtual Studio at FhG. The moderator in the studio plays a conductor who binds the incoming words of the networked audience into a new phonetic poem.

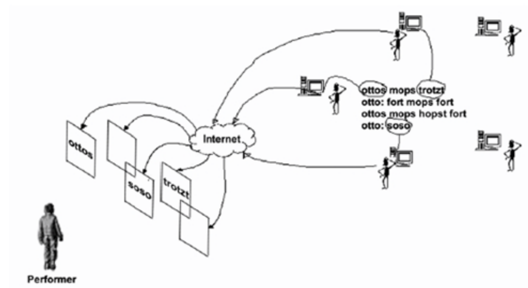

Figure 14: Basic concept "Ottos Mops" distributed poetry play in i2tv.

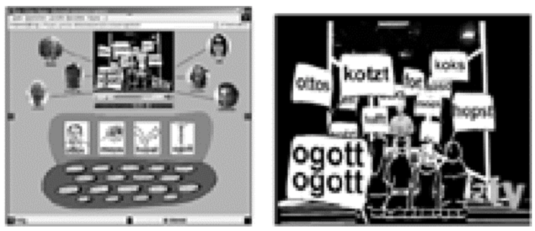

Figure 15. "Ottos Mops" i2tv interface and medial staging in Virtual Studio

These two i2tv applications investigate the specific factors of situations that integrate networked participants in real-space events and explore how the combination of broadcast technologies with interactive media channels of the Internet can develop new forms of cultural spaces based on Mixed Realities.

4. The toolbox principle: distributed, user-extendable system architecture

The underlying basis of the described modules of netzspannung.org is an open, user-extendable distributed system architecture. The challenge is to build a system, which not only deals with different user requirements in a heterogeneous environment of the Internet but also enables the users to modify and extend the system with new functionalities, data archives and interfaces, at different levels of expertise.

The developed system architecture realises a framework for Internet-based distributed systems with decentralised application management and dynamic integration of heterogeneous data sources, distributed services and user-defined modules.

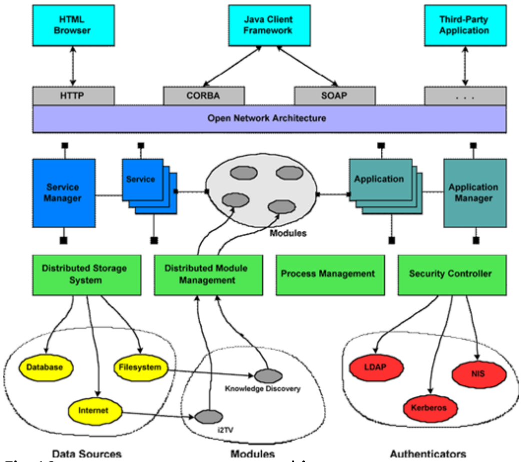

Fig. 16. netzspannung.org system architecture

This framework enables the modelling of a transparent data-pool consisting of both structured and unstructured data sources (heterogeneous databases, file-systems, websites etc.). A basic model for the distribution of applications provides the foundation for decentralised management of application elements while an event notification service implements a basis for shared workspaces and information awareness. These functionalities are supported by the following modules:

Distributed Module Management (DMM)

Transparent integration of system functionalities is enabled by dynamic location and loading of modules, and resolution of their dependencies. Modules can be located anywhere on the Internet and accessed transparently as though they are stored locally on the machine.

Virtual Storage System (VSS)

An open storage interface and data abstraction layer enable transparent access to heterogeneous data sources, without regard to where and how the data is stored. Different applications can share the same data archives, even when they span over different storage types like object-oriented and relational databases, XML repositories and network connections.

Open Network Architecture (ONA)

A protocol abstraction layer supports the implementation of networked systems not only in a Client-Server-Architecture, but also in a Domain-based architecture or within a P2P network. This enables concurrent use of different network protocols (e.g. CORBA, SOAP) as well as individual selection based on the needs of a given application.

Distributed Server Framework (DSF)

Though netzspannung.org does not want to instruct how the implementation of server or client nodes must be designed, it provides a ready-to-go framework, for distributed server implementations. The framework is a basis for extension by custom modules and provides both runtime and developer support. The C++ release is accompanied with a Java version, that comes with Java Servlet, Java Server Pages (JSP) and Extended Server Pages (XSP) support.

Java Client Framework (JCF)

A community platform which requires only a native HTML browser, can be accessed by most Internet users without installing additional software portions. But for more dynamic interfaces, active clients are needed. For this purpose, we provide a Java Client Framework, able to run in a browser window and needing only a Java Plugin for execution. Additional software packages can be loaded from the server and extend the client with the needed functionality.

5. Information channels and media strategies for community building

In order to build up a community based on the productive possibilities of the described web-platform netzspannung.org, the toolbox principle needs to be accompanied by appropriate information channels and media strategies connecting activities in real and virtual space. In the first on-line demonstrator this aspect is supported by the netzkollektor as the public input channel and the workspace as personal space for individual configuration of the platform. Furthermore the cast01 conference and the digital sparks student competition are media strategies for community building and mapping the current space of media culture. In addition, pilot projects with individual artists and institution are an integral part of the development of the platform and demonstrate its "real-world" application for realisation of artistic projects.

6. Conclusions

In this paper we have described a model for an online media lab as a web-based distributed toolbox for knowledge discovery and networked media spaces. This is accompanied by community information channels and media strategies connecting processes in virtual space with real places.

The developed knowledge discovery tools include a dynamic adapter for on-the-fly connection of existing archives and collections into a collaborative knowledge map based on semantic relationships between descriptions of artistic works and scientific and technological research. The Timeline and Semantic Map interfaces support visualisation and exploration of contexts and relationships in such collaborative information pools.

The first prototype of this system is put in use as the web-platform (netzspannung.org) for a developing online competence centre for digital art, culture and technology. The integration of the developed system with a public input channel (netzkollektor) and media strategies (cast01 conference & competition digital sparks) demonstrate the deployment of developed models in a real-world context. This online strategy is complemented with the Mobile Unit and the i2tv system for events connecting real and virtual space.

The goal of this demonstration deployment is to explore the building up of a professional community based on tools for construction and semantic exploration of a collaborative knowledge space in connection with real space events based on Mixed Reality scenarios. In this way we have created an experimental setting for empirical investigation of the convergence of the approaches of knowledge discovery and mixed reality into an architecture connecting social/ knowledge processes in real and virtual spaces.

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papers

panel 5:

tools and strategies for intermedia production

tools and strategies for intermedia production

Media production has become primarily a digital process; the control tools for the (post) production of feature film through to newspaper or to web site have merged to a strikingly similar interface with a large percentage of shared commands and user logic.

As the processes of the organisation and production of media converge, the range of physical display systems, interfaces and their location diversify. It is within this trend that media production, conceptual development, communication and financial control occur within the same system (i.e. a power-book), with only occasional support from (borrowed) larger machines. From this centralised production process the work manifests itself within a range of physical, virtual and mediated spaces, appearing both as deliberate components of an environment and as self contained units (i.e. a film or website).

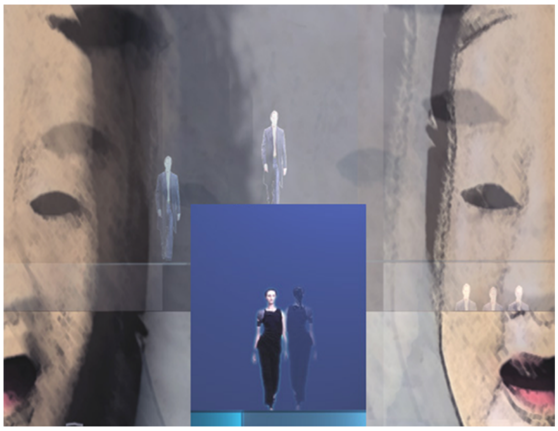
Although production processes are similar, the concerns in terms of narrative, integration and interaction of media content and display differ, as we take on the presence of additional elements within the ambient media designated space. In previous works these spaces have included opera, music theatre, performance and dance or architectural/urban spaces. Again, while the spatial requirements and subsequent solutions differ between the differing genres, conceptual development and (post) production processes follow along similar lines.

The i-skin project by Abendroth e. al. investigates the theme of identity, by confronting it with the emergence and the social implications of modern communication and information technologies. It proposes an experience binding physical to digital, through the vector of an "avatar". The installation underlines the questions relating to the perception, the representation and the extension of the individual in electronic space. The topic is that of migration of the human body into the electronic space of communication and computation technologies as a hybrid extension of body, clothing and architecture. The programming of these three skins into one single display includes complex identification and representation codes based on mental and cognitive rather than physical processes.

In his paper, Marc Cavazza and others, describes a fully implemented prototype for interactive storytelling using the Unreal™ engine. Using a sit-com like scenario as an example of how the dynamic interactions between characters and/or the user dramatise the emerging story. They present how all possible narrative variations are formalised using Hierarchical Task Networks. However, within interactive narrative representation, matters arise from the conjunction of different sorts of causality: physical, psychological and narrative.

Henry Kaufmann and Christopher Kline discuss the design challenges for creating NetWorld, a permanent museum exhibit about how the Internet works. The exhibit space itself is responsive to visitors. It senses them through technologies such as computer vision, wireless ID cards, and physical devices, with embedded sensors and responds to them through large touch screens and large-format interactive displays, that span across multiple projectors. They present the design goals, that lead to the adoption of these techniques and discuss the practical challenges in creating a coherent aesthetic and immersive visitor experience while adopting brand new technologies.

The Sonosphere, a project by Raimund and Gernot Schatz is a journey into the world of tonal and sound phenoma. On one hand, it is an artistic and scientific introduction to the basic parameters of music and on the other hand, a sensual and aesthetic sensibilisation to auditory perception. They describe the content and making of the media-installations by means of a visitor's walk through Sonosphere.



As I Crossed A Bridge of Dreams (Peter Eötvös)
Cité de la Musique Paris, Ensemble Intercontemporain
2000/ Donaueschinger Musiktage 1999

media production

LAWRENCE WALLEN

Media production has become primarily a digital process; the control tools for the (post) production of feature film through to newspaper or to web site have merged to a strikingly similar interface with a large percentage of shared commands and user logic.

As the processes of the organisation and production of media converge, the range of physical display systems, interfaces and their location diversify. It is within this trend that media production, conceptual development, communication and financial control occur within the same system (i.e. a power-book), with only occasional support from (borrowed) larger machines. From this centralised production process the work manifests itself within a range of physical, virtual and mediated spaces, appearing both as deliberate components of an environment and as self contained units (i.e. a film or website).

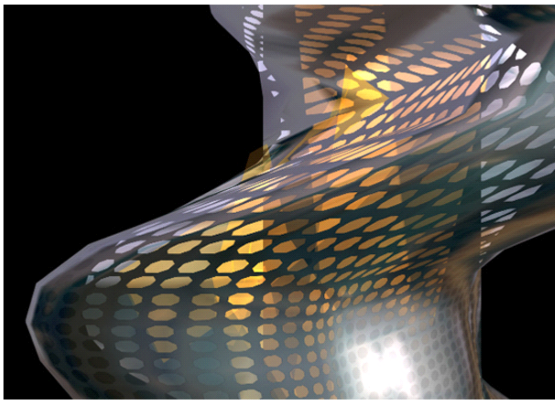
It is the former that we refer to as ambient media. Although production processes are similar, the concerns in terms of narrative, integration and interaction of media content and display differ as we take on the presence of additional elements within the ambient media designated space. In previous works these spaces have included opera, music theatre, performance and dance or architectural/urban spaces. Again, while the spatial requirements and subsequent solutions differ between the differing genres, conceptual development and (post) production processes follow along similar lines.

Opera, music theatre and oratory however, require at the same time utmost visual precision AND flexibility to allow for the visualisation of new musical forms, eg an interactive operatic score, manipulated and played in real-time as in my forthcoming production of "HEPTAMERON" for the Munich Biennale/ZKM 2002. Here, video composition and musical composition happen parallel to each other, forming a kind of material tank, while the final audio-visual composition happens on the actual night - again, differing from performance to performance depending on performers` and instrumentalists` immediate decisions.

In contrast, the creation of a mediated theatrical space surrounding a traditionally scored piece requires for the media to "breathe" with the music without illustrating rhythm or dynamics as in Media placed within a problems As I Crossed A Bridge of Dreams (Peter Eötvös) Donaueschinger Musiktage (1999), Cité de la Musique Paris, Ensemble Intercontemporain (2000), even the slightest change in musical tempo between performances would render the ensemble play between music, staging and media ineffective and out of synch. Additionally, live mixing the image aids the interplay between moving image and live music, be it smooth or dynamic.

Mediated architectural spaces then again require a different visual dramaturgy as the media intervenes into an already exiting space, i.e. a medieval church as in my production of Haydn's "Die Schöpfung" in the Kreuzkirche Dresden for the Musikfestspiele 2001. Here, both spatial integration and spatial differentiation between media and architecture are fundamental to the overall mediation of the space as is the nature of the musical-temporal development of the moving image and a close grip on how different images will change the audience`s perception of the space during the piece.

paper



i-skin

electronic bodyness

Manuel Abendroth, Jérôme Decock, Naziha Mestaoui, Christophe Beaufays
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Abstract

The i-skin project, conceived and realised by LAB[au],laboratory for architecture and urbanism ,the fashion designer CRSTOF and Naziha Mestaoui, architect in the scope of Avignon 2000 exhibition ' La beauté ', investigates the theme of identity by confronting it with the emergence and the social implications of modern communication and information technologies. By proposing an experience binding physical to digital through the vector of an "avatar", the installation underlines the questions relating to the perception, the representation and the extension of the individual in electronic space.

The i-skin project is a construct on the migration of the human body into the electronic space of communication and computation technologies as a hybrid extension of body, clothing and architecture. The programming of these three skins into one single display includes complex identification and representation codes based on mental and cognitive rather than physical processes.

The programming of behaviors and instructions into form - InFormation – is based on visual communication and identification code-image;

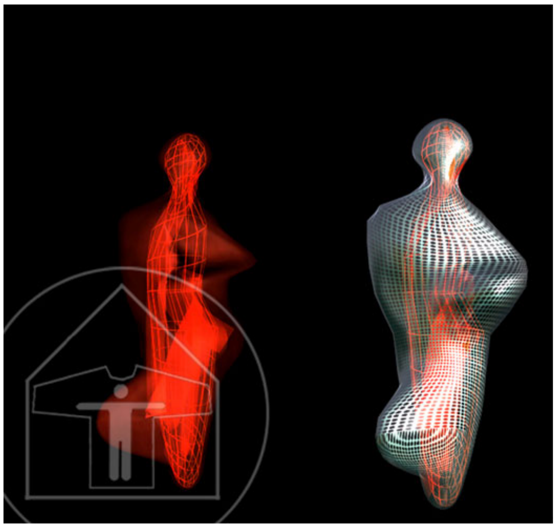
individual identification and social representation codes – identity; processual thinking and programming - interactivity, coding of sign/shapes out of data structures – information.

Keywords: Avatarchitecture – DNArchitecture – Behavior mapping – mixed reality

Project URL: http://www.i-skin.org

Year the Work was created : 2000

Project Partners: La Mission 2000
i-skin ; Body - Clothing - Architecture



1. Project Description

Avatar

Today's avatars are mainly figurative representations, simple bodily transpositions possessing limited functionalities, limited codings, they are poor information transmitters.

Yet, an avatar has the potential to become an incorporating vector of communication of the complex cultural and social identification and personal expression codes (mixed reality). Consequently the avatar is the interface that will in the future enable people to experiment virtual environments through new senses and by extending the communication modes. Just like the face of a human, the avatar is a screen of faciality, an interface which veils and reveals the identity, the character and the expression; it is similar to a skin, being at the same time a mean of protection and a mean of communication.

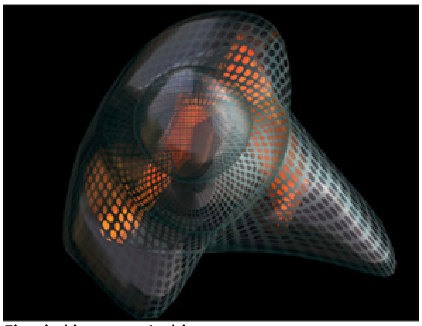


Fig.1 i-skin: avatarArchitecture

The constitution of the i-skin

The project is conceived as an interactive installation introducing each visitor to the creation of such avatar, weaving a link of identification between the person and its double. The visitor participates in real-time to the creation of its avatar, enriches it by selecting images from an interactive slideshow on a touch screen. The 'archetypal' and 'figurative' display (starting point) of the avatar, the i-skin, is transformed, individualised through each choice of the user of images. The images to be selected coming out of three for the user not readable classification categories (body, clothing and architecture), each one influencing one of the parameters and one of the skins, defining the form and the appearance of the avatar. 1. body: influences the colour of the i-skin 2. clothing: influences its texture 3. architecture : sheltering an individual by linking identification processes to representation. The process of creating an i-skin therefore builds up a codification of the avatar appearance by linking the spontaneous associations of the user's panel of selected images to the parameters of the i-skin transformation. The fusion of the 'three skins' in only one representation of the individual thus deals with the codification of appearance and the mapping of behaviors not characterizing the avatar as a blunt figurative representation of the body but rather as a representation of its psyche and behavior, like a mental cartography (Thinkmap). Indeed, the image, vector of complex visual codifications, translates the mental, cognitive and emotional processes leading, through interactivity and identification, to define the personality of an individual or a group.

This method of image mapping has turned into a common step in industrial production in the development and qualification of new product series. The process of creating an avatar, building a representation out of images, thus illustrates the link between information and appearance: i-skin, an information skin.

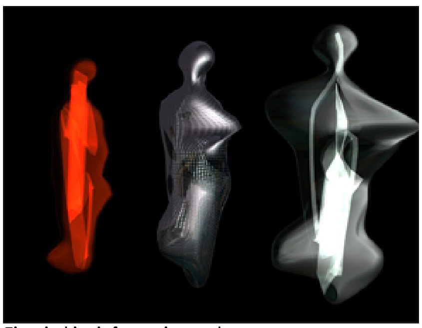


Fig.2 i-skin: information and appearance

The question of identity in electronic space reveals the one of information structures and displays. Therefore, the generation of an i-skin is based on a dynamic process building up the i-skin as a personal display and host of information. Each image is treated as a piece of information transforming the avatar, and, according to the moment it is selected, builds successively a space integrated into the avatar, where it is recorded thus introducing the parameter of time. The 'metaball' moving up and down along the inner spiral of the i-skin defines, each time the user interacts, a point in space. Throughout these co-ordinates the i-tunnel, the inner structure of the i-skin is progressively constituted. This integration of the time parameter to the spatial and structural ones extends the i-skin to an organism processed out of information – as a specific, personal architecture of textures movements and sounds. The processing of specific forms through information- inFORMing - combined with the archetypal display of the i-skin and the recording of behaviors even more extend the question of identity from visual, to cultural a social parameters and determinates the question of identification throughout cognitive and mental parameters.

This assemblage operates like a DNA spiral, a set of processual information, a transmitted and transmissible structure, and an encoded index of behavior. It is in the complexity of the relations among consulted links and the nature of their original organization in a visual sequence, that the assemblage takes its significance underlining the importance of the constitution of differentiated types yet, all originated from the same elementary material. From this signifying complexity emerges the possible reading of a behavioral structure, like the genotype of the avatar. The avatar thus constitutes a representation on two levels, an external codified "envelope", skin, and an internal space of recorded information.

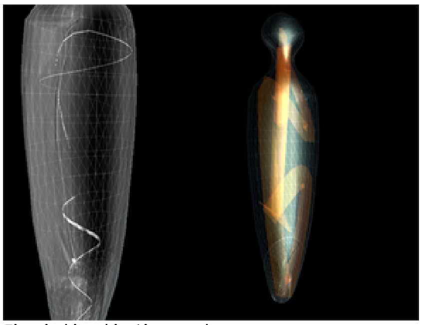


Fig.3 i-skin: skin / i- tunnel

By touching, clicking on, the surface of a I-skin, one crosses this space and sees the information it absorbed, its code or its constitutive images. Therefore the i-skin, vehicle and personal representation, integrates an architecture of interpersonal communication, thus bridging appearance and communication.

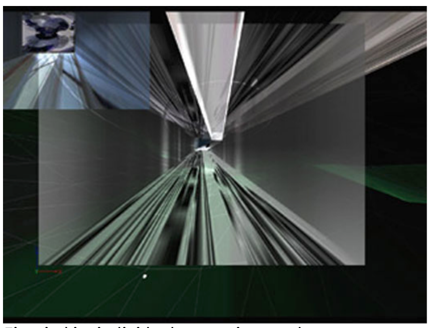


Fig.4 i-skin: individual space , i- tunnel

The collective space of the I-skins

Each i-skin created by a user is automatically placed on a specific space coordinate (x,y,z) in a three-dimensional electronic environment, the collective space.

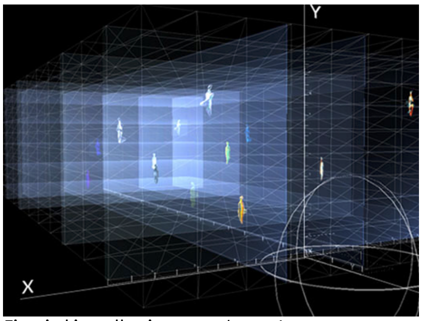


Fig 5 i-skin: collective space / zoom1

The different space coordinates correspond to the average value of users choices calculated according to the image indexing principle, the three classification axis ; (body – clothing – architecture). The 'i-skin' thus constitutes a qualification and quantification of all the user choices, becoming a general evaluation (3D mapping) through the spatialization principle.

The more users create their I-skins the more the collective space reveals densities where users made similar choices. The visitors of the installation can navigate through this space using their own i-skin where the various stages of the navigation system, the "zooms" inside this space, make it possible to have not only a global picture, a statistical vision but ultimately also to discover a person through his/her space of information/code, vision of the individual. The collective space reveals, through the external and internal visions, the processes of personal affection and social sense of belonging.

This AvatarArchitecture is the expression of the hybridization of body space and mind space, fusing abstraction with figuration, identity with representation. AvatarArchitecture is either a device allowing the presence of the user, its extension in the electronic medium but also the translation of self-consciousness.

The installation

Extending the experimentation of a real world enhanced by the digital one, the installation scenography proposes the visitor to penetrate a space where the image turns into architecture merging the electronic space with the concrete one, mixed reality

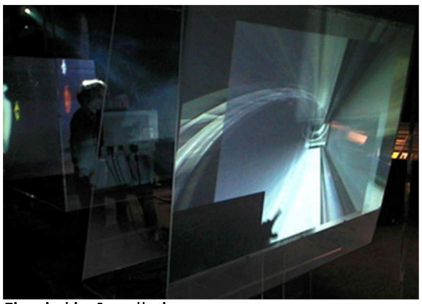


Fig 6 i-skin: Installation

The visitor is dropped into a highly reflective space, a Plexiglas pleat, a continuous surface banded in space producing a multi-layered architecture. The pleat constitutes the projection screen, with folds to be crossed, creating a game of multiple forms of presence between shadow, reflection and projection combining the physical experience of body space with the mental, digital one.

Fig 7 i-skin: Installation

The installation is based on the construct dissolving the dichotomatic relations (like inside-outside, ground and sky...) between surface and space, by fusing these binaries into one single element. Enhanced to information displays, the hyper-surfaces describe the passage from the bi-dimensional sheet, the surface, to the n-dimensional space of information - its perception and interaction. So these hypersurfaces can be defined as the programming of information and behaviors in space according to the relation of perception and conception of space and information displays.

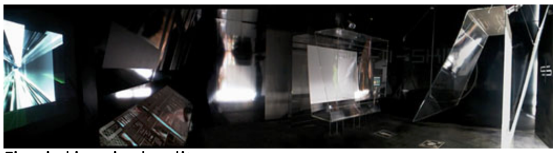


Fig 8 i-skin: mixed reality

Through the themes of the body, clothing and architecture, the entirety of the i-skin project plays with the possibilities that new communication and information technologies offer in the mutation of these concepts and their respective value.

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paper

narrative representations and causality in character-based interactive storytelling

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Abstract

In this paper we describe a fully implemented prototype for interactive storytelling using the Unreal™ engine. Using a sit-com like scenario as an example of how the dynamic interactions between characters and/or the user dramatise the emerging story. We present how all possible narrative variations are formalised using Hierarchical Task Networks. However, within interactive narrative representation, matters arise from the conjunction of different sorts of causality: physical, psychological and narrative.

Keywords: Interactive storytelling, Emergent stories, Virtual characters, Agent behaviour, AI-planning algorithms.

1. Introduction

Recent developments in interactive storytelling have resulted in many different approaches, sometimes taking opposite views on key concepts, such as the relations between character and plot. These approaches include emergent storytelling [1], user-centred plot resolution [2], character-based approaches [3] [4], anytime interaction [5], and narrative formalisations [6].

In this paper, we describe the first results obtained with a character-centred [3] interactive storytelling system. The final applications we are addressing consist in being able to alter the ending of stories that have an otherwise well-defined narrative structure. In other words, we start with a generic storyline representation, which defines the characters' roles: their dynamic interaction, together with potential user interference, will determine the actual instantiation of the plot.

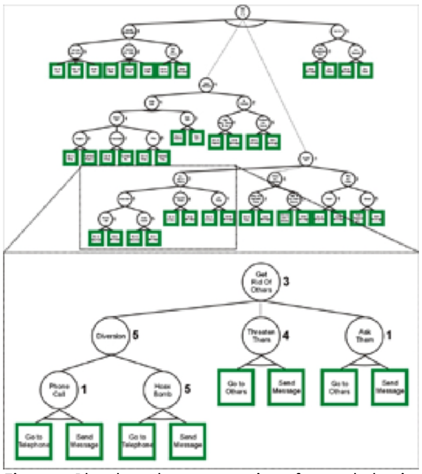

Figure 1. Plan-based representation of agent behaviour

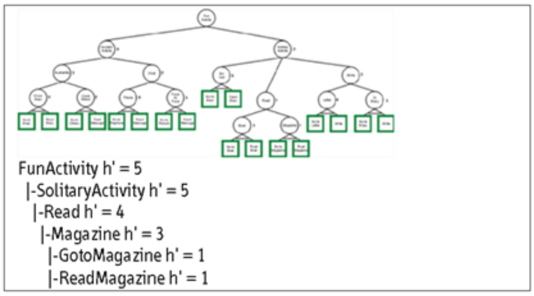

Fig 2a.

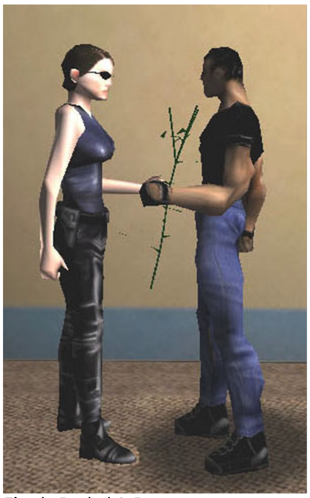

Fig 2b. Rachel & Ross

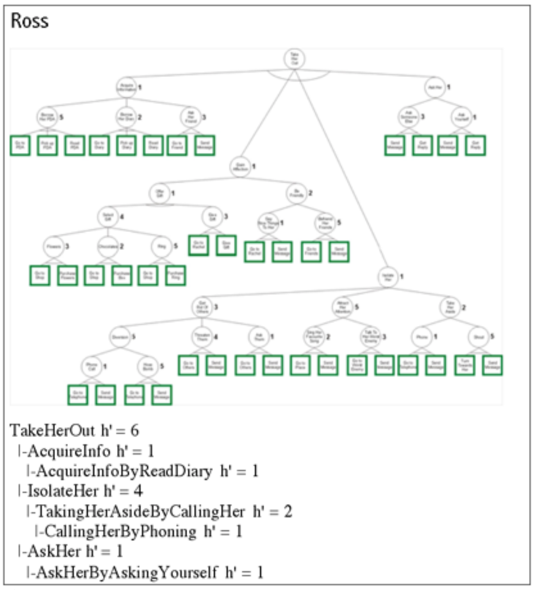

Fig 2c.

Figure 2a-c: Ross' "active" plan and Rachel's generic pattern of behaviours

Previous work has identified essential concepts and techniques in interactive storytelling, such as the relation between character and plot, or the balance between storytelling and interaction [3] [7]. However, there is still often a gap between the AI techniques supporting character behaviour and their use to represent narrative knowledge. Now that practical solutions have been proposed for some basic problems, such as the use of planning for characters' behaviour, there is a need for some more fundamental analysis to take place before attempting to scale-up interactive storytelling systems.

We hereby try to identify, on the basis of the first results of our prototype, essential problems in narrative knowledge representation, analysing them through the notion of narrative causality [8] [9].

2. Authoring and Storytelling

The storyline for our experiments is based on a simple sitcom-like scenario, where the main character ("Ross") wants to invite the female character ("Rachel") out on a date. This scenario tests a narrative element (i.e. "will he succeed?") as well as situational elements (the actual episodes of this overall plan that can have dramatic significance, e.g., how he will manage to talk to her in private if she is busy, etc.). Our system is driven by characters' behaviours. These actually "compile" narrative content into characters' behaviours, by defining a superset of all possible behaviours, represented by a plan for each character. Dynamic choice of an actual course of action within this superset is the basis for plot instantiation [3]. In that sense, this addresses the causality/choice duality described by Raskin [9] in storytelling, though this choice takes place within the limits of the formalism used to represent possible behaviours, which is a plan-based formalism [3] [10]. This can be illustrated by considering the overall plan for the Ross character (Figure 1).

In order to invite Rachel, he must for instance acquire information on her preferences, find a way to talk to her, and finally formulate his request (or having someone acting on his behalf, etc.). These goals can be broken into many different sub-goals, corresponding to potential courses of action, each having a specific narrative significance.

The initial storyline should actually determine not only the main character plan, but those of other characters as well. The problem of dependencies between characters' roles has actually been described within modern narratology, though not to a formal level. Narrative functions can be refined into bipolar relations between couple of actors, emphasising the asymmetry in their roles [8]. We have adopted this framework to define the respective behaviours of our two leading characters (Figure 2). We started with the overall narrative properties imposed by the story genre (sitcoms). In terms of behaviour definition, this amounts to defining an "active" plan for the Ross character (oriented towards inviting Rachel) and a generic pattern of behaviour for Rachel (her day-to-day activities).

3. System Description

A first version of the prototype has been fully implemented and runs the scenario in a real-time interactive 3D environment [10]. Graphic rendering, character animation and user interaction in the system are based on the Unreal™ game engine. The engine provides high-quality display at a constant frame rate, while also serving as a software development environment [3]. Besides embedding its own scripting language (UnrealScript™), it can accept C++ modules and can communicate via sockets with external software. This first prototype has been developed mostly in C++ to implement the AI planning techniques at the heart of the system and UnrealScript™ to describe low-level animations and interactions of characters.

Individual agent behaviours are produced by solving the plans discussed in the preceding section, which are represented by Hierarchical Task Networks (HTN) such as the one of Figure 1. Using formal properties of these plans, it is possible to generate solution plans by searching directly the AND/OR graph of the HTN with an algorithm such as AO* [12] [13]. In our system, this is done with a "real-time" variant of AO*, which interleaves planning and execution and supports re-planning that is required when a character's plan is altered through interaction with another virtual actor or the user. The terminal actions (e.g. reaching a location, using an object, interacting with other actors) forming the plan are actually played in the graphic environment through their corresponding animations. The dramatisation of these actions constitutes the story as seen by the user.

4. Example

While the conditions for interaction between characters lie in the on-stage spatio-temporal instantiation of the storyline, additional mechanisms are required to recognise these interactions and propagate their consequences. Figure 3 illustrates an entire story instantiation.

Let us now give a more technical description of these events, by detailing the associated steps in plan generation or terminal actions. Each of the main characters has its own planning system: they are synchronised through Unreal™ low-level mechanisms. Firstly, Ross' plan. The first sub-goal for Ross' plan is to acquire information about Rachel. There are various ways to satisfy this goal in Ross' behaviour representation, and the first one selected is to read her diary. The corresponding script involves going to the diary location and reading it (reading it always succeeds in providing the information). The first part of the script is executed and played on stage. In the meantime, Rachel's plan that governs her spontaneous activity, determines her to write something in her diary. She reaches the diary and starts using it through a durative action (a scripted action which is associated a clock based on the internal Unreal™ clock). When Ross arrives in sight of the diary, the pre-conditions of the action of "reading it" are checked: the diary is in place and that no one else is using it. This pre-condition is not satisfied, hence the second terminal action ("ReadDiary") fails, which in turn causes the whole sub-plan to fail. The re-planning produces a new partial solution, which consists in asking Phoebe. Ross then goes to Phoebe's location and starts talking to her. As Phoebe is a reactive actor, she responds directly to Ross' request, in this case positively. In the meantime, Rachel's next occupation is to talk to Phoebe. When she reaches Phoebe, the internal mechanisms will make Rachel aware of the situation where Ross is talking to Phoebe. The pre-conditions for a terminal action involving conversation with another actor is to check whether this actor is free. The jealousy rule is added on top of this check and concerns subjects with which there is a relationship. Internally, the mood state is altered accordingly: all heuristics are revised, and of course, the activity "Chat with Phoebe" fails.

Rachel leaves the room. In the same way, Ross' low-level mechanisms will provide situational information that will modify his internal states and influence his sub-plans. Ross will stop talking to Phoebe (terminal action fails) when he realises Rachel is upset, and will then run after her.

In order to get the information he needs, Ross goes to read Rachel's diary (a). When he approaches the room, he realises that Rachel is actually writing in her diary (b). Unnoticed by Rachel, he goes to meet Phoebe to ask her about Rachel (c).

In the meantime, Rachel has finished writing and decides to have a chat with Phoebe. As she arrives to meet Phoebe, she sees her in a joyful conversation with Ross (d). She gets jealous and ostensibly leaves the room (e) to go out on her own (f).

Figure 3: Sequence of actions illustrating a story instantiation

To summarise, this example illustrates the two main character's plans as a representation of narrative instantiation. Though these plans are run independently, they are designed from global narrative principles (considering the story genre).

5. Causality and Interactivity in Storytelling

The creation of an interactive narrative can be analysed through the notion of causality in storytelling as described by Raskin [9]. Raskin introduces three different sorts of causality: physical causality, psychological causality and narrative causality. Causality, which can be tracked back to Aristotle's Poetics, is mostly instrumental to the understanding of stories and their formalisation for narrative analysis. It is however common in interactive storytelling to assume that narrative formalisms, originally introduced for narrative analysis, can serve as a basis for computer implementations. This is largely similar to the role of descriptive linguistics in computational linguistics, and we should consider in that case that interactive storytelling can be based on computational narratology, supported by narrative knowledge .

Physical causality corresponds to common sense physics, i.e. our understanding of the physical consequences of actions in the everyday world. The point to be considered here is the level of detail of the simulation. While in traditional simulation or some computer games, physical causality plays a major role, this needs not be the case in interactive storytelling. This again is consistent with the fact that the virtual characters are not improvising, but acting along the lines of a variable, yet initially defined, storyline. Not every low-level detail needs to be generated and, more specifically, not every physical detail. In our system, we have only dealt with physical causality at the object level, i.e. the availability of objects as resources for actions (a diary, a telephone, a gift, etc.), illustrated in Figure 4.

Figure 4: Physical interaction with resources

Psychological causality is what determines an agent's actions from its internal mental states. Personality determines the choice of a character's actions from the set of narratively meaningful ones. In our system, agents' behaviours are not determined by an explicit intentional representation in the cognitive sense, and psychological causality is implemented through the notion of personality profiles. For instance, when trying to find a way to talk to Rachel in private, a "shy" Ross would not interrupt Rachel when she is with her friends, while an overconfident Ross would ask them to leave (Figure 5). Hence, internal sub-goals are categorised according to personality-related narrative dimensions and the heuristic values that are used by the planning algorithm will determine the course of action accordingly. This also results in a consistent set of decisions that should make the personality visible to the user, through the specific actions taken by the character.


Figure 5: Personality in character behaviour

Narrative causality is certainly the most relevant concept in this context. This difficult notion is discussed in narrative theories such as Barthes', through the notion of dispatcher [8]. A dispatcher is essentially an element that signals the possibility of alternative course of action. That causality of events can crystallise around a single intervention triggering dramatic change also evokes the Althusserian concept of clinamen. Causality is of course strongly related to choice [9], which in our system is supported by the alternative sub-goals that an agent can follow. In our system, dispatchers are represented through objects that are resources for actions. There is also a strong relation between dramatisation and the recognition of dispatcher. Because in our framework the characters are acting rather than improvising, nothing in their behaviour is accidental: the actions they are undertaking have a narrative meaning, which facilitates the dramatisation of actions. For instance, the fact that Ross tries to get Rachel's diary suggests to the user that this diary has narrative significance (without of course always signifying which meaning it has), which can prompt user interference, such as the user "stealing" the diary from the set (Figure 6). In that sense, the equivalent of dispatchers are associated with interactivity as well. However, the main source of narrative causality remains the sequential ordering of sub-goals in a character's plan.

Figure 6: Dramatisation of user interference

6. Conclusions

The description of character's behaviour from narrative principles is a difficult task and still a field for investigation. The main challenge is to turn concepts defined for narrative analysis into knowledge supporting automatic narrative generation. Taking the example of causality, we adopt a pragmatic view, namely that causality can underlie interactivity by i) supporting user understanding on ongoing actions and ii) providing mechanisms to propagate the effect of agents' or user's intervention. However, causality, with its associated determinism, should not imply the unfolding of predictable events at the user level. Several factors actually contribute to this non-predictability, essentially the dynamic interaction between various characters' plans. The random allocation of initial conditions to various characters, together with the duration of the actions they carry out, creates conditions for variability, such as characters competing for objects, meeting or missing each other, depending on their on-going activities, etc. At this stage, this has already been confirmed in our experiments. We are now working at scaling-up the system both in terms of episode complexity and in terms of number of feature characters

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paper

design goals for networld, an immersive public exhibit about the internet

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Abstract

This paper discusses the design challenges for creating NetWorld, a permanent museum exhibit about how the Internet works. The exhibit space itself is responsive to visitors. It senses them through technologies such as computer vision, wireless ID cards, and physical devices with embedded sensors and responds to them through large touch screens and large-format interactive displays that span across multiple projectors. We present the design goals that lead to the adoption of these techniques and discuss the practical challenges in creating a coherent aesthetic and immersive visitor experience while adopting brand new technologies.

Keywords: Immersive Public Spaces, Physical Interactives, Multimodal Interaction

Project URL:
http://www.nearlife.com, http://www.msichicago.org

Introduction

Over the past several decades the nature of public space has undergone a transformation: public entertainment has become ubiquitous. The growth of urban entertainment centers, theater complexes, theme restaurants, gigantic shopping malls, theme parks, and increased Internet access has fostered fierce competition among entertainment, retail, and educational outlets for an audience that has very high expectations but limited time, money and attention. A direct result of this competition has been an increased demand for a new generation of spaces within which the general public can have a novel entertainment experience [1][2][3][4]. The discussion below focuses on what we have learned from our experiences in designing and building NetWorld, an interactive public educational space. Our past work has been primarily in the domain of location-based entertainment. However, this discussion may prove useful to anyone with an interest in expanding the boundaries of interaction techniques and those looking for ways to design compelling, non-traditional entertainment experiences for the public. In the following sections we first outline some general goals for the design of these types of spaces, after which we discuss our design process and some constraints by which it is guided. Following that, we present the NetWorld project and discuss some of the creative and technical approaches that we used to achieve these goals.

1. General goals

When designing an immersive entertainment or educational space for the general public there are several over-arching goals that we have found to be characteristic of a successful experience.

1.1 Accessibility

We always strive to create an experience that is accessible to and enjoyable by the widest possible audience. One of the many aspects of this goal is the consideration of age. In a science museum, for example, the experience must first and foremost be fun for children, because otherwise they may not participate long enough to absorb the educational content. However, since children rarely attend museums without adults, the space must also be appealing to their parents and other older visitors. Physical ability is another aspect of this goal; public spaces must often meet the stringent access requirements such as those of the Americans with Disabilities Act in the United States.

Another consideration is that around 8% of men and 0.4% of women have some form of colorblindness, so color palettes must be carefully chosen.

1.2 Blending between the real and the virtual

A second major goal for an immersive space is to make the blend between the real and the virtual portions of the space as seamless as possible. The architectural design and the interaction patterns should complement each other. Under ideal circumstances, the physical space is designed to blend with the virtual imagery and support the intended interaction patterns. For example, subtle changes in the physical layout can serve to guide the desired movement of people within the space. More often than not, however, the experience must be designed to accommodate an existing space. In this situation the designers can smooth the virtual-physical boundary by incorporating the real-world objects into the virtual space. It is also possible to enhance the architectural space with projected imagery, thereby adding life to inanimate surfaces.

1.3 Direct interaction

To create a sense of immersion it is not sufficient to merely surround the visitor with imagery. It is also very important that the method of interaction be direct, intuitive, and obvious. Levels of indirection are to be avoided because they distract from the immersion. For example, by requiring a user to move a mouse or press buttons in order to connect with a virtual object the designer has emphasized the seam between the real world and the virtual. A better scheme is to use the visitor's body as the interface whenever possible. If the focus of interaction is on an object, have the user touch it wherever it is--- on the wall, on the floor, on a table, wherever. Use the position and motion of a visitor's body as an interface device. If a physical input device is needed, design it to resemble an item in the virtual world and, if possible, have it physically respond to what is happening around it in the imaginary space. Also it is helpful to take advantage of people's familiarity with the way objects work in the real world. For example wheels turn, and are a familiar interface for steering (in cars). We can take advantage of that familiarity when creating a new interface. These guidelines make the interface more intuitive and engaging.

1.4 Seamless/ Invisible technology

Another goal is to make the technological behind the experience invisible in the interaction. One of the main reasons why Disney World is so successful is that people leave their experiences wondering "how did they do that?!". This sense of wonder makes the experience magical and unique, driving the visitors to return again and again.

2. The Design Process

While these general goals give us directions in which to push a project and help us to evaluate a project, most of the work in creating the exhibit lies in making tradeoffs between various approaches and coming up with solutions that work within the constraints of the project. This section outlines the design process that we go through to create an exhibit.

2.1 Project-specific goals

Design goals are meaningless without first articulating the primary goals of the installation itself. When we work with a client, the first month or two is often spent trying to articulate the high-level goals of the project. Sometimes this is easy to define and we quickly move on to interaction design, while other times the process is iterative because the client does not want to close off any options by making an early design decision. Clients often worry that the specification of goals will constrain the possibilities for design. While this is true, fear of goal specification is counterproductive, because once the goals are clarified, potential paths to achieving those goals can be identified earlier and more quickly. In addition, it becomes possible to evaluate whether or not a given design will help create a successful installation.

An example of a how a primary goal might be determined is by answering the question "what is the one thing people should remember about this experience?" or "what is the story that needs to be told?" The answers should be one or two sentences long, such as "kids should feel like they were inside the Internet", or "people should leave with the experience with the knowledge that Internet packets travel through many computers before they arrive at their final destination."

2.2 Project constraints

Once the project-specific goals are defined we can begin thinking about the kinds of experiences that will best meet those goals. Should the experience be guided, like a linear narrative, or should people be able to jump in at any time? If the installation has multiple components, will there be a preferred order of viewing, or should each unit be self-contained? Sometimes these decisions are constrained by the client's throughput requirements (i.e., people per hour). If high throughput is required we have to estimate the amount of time it will take to complete each task; if an interaction is too slow, it must be changed or simplified to allow the desired throughput. In high-volume locations such as museums or theme parks, crowds will form if visitors spend more than thirty seconds at certain units.

There are many ways of working around constraints without losing the essence of the design. For example, NetWorld had a high throughput constraint that needed to be reconciled with highly personalized interaction. Instead of having visitors step up to a kiosk and type in personal information like a username, which would have created a backlog during peak museum hours, we instead created a collectable visitor pass containing a tiny wireless ID tag (using Bistatix RF technology from Motorola[6]). This reduced the interaction required to simply waving the pass in the air next to each unit. The unit can then present something unique for each visitor based on what they did in the exhibit. The card was designed to be a keepsake by placing an attractive lenticular animation displaying an avatar character on the card's front face.

The designer needs a great deal of experience and creativity in order to effectively balance geometric, calibration, economic, and human-factor issues. When design choices are constrained by the characteristics of the physical space, such as ceiling heights and physical layout, we attempt to use these architectural elements to our advantage whenever possible. For example, projection displays require large throw distances to achieve large display geometries so large walls or high ceilings present opportunities to build giant displays that entertain many visitors simultaneously and create a visual experience that the visitor is unlikely to encounter at home or elsewhere. Furthermore, projection displays have expensive bulbs that need to be replaced periodically, as well as brightness and contrast limitations. Often the cost of projectors is constrained by budget, so a designer must carefully choose equipment that balances all the needs. The following sections outline how these some of tradeoffs were implemented in the NetWorld exhibit.

3. NetWorld

NetWorld is an exhibit about how the Internet works. It was created for the Museum of Science and Industry in Chicago and opened in March 2001. Nearlife worked on the project for about a year and a half, including about 6 months of design time. After having done some prior conceptual work in 1998, the museum approached Nearlife with the idea of making a major exhibit about the Internet and solicited our design approach. Considering the possibilities, we realized that we did not want to create an exhibit that simply shows what can be done on the Internet (e.g., surfing the web, shopping, participating in chat rooms) but rather gives visitors a unique look "under the hood" of the Internet [7]. The exhibit was intended to be "permanent," which meant a life span of 5 to 10 years. Because of this we did not want to focus on issues that might be timely at the opening, such as Napster, but could potentially be outdated a year later.

With these goals and constraints in mind we decided to focus on the fundamental concepts behind how the Internet works, since these concepts were not likely to change as quickly as the technological advancements based upon them. We put our focus on explaining concepts such as packet switching, bandwidth, and how web pages are built up from 0's and 1's traveling between nodes on the Internet. The fundamental story that we wanted to tell was that "digital information of any sort is broken down into its constituent bits; those bits are used to fill up many fixed-size packets that are then sent out onto the Internet, traveling across many computers before being reconstituted at their final destination".

This story is told in one way or another using the same visual language throughout the many units in the exhibit. The visual story is of media (email, audio, image, or video) being broken into parts (e.g., email text breaks into letters; images break into chunks of pixels) that further break up into streams of flowing 0's and 1's. We call this process "bitification". The 0's and 1's fill up pill-shaped packets that are then sent out into the Internet. These transitions were implemented in our 3D interactive system with various combinations of particle system effects. In addition to helping us share the core software development across many of the units, we found that a consistent visual language helped to repeat the story in all of the various contexts.

3.1 Immersion in the Internet

Inspired by imagery from films such as The Matrix, we found the idea of a dense, frenzied, overwhelming network of data to be a compelling aesthetic, and wanted the visitors within the exhibit to feel like they were immersed in such an environment. To that end, we made heavy use of floor projection and computer vision sensing to make the space itself responsive to visitors. In particular, we created two units that are large multi-projector floor projection interactives. In one, luminous discs with Internet trivia questions written on them wander around on the floor and then flip over when someone stands on them to reveal the answer. In the other, a huge simulated river of 0's and 1's flows across the floor; as people move through the virtual river the particles adjust to flow around them as they are tracked using ceiling-mounted cameras and people-tracking software. The centerpiece of the exhibit is a custom-built 9.75 by 1.82-meter rear-projected display called the "Portal Wall". This display tells the story of how web pages are built up from packets; It shows how 0's and 1's flowing out of packets are converted to ASCII characters that form HTML code that makes up web pages. Because the display is so large, it becomes a major attraction point and adds to the feeling of being immersed in the environment.

3.2 Aesthetics

Though we wanted to use imagery that was familiar to people from other popular representations of "cyberspace", we did not want to simply repeat what had been done before[11]. Also, our vision of the network was of an organic space filled with flowing information in it, not one that was cold and linear. To emphasize this we designed the architectural structures to be smooth and organic-looking, incorporating curved walls and a curved cable tray that functions as a both the figurative and literal backbone of the exhibit as well as a decorative element. In the design of the virtual space, we focused on creating curved flowing streams of 0's and 1's in various incarnations and colors.

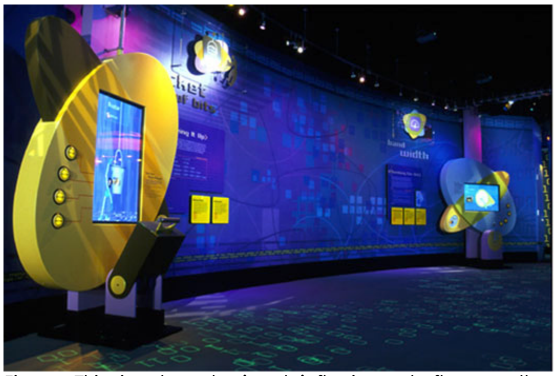

Figure 1. This view shows the 1's and 0's flowing on the floor as well as two mixed physical and virtual interactives that tell visitors about bits and bandwidth on the Internet.

3.3 Bits and bandwidth

To give people a feeling for how information is represented on the Internet, it is important to show how all types of information are represented as 0's and 1's. To convey that, and to give a sense of how much information is in different media types, we let people compare how much an email "weighs" versus how much an image "weighs" with a force-feedback lever. People can select a media type, whose bits fill up a virtual bucket, and then attempt to lift the bucket with a real lever whose resistance changes in response to what is inside the bucket.

In the Bandwidth unit, visitors choose different media types that are digitized and sent down "pipes" of varying bandwidth so that the visitor can get a sense of the difference in capacity of various transmission mediums (e.g., 28.8 kbps modem, T1, OC3, etc).

3.4 NetPass wireless ID cards

We also wanted to give visitors a feeling of being "inside the network" by putting some part of them into the network. To that end, we encourage visitors to purchase a collectable card called a NetPass that contains a wireless ID tag. At every unit, the visitor can swipe their NetPass on a sensor, causing a personalized avatar to pop in and join the visitor in the particular unit's activity. At "Digitize Yourself" unit a visitor can have his or her face digitized; if they have a NetPass their face will be placed on their avatar's face. The avatar will then appear with their face on it in every other unit. The idea is that, by having the visitor's own bits traveling through the exhibit's network, visitors will begin to feel like they themselves are inside the network. In fact, the people's images are not purged from the exhibit database until disk space is low, so repeat visitors will still be "in the network" when they return for a second visit.

The NetPass is supported by a central database that stores every card swipe and associated data (e.g., visitor's face). Each time a card is swiped, the database is queried for data associated with the card so that a current avatar representation can be shown. The avatar character and all the 3D animation presented to visitors is supported by a networked version of Nearlife's character animation system based loosely on [8] and [9].

Figure 2. This shows the Portal Wall display with an avatar in the foreground.

3.5 Messaging

One important use of the Internet is personal communication. We wanted to reinforce the idea that anything that people create and communicate over the Internet uses the same underlying representation of packets, bytes, and bits. To that end we created two units: Shipping and Receiving. In the Shipping unit, people can create messages using an interface similar to the familiar refrigerator magnets and see how they are made of bits that are chopped up into fixed-size packets. In the receiving unit, people can reassemble those packets to read their messages as well as others' messages. The Shipping unit is a large (approximately 120 by 160 cm) rear-projected touch-screen display that shows words floating in space. When people touch the words, they float down onto a message tray. When they are happy with the message, it can be sent out into the network and retrieved on the Receiving unit. Because the display is so large, the whole interface is on a virtual pivot that allows visitors to move it up and down so that children can reach the words as well as adults. We used rear infrared (near-IR) illumination and computer vision to sense screen touches in the Shipping interactive [10].

3.6 Packet Switching

Another key message that we wanted visitors to learn is that information is sent on the Internet from node to node and then reassembled on the destination computer.

Figure 3. A boy blocks the flow of packets on the Packet Switschung Table

We showed this through an interactive Packet Switching table where people could turn off a node by touching it and see how the packets are rerouted to reach their destination. Visitors learn intuitively how this is a fault-tolerant system until all routes are blocked (at which point an alarm goes off). The interface for this is a table with a simulated network projected onto it. Media objects fly in on one side and are bitified before they fly into the network as packets and are reassembled on the opposite side. Nodes in the network are represented by metal touch-sensitive disks that stick out of the table surface. People find this interface inviting and often come up to it and start experimenting naturally without any particular purpose. When their curiosity is piqued, they can quickly determine how the table is functioning algorithmically because they can see the packets flowing through the nodes or being blocked as a result of their actions.

4 Practical Issues

4.1 Managing complexity

The NetWorld exhibit presented us with many challenges during the design and implementation process. One of the main issues was scale. The exhibit contains 10 distinct units (4 of which are repeated), and uses 35 computers, 19 projectors, and several other display types (such as LCD and large-format plasma displays). For sensing touch on the rear-projection screens we are using 2 IR-sensitive cameras; and for people tracking we use 6 special depth-sensing Triclops cameras from Point Grey Research[12]. We found that a significant portion of our time was spent researching and ordering equipment and maintaining accurate inventory. For example, computer projector bulbs can cost a few hundred dollars each, so with that many projectors, bulb-life became a significant issue. By finding a projector that met our other specifications (high brightness and short throw distance) and had a 2000 hour bulb life instead of a 1000 hour life, we potentially saved the museum twenty thousand dollars per year in light bulbs!

We also had to create systems that manage the day to day running of the whole exhibit by starting up and shutting down the exhibit from one central location, as well as monitoring the functioning of all the units. These systems are often overlooked when designing public interactive spaces. It is as important for the exhibit technicians to effectively monitor the exhibit as it is for the public to have a rewarding experience.

4.2 Multi-projector Displays

Another technical issue we had to tackle was using multiple projectors to create large seamless displays. Wherever possible we used multi-board graphics card solutions to avoid writing and debugging complex networking software; this also saved money requiring fewer computers. The multi-board solutions had their own problems, however. Because graphics cards that support multi-board configurations represent a small niche market for many manufacturers, the performance is usually lower than that of single-board solutions, and sometimes certain features are not supported. For example, we are using a four-board solution in some of our units. Their graphics driver only supports a 4 by 1 display matrix because that is how the manufacturer the board being used: running a driving simulator with four monitors on a desktop. We required a 2 by 2 arrangement, however, so we had to come up with a creative solution, mirroring the scene geometry with an offset so that the geometry appears on each screen in the proper place. Readers interested in approaches to building scalable displays may enjoy reading [13].

4.3 Testing

During our development process we always perform several rounds of visitor testing. Sometimes this takes the form of inviting people to the company for testing of our interfaces, and sometimes we do on-site testing with random museum visitors. The latter is preferable whenever possible, because it provides a more accurate sample of our target audience.

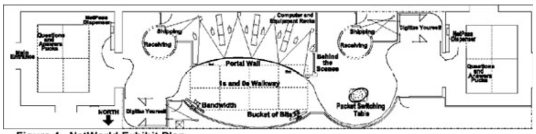

Figure 4. NetWorld Exhibit Plan

When asked carefully, visitors can give very valuable feedback about what makes sense to them and what does not. Sometimes we are aware of what needs improvement and this feedback helps to validate our intuitions speed up the improvement process.

On other occasions user feedback helps to reveal unforeseen problems. When testing a one NetWorld unit, for example, we discovered a surprising and important issue. The unit in question (Receiving) involved a touch-screen interface where visitors had to properly arrange color-coded packets arriving from the network in order to decode a message that had been sent by another visitor. One of the visitors testing the unit was colorblind and could not see the difference between the packets! After finding a site on the Internet that shows what an image will look like to various types of colorblind individuals [14], we adjusted the colors and brightness levels until the difference between packets was clearly discernable.

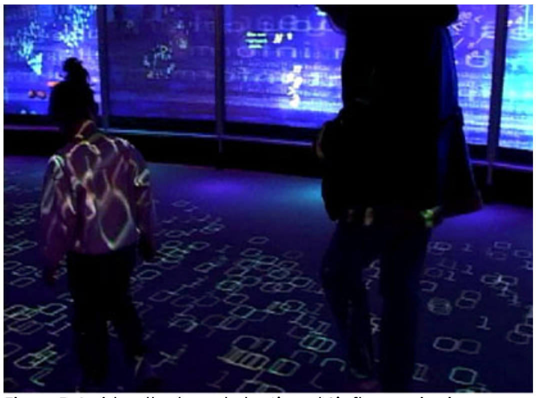

Figure 5: A girl walks through the 1's and 0's floor projection

In the previous sections we discussed Nearlife's approach to designing successful, immersive public entertainment spaces. While we believe that the approach outlined above is a useful and successful one, we consider it neither perfect nor cast in stone. Having evolved over time from experiences with NetWorld and other projects, our approach continues to expand and improve. It is our sincere hope that future designers will apply their talents to this exciting domain, and create spaces that we can both learn from and enjoy.

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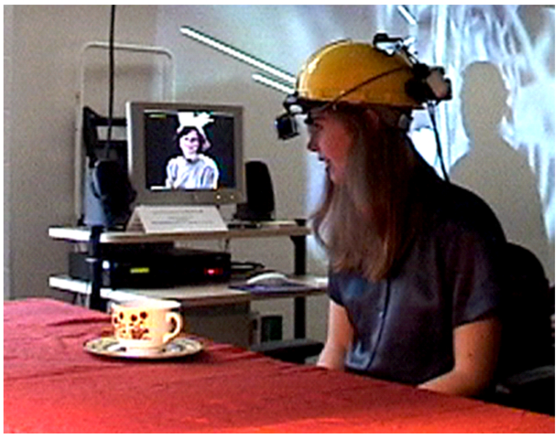

alice's adventure's in new media

an exploration of interactive narratives in augmented reality

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Abstract

Alice's Adventures in New Media is an Augmented Reality (AR) experience based on A Mad Tea Party, a chapter from Lewis Carroll's book Alice's Adventures in Wonderland. The user assumes the role of Alice and sits at the tea party with three interactive characters: the Mad Hatter, the Dormouse, and the March Hare. The video-based characters are presented through a head-mounted display, and appear to be seated at the same physical table as the user.

As a developing medium, AR has yet to establish itself as a narrative form. By comparing the unique characteristics of AR with established media, the project explores AR as a storytelling medium. Innovations include the refashioning of older media (such as film) for the development of an AR narrative, the use of simple procedural characters to create an immersive interactive experience, and the development of tools that enable the production of AR experiences.

Keywords: Augmented Reality (AR), video actors, video texture mapping, digital video, interactive narrative, procedural interactive characters, Macromedia Director, remediation

Project URL:
http://www.cc.gatech.edu/projects/ael/armedia/alice.html

Year the Work was created: 2001

Project Partners: Graphics, Visualization and Usability Center (GVU). The Wesley Center for New Media

Introduction

One important aspect of "living with mixed reality" is to show how the techniques of mixed reality can define new media forms for artistic expression and for entertainment. Such forms will help to convince our society of the cultural and even commercial value of the new technologies of mixed reality. For this reason, our work focuses on creating the formal conventions and the technology to support dramatic and narrative experiences in augmented reality (AR).

AR combines the physical world with virtual elements. Typically, the user wears a head-mounted display (HMD) that mixes the view of the physical environment with computer-generated elements through the use of semi-transparent HMDs or opaque video-mixed HMDs (real-time video of the physical environment is mixed with virtual elements and displayed on an opaque HMD) [7].

Often a new medium such as AR develops from the work of technical innovators. Initial research focuses on the mechanics of the technology, while issues of effective use of the technology as a medium are often secondary. The new medium may enjoy some initial success as an entertainment form based completely on the novelty of the technology.

In contrast, established media rarely depend solely on technology to provide a gratifying experience. The development of an experience for an established medium is more often a synergy of technical mechanics and storytelling; narrative conventions are accepted and understood by the audience culture, while production tools and methods are in place to support the creation of experiences. A new medium faces the challenges of technical innovation as well as the development of narrative conventions.

Aims of Research

Our research has three main goals. The first goal is to borrow and refashion a sense of authenticity from one or more earlier media, such as film and interactive CD-ROMS. We are drawing here on the theory of "remediation" by Bolter and Grusin [1]. Remediation is important because it promotes acceptance and understanding of AR by showing how it relates to earlier and established media.

The second goal is to "surpass" the earlier media in some way – in this case by exploring interaction techniques to which AR is particularly well suited, namely interaction between virtual and physical elements in the user's environment.

Finally, we are developing tools that enable both artists and technologists to work, experiment and collaborate in AR as a new interactive narrative form.

1. Project Description

The experience is based on A Mad Tea Party, a chapter from Lewis Carroll's Alice's Adventures in Wonderland [8]. The user assumes the role of Alice and sits at the tea party with three interactive characters: the Mad Hatter, the Dormouse, and the March Hare. The characters are computer-controlled video actors displayed in the user's HMD and appear to be sitting at the same physical table as the user (we describe video actors in [9]). The characters can interact with the user and with each other.

The user's objective is to get directions to the garden, located somewhere in Wonderland. The characters view the user as an interruption to the party already in progress and continue about their own business. They are frequently reluctant to acknowledge the user and often ignore the user altogether – the user discovers that she cannot simply ask for directions and must participate in the tea party.

Each character has a set of primitive actions that they can perform, including serving tea, receiving tea, sipping tea, asking riddles, and various reactions to events that may occur in the story environment. If properly provoked, a character may splash the user (or another character) with tea. Procedural behaviors govern how the character will react to events that occur in the environment (instigated by the user or by other characters). An example is shown in Figures 1-3. In Figure 1, the user splashes the Mad Hatter with tea. The March Hare reacts with laughter in Figure 2. Finally the sleepy Dormouse is awakened by all the noise (Figure 3).

The user also has a range of gestures for virtually serving, receiving, sipping and throwing tea. The user can also address a character through simple audio level sensing. The characters have procedural behaviors that govern how each character acts or reacts to the user or other characters in the scene. Each action represents a primitive story element – the progression of these elements builds the overall narrative experience.

1.1 Relationships to older media

Alice's Adventures in New Media refashions the conventional film screenplay [4, 6] as a formulaic basis for objective-based procedural characters, following proposals made by Janet Murray [10]. Murray's procedural concepts are combined with the interactive narrative techniques of conventional CD-ROMs [2, 11] to develop the idea of the procedural narrative node.

Figure 1. The Mad Hatter (at the user's left) has just been splashed with tea.

Figure 2. The March Hare (at the user's right) reacts with laughter.

Figure 3. The Dormouse (opposite the user) will soon awaken from the noise.

1.2 Unique characteristics of AR

The spatial characteristics of AR are unique compared to interactive CD-ROMs, web sites and Virtual Reality (VR). While other digital forms immerse the user by presenting an alternative virtual world, AR integrates the story world into the physical world in real time.

A conventional CD-ROM might pause while waiting for user interaction. The pause reveals story time disjointed from real time, frozen while the user contemplates a choice.

In VR, the environment can change in an instant, transporting the participant from one place to another. Users have grown accustomed to this convention. Many VR environments strive to be fantasy-like rather than simulations of reality [3].

In contrast, most virtual objects and characters in AR are "world-stabilized" to the physical realm, a world that is not completely replaced by the machine and continues whether the machine is on or off. The medium depends on a delicate tension between the virtual and the physical to immerse the user in the story. If the video actors in Alice have to "freeze" and reload new video segments each time the user interacts, this discontinuity would disrupt the immersive experience for the user.

Alice is an experience that requires story time to be in-sync with real time. Alice strives to create an environment responsive to the user, as well as the illusion that the story world exists whether or not the user takes action. While these goals may seem contradictory at first, they are complimentary – they each help to synchronize story time with real time.

The interactivity and spatial characteristics also distinguish AR from film. Film has the advantage of a well-defined form of linear writing embodied in the formulaic screenplay. A non-linear equivalent is needed to enable widespread production of AR experiences.

1.3 The interactive cul-de-sac

A common interactive technique described by Samsel and Wimberly is the interactive cul-de-sac [11], or user-choice node, located on a linear narrative spine. The node consists of user options and pre-written optional scenes. The user makes a choice, and the corresponding scene option is presented. The user's choice simply leads to a pre-determined end condition, keeping the linear narrative intact. The user's actions simply alter the presentation of the story.

The use of a cul-de-sac poses technical problems for AR. This technique assumes the user is typically passive, only taking an active role when presented a choice at a cul-de-sac. After choosing, the user typically experiences the resulting scene through an avatar that represents the user-as-character in the story-world. The disjointed real-world/story-world (separated by the computer screen) of CD-ROMs and web-based interactive narratives tolerates – and perhaps requires – this convention.

When users assume roles in AR, typically their own physical bodies become the avatars for users-as-characters in the story-world. The author does not have direct control of the users' bodies. The users must actively perform in character to move the story forward. The author must have a strategy for scripting the user on a level more basic than choosing occasional optional pathways or varied scenes. The user's actions must be scripted (predetermined and encouraged), evaluated and used in a way the cul-de-sac cannot support.

1.4 The procedural node

The procedural node progresses from the cul-de-sac towards what Murray calls procedural authorship. Procedural authorship has roots in the oral bard storytelling tradition of ancient Greece. The bardic tradition worked by using a formulaic system to substitute basic story elements – or "phrases" – to construct a coherent narrative [10].

In a procedurally authored story, the author creates basic building blocks, or "primitives," that can be arranged differently to construct a coherent story. In Murray's model, the primitives are the basic actions or gestures of the user as structured by the author. The computer as story-presenter responds to user's gestures – first by capturing and analyzing the gestures, then by applying procedural rules to determine the appropriate story element to present [10].

Rather than producing several varied linear scenes as in a cul-de-sac, this project focuses on developing primitive story elements attached to the basic scripted actions of the user and the interactive characters. The actions and the corresponding story primitives fit within the framework of a linear narrative spine. The user's actions vary the arrangements of story primitives and influence the actions of the other characters.

1.5 Scripting the Interactor

The use of a familiar story is our first strategy for scripting the interactor. It is reasonable to expect users (at least in Anglo-American culture) to be at least vaguely familiar with Carroll's A Mad Tea Party. Even if the user is not familiar with the story, a tea party is not difficult to understand. The teacup and teapot are seen physically on the table and virtually within the story-world. The coexistence is a cue to the user that the objects have significance. As the user witnesses other characters using teacups and teapots, the significance is further revealed. The characters wake up the Dormouse or address and answer each other, subtly encouraging the user to participate in the same manner. Finally, character actions can discourage inappropriate user behavior. If the Hatter is asking the user a riddle, the Hare's attention is turned towards the Hatter, cueing the user to look as well. Additionally, if the user tries to address the Hare during the Hatter's riddle, the user is ignored.

1.6 The illusion of independent characters

In order to create the illusion of a story world independent of the user, the experience must appear to continue whether or not the user takes action. If the characters are solely reactive to the user, the story will pause when the user is inactive, again disjointing story time from real time. Alice incorporates characters with their own objectives, and procedures to pursue their objectives. If the user is inactive, events still occur in the story world; however the user can still interact at any time without intruding on the story.

Alice borrows from film conventions to define character objectives within a narrative structure. Dan Decker's model of the character structure and objective drive in the American film is used as a formulaic basis for describing the procedural behaviors used by the characters in pursuit of their objective or in reaction to other characters and story events [4]. Note that these behaviors are simple procedures to address varying property states and fall short of artificial intelligence. The intent is to create the illusion of independent character action, not to create truly intelligent agents.

2. Tools and technology

In order to promote the development of AR as a narrative form, we believe it is vital to engage the creative talents of filmmakers, stage producers, and new media designers. We are working to make our development system easy to use, at least for those with some background in digital video and multimedia design. It is unrealistic to expect such designers to familiarize themselves with OpenGL or C++ programming in order to create AR experiences. For that reason we are focusing on the use of Macromedia Director, perhaps the most commonly used tool for digital presentation and interaction. We are currently building native plug-ins ("Xtras") to turn Director into a full-fledged AR prototyping environment for optical and video-mixed AR, including support for tracking, spatialized sound, gesture recognition, and so on.

Director Lingo is used to describe procedural character behaviors, control the display of character actions and manage property states. For example, if the Mad Hatter needs to splash tea on the Dormouse, Lingo is used to load the appropriate video segments to show the Hatter turning towards the Dormouse, then splashing him with tea. In response, video clips of the Dormouse reacting and the March Hare laughing are loaded. When the action is completed, the properties for each character are updated, and new character states are set.

Director 8.5 features built-in support for 3D sprites. 3D sprites combined with position tracking and orientation are used to place the characters in 3D space.

Audio level sensing for Alice is achieved using the GetSoundInLevel (GSIL) Xtra [13].

3. Conclusions and future directions

Alice's Adventures in New Media demonstrates that AR can be used to create short, relatively simple narrative experiences based on procedural characters. The techniques demonstrated here did have communicative power. Most users could understand that the use of the teacup represented a significant gesture (among others).

Alice's Adventure's in New Media was demonstrated at Georgia Tech's New Media Center in April 2001. One particular young girl persuaded her mother to participate. Before the mother could begin, the young girl explained, "Be polite to everyone and say 'hi' to them, before you splash them with tea – because then they get really mad!" The emotional loops of the characters – easily recognizable even by a young child – fall short of the "independent" story world goal. However, the fact that the child recognized scripted actions and story primitives (splashing tea modifies the story presentation), and that she so easily humanized the characters as people to be greeted, to be polite to, and to be angered is encouraging.

3.1 Future directions

At the printing time of this document, a Polhemus magnetic tracker has been partially implemented for gesture recognition and only a limited set of procedural behaviors has been completed. Work continues with full implementation as a goal.

Additionally, our use of bitmap sequences extracted from video to create character actions allows us to integrate novel video playback techniques. In particular, we are attempting to address looping video artifacts using Video Textures [12], a technique that can be used to generate infinitely long, non-repetitious video sequences, potentially providing more natural-looking transitions between character actions and idle states.

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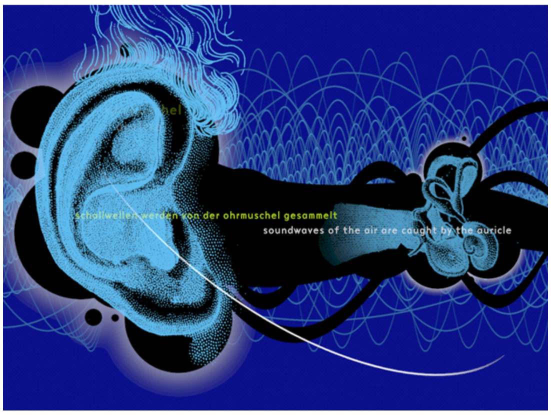

sonosphere

a multisensoric experience of auditory perception

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Abstract

The Sonosphere is a journey into the world of tonal and sound phenoma. On one hand, it is an artistic and scientific introduction to the basic parameters of music and on the other hand, a sensual and aesthetic sensibilisation to auditory perception. In this poster we describe the content and making of the media-installations by means of a visitor‘s walk through Sonosphere. At some installations we will stop and get more into detail, focusing on technology, concept and design issues.

Keywords: mediatecture, interactive exhibits, sound installation, multimedia learning

Project URLS:
http://www.nofrontiere.com/sonosphere
http://www.hdm.at

Year the Work was created : 2000

Project Description

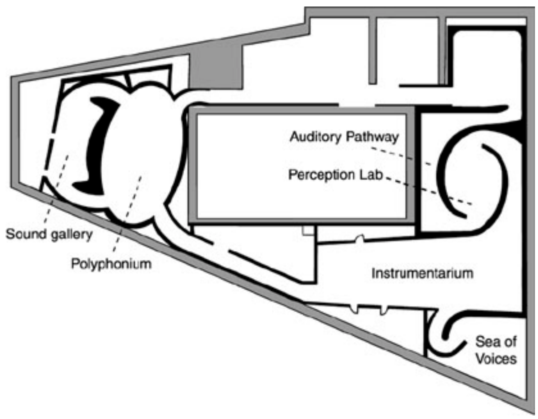
Introduction

The House of Music Vienna, situated in the center of Austria's proverbial capital of music, invites its visitors to an immersive multi-sensoric experience. Its mission is to present the past, presence and future of music on 5 levels.

The second level, named Sonosphere, provides a journey into the world of tonal and sound phenoma. On one hand, it is an artistic and scientific introduction into the realms of auditory perception. On the other hand, it is a sensual and aesthetic sensibilisation by means of experimental, interactive, playful Multimedia-Installations and exhibits.

2000 squaremeters of ehibition space are divided into 6 thematic rooms: Auditory Pathway, Perception Lab, Instrumentarium, Sea of Voices, Polyphonium, Sound gallery.

The contribution of Nofrontiere Design, a premiere Viennese full-service new media agency, was to provide these rooms with a plethora of visuals and interactive installations which master a subtle balance between the immediately sensual, playful experience and the educational aspect of imparting the principles of auditory perception.

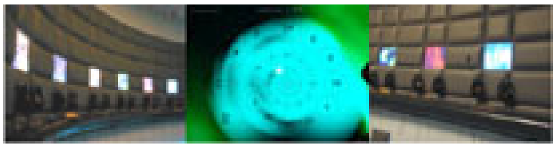


Auditory Pathway

As an introduction, the visitor floats through the Auditory Pathway, where the extreme acoustic situation of the entrance room is reduced to a single sound impulse - the acoustic atom. On five sequential displays, the path of sound from the outer ear to the cerebral cortex and the transformation of the acoustic signal from air pressure-waves through mechanic, fluid and electric processing is traced by sensual, animated visuals.

Perception Lab

Having entered the cerebral cortex, the visitor's space shifts and opens up to a rich and playful environment where the basic principles of psycho-acoustic phenomena can be experienced in the experimental atmosphere of a laboratory. Six installations, each one telling a different story about a psycho-acoustic topic, can be conquered via specially designed haptical interfaces: Discover the essence of pitch, explore the secrets of infinite rising scales or make a virtual trip through different acoustic room situations.



Terminals: Concept

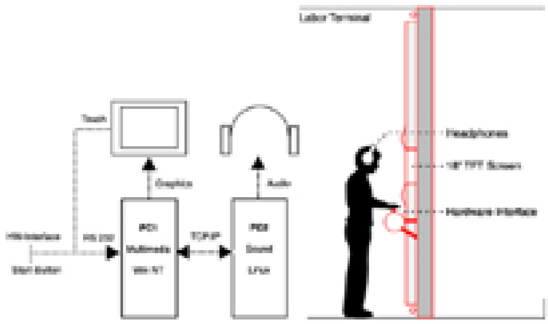
The concept and design of the interactive stations focused two main usability requirements: Ease of use - no learning curve for the visitor, and self-explanation - the user should be guided by the application and its intuitive design. From the multimedia-learning perspective, the content had to be grouped into digestable chunks and the user has to be kept motivated throughout the whole session, to make him understand the full story.

With these points in mind, we came up with an application concept/design, which we used for all terminals in the sonosphere level, thus ensuring interface consistency. To avoid user-complications with hypertext, we sticked to a linear structure, following the principles of dramatic closure: Every satisfying experience should have a beginning, a main part (+climax) and an end [1].

In this way, our applications start with an introduction (what is the user going to see ?) leading to the main part (content) and ending with a final conclusion, which summarizes the key-issues of the shown topic.

In formal usability-testings we found out, that users especially liked the conclusion part, not only because of the short summary of content, also because it ensured them that the story was over and they could move to the next installation.

Visitors of an exhibition cannot retain facts very well in memory. But in contrast, the phenoma experienced there, they can memorize fairly easy and recall details even after years. According to these circumstances, the main part consists of game-levels accompanied by info-levels. With the game-levels we put interactivity in the foreground, allowing playful experimentation and exploration of a specific phenomenon. The more facts-oriented information-levels, give answers to the questions raised in the game-levels before.



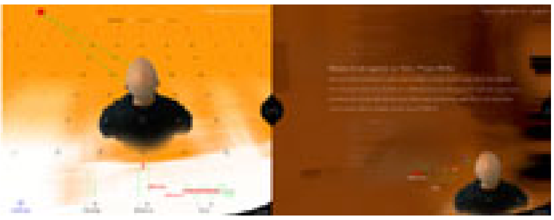
Terminals: Technology

The interactive installations have to provide 2D & 3D-realtime-graphics and -animations combined with highly customized audio-processing like spatialization, audiomorphing, FFT-Filtering and more. We accomplished this task by distributing these two realtime-components (graphics & sound) on two PCs.

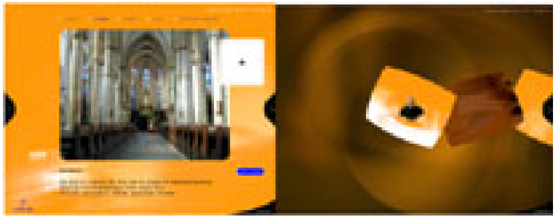
PC1 (multimedia) runs an application authored with Macromedia Director, PC2 (sound) runs a customized version of PD, an open-source sound-processing environment available for WinNT and LINUX. Control- and synchronisation-communication happens via a TCP/IP-Connection.

Terminals: Interactivity

When a visitor encounters a terminal, a screensaver displaying the title and graphical animation tells him to touch the screen in order to dive into the story. Next, in the Introduction, a voice accompanied by keywords popping up, explains the topic: In the installation "Perception of Space" for example, the story is about how human perception decodes the spatial position of sound sources and why different environments sound different. In the first game the user flies a sound-source around his head using a joystick. While hearing the sound positioning effect, changes of physical/perceptual parameters become visible via on-screen graphics. Afterwards an info-level explains the prior experienced effects in deep.



The second game always builds upon the knowledge gained in the levels before. In our example, the user can choose between the different acoustic situations of real and virtual spaces: By steering sound-sources again, he learns the differences between the acoustic qualities of churches, living rooms, tunnels, spheres, cylinders and more.



Note, that the transitions between the different levels show an overview of the linear structure of the story as a progressing strip of screens/levels. With this kind of navigation design, the user always has an idea where he is and how much content he still has to expect. In this way, visitors never feel lost in the application.

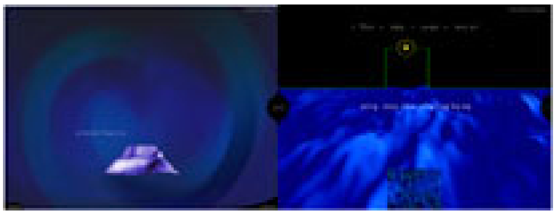
After the details in info-level II, the conclusion finally sums up the phenomena learned in the application and hands the visitor over to the next exhibit.

Instrumentarium

Leaving behind the principles of auditory perception, the Instrumentarium contrasts the analogue generation of sound with the digital audio world. Three big-sized analogue instruments (string-monochord, drum, pipe) with a sounding mechanism are surrounded by six digital instruments which give access to advanced digital signal processing techniques: One can blend his own voice with car noises via audiomorphing, fly through a real-time 3D sonogram-landscape or build his own instrument and play with it by exploring the colours of sound.

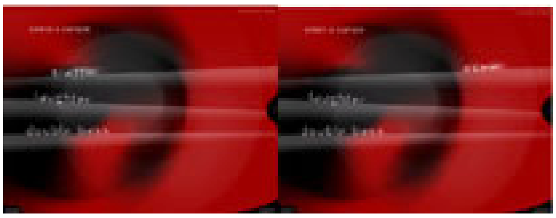
In "Sound Scapes" the user flies through a sonogram landscape built by the spectrum of the actual sound heard: Approaching mountains and valleys are dynamically built from left to right according to the intensities of the spectral frequencies from low to high.

This results in an intuitive, tangible 3D-Representation of sound. In the second game level, the visitor can control a bandpass-filter with his finger, forming the sonogram landscape of his own voice via touch.



"Sound Alloy" shows the possibilities of Audiomorphing, a relatively new digital sound manipulation technique. Like in visual morphing, audiomorphing blends the characteristics of different sounds in order to create new, formerly unheard effects.

In the first level, three examples introduce the idea of audiomorphing: The noise of city-traffic gradually transforms to the sound of ocean waves, laughter turns into chicken cackling, a bass into a diesel engine. In order to avoid the typical clichés of known visual morphing animations via real images, we relied on a more graphical solution: The letters of the words (like 'traffic') become alive, they move and transform in a comic-style fashion, visualizing the actual characteristics of the sounds being heard.

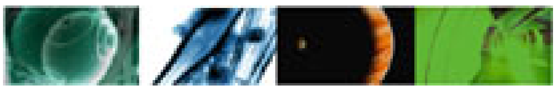


In the Sea Of Voices, multiple users interact with touch-columns in a magic triangle of human vocal sound production, ranging from simple utterances to complex phrases to rare phenomena of the voice. The sounds triggered by the visitors immediately start to circulate through the whole room and rise up to the ceiling, an illusion made possible by a 7-Channel sound system.

Polyphonium

The Polyphonium is a hybrid sound-alloy space, aesthetisizing ist 'non-musical' basic matter (mostly ambient sounds) by means of non-musical generation of structure in digital space: Sounds like rattlesnakes, cosmic radiation, human breathing, microbes, etc., chosen from 4 different realms become digitally and spatially transformed (like speeding their movement up to 3000 km/h).

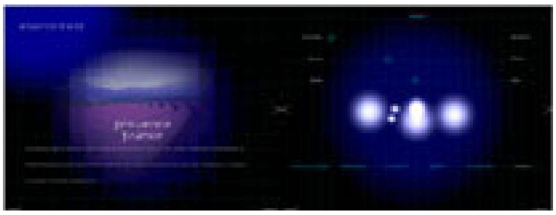
An elliptic arrangement of 2x12 speakers blends the different sounds into an oscillating, room-filling sound composition. The auditorial noise texture of the polyphonium is visually stabilized by four video animations serving as avatars displaying the four realms where the sounds come from: microsphere, macrosphere, environment, human bodysphere.



Sound gallery

In the Sound Gallery, the decomposition of the Polyphonium manifests itself in the shape of acoustic microscopic-stations: At the haptic hearing wall, one can sensually experience single sounds, the 'ingredients' of the polyphonium: cosmic background-radiation, human breathing, the singing sand, etc.

The interactive "evolution machine" allows the audience to learn more about the sounds heard at the hearing wall. Visitors can also compose their own 'polyphonium' by mixing together these sounds and putting effects on them. As a special feature, they can record their session and create their own audio-cd to take home, serving as a snapshot of their personal composition-universe and as a souvenir of an entertaining visit in Sonosphere.



Nofrontiere design philosophy

Our goal is to nurture a new public cultural awareness in which 'design' plays an integral part in stopping the watering down of content in mainstream media. The concept of human interactivity in design will take the expanded meaning of an educational polysensoric experience. No longer is the interface a series of commands to access content and no longer is content just the "heavy stuff" behind a cool design. They are a fluid experience pulling the user into an entertaining and educational public realm.

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papers

panel 6:

performative perception

the body as instrument

performative perception

the body as instrument

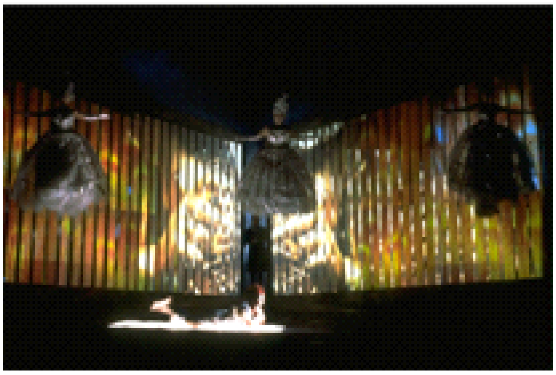
Is the utilization of digital technology on the stage a fundamental shift away from a text / score-based simple stage realisation? Is it a shift towards an emphasis on the permeability of form and towards the conscious manipulation and creation of perceptual processes?

What has become possible through working with moving images on the stage, is mainly the creation of time and space as performative processes - meaning that director and media artist together emphasize the constructed, the made and the provisory nature of the stage environment. This is in sharp contrast to the creation of time and space in a built set design, that has as its only possible moving aspect a highly sophisticated lighting design and equipment. Martina Leeker describes a co-operative workshops between theatre and media artists realised since 1999 show, that the performative use of technology can have today three functions in a cultural education of competencies in dealing with digitally supported realities. These are (1) the training of the body as a fluid medium, (2) the construction and the embodiment of a transitory identity and (3) the reflection of this human self-understanding, which is enabled by the ambivalence of the present concept of performativity, constituted on the one hand out of a contingent and transitive and on the other hand out of an intentional process of acting.

Christoph Rodatz' paper introduces the opera project «Parsifal – an opera for singers, musicians and wanderers» by Anja Diefenbach and himself. With the use of conventional low-tech they built an artwork, that generates and simulates network communication structures on a typical theatre stage. Main focus of the project is to question the established vis-á-vis of spectator and stage in theatre and to evolve a staging of «Parsifal», that deals with influences of new technologies on a changing attitude of perceiving media. In this paper I will discuss three facets of new technologies that influence our attitude towards perceiving media that are also incorporated in our artwork: first, structures of hypertext that oppose against linear narratives and perception; the growing aspects of process in using new technologies, that lets the spectator become an interactive user; the tele-presence as possibility of making the invisible visible and the un-present present.

Tanaka and Bongers portray creative and technical considerations on building a musical instrument to go across acoustical space and network space. Conceiving a musical instrument for heterogeneous space and democratic use requires implementation of diverse modes and techniques satisfying needs of tactile local presence, and tangible telepresence. The result is an artistic project destined for multi-site gallery installation and performance. It is a musical instrument that exists in the mixed realities of acoustical space and network space.

In face-to-face communications, the occasional need for intentional lies for Tosa in something with which everyone can identify. For example, when we get mad, circumstances may force us to put on a big smile instead of expressing our anger; when we feel miserable, good manners may dictate that we greet others warmly. In short, to abide by social norms, we may consciously lie, she thinks. On the other hand, she considers that signs our bodies expresses as communications (body language) could be interpreted as lie. Considering this phenomenon, she proposes a means to touch the heart in a somewhat Japanese way, by measuring the heartbeat of the "honest body" and using other technologies to develop a new code of non-verbal communications from a hidden dimension in society. She calls this "Meditation art" or "Zen Art.Zen" is Buddism style meditation.



performative memories

Thea Brejzek

Long before now ever present notions of the "performativity" of theatre have spread from philosophy into theatre academias, the notion of the "ephemeral" character of theatre has fascinated and disturbed academics and practitioners alike.

Romantic ravings about the uniqueness of the individual live theatre performance, producers` and directors` despair at the essentially unsatisfying results of trying to capture the live experience on audio or visual tape, were all concentrated on the entirety of the evening and thus on the entire ensemble - the bodies and voices of the performers, the orchestra, the conductor, the stage workers and, last but not least, - the audience's perception of it all.

With the utilization of digital technology on the stage, and here I will concentrate on the opera stage as my favourite playground as a director, a fundamental shift away from a text / score-based simple stage realisation towards an emphasis on the permeability of form and towards the conscious manipulation and creation of perceptual processes has taken place.

What has become possible through working with moving images on the stage, is mainly the creation of time and space as performative processes - meaning that director and media artist together emphasize the constructed, the made and the provisory nature of the stage environment. This is in sharp contrast to the creation of time and space in a built set design, that has as its only possible moving aspect a highly sophisticated lighting design and equipment.

Working in my own opera productions with a combination of projection of moving image and reflection of stage / performer/image out of and back into that image, I aim to present, highlight and contrast the presence of each stage and musical moment with its past and its future.

In creating a memory space, in which the performers' memory is but one part,

I am able to inscribe a kind of shifting, provisory, illusionary memory that may cancel itself out and overlay a new memory at any time.

Such a stage environment may be considered the physical equivalent of a space in which multiple performative processes occur. These serve to invent temporarily all parameters of perception: presence, past, future, touch and, most importantly on the stage, the parameter of proprioception - the perception of one's own body and of the bodies of others in the stage environment.

In accordance with Deleuzes "crystal image" concentrated in the mirror, the mirrors in my stage stories house memories. These are shifting memories that may be contradictory, non-linear, non-sensical even, that are invented and continually reinvented during the performance. On my stage, then, it is the singer's task to evoke the mirrors' memories with his body and / or voice.

The performers` movements might be tracked, in turn influencing the movement, angle and speed of an electronic mirror lamella system that reflects projected video imagery from both sides of the stage as well as from the performers body. The sopranos spatial and mythical memory thus becomes split and refracted and the presence of her body the catalyst for any changes in the dominating moving image as in my staging of "Ariadne on Naxos" by Richard Strauss. Premiered in 1997, for Opera Australia at the Sydney Opera House, this production will be restaged in 2002.

The singers' voice might be doubled, in an eerie interactive game with pre-recorded vocal sequences forcing her to react to real-time manipulations of her own voice as in my production of "Memoria Futura Bacon" (P. Ferreira Lopes/ Brejzek) premiered earlier this year at Schauspielhaus Vienna. Or her body might encounter her (projected) physical and musical alter ego in a semitransparent mirror and by controlling lighting states, the performer might "switch on" and "switch off" each encounter as in my staging of "As I Crossed a Bridge of Dreams" (P.Eoetvoes) Donaueschingen/ Paris 2000.

In each of these examples, memory has been inscribed onto a physical (Sydney/ Paris) or a symbolic (Vienna) mirror that in turn is reflecting and is projected upon. It is only the moving image that enables the inscription of performative memories, and thus the creation and continual manipulation of both external spaces and of internal, psychological states onto the stage in a temporal precision - of crucial importance in a live opera context, and a potential spatial dimension that is far removed from either the "naturalism" or the "abstraction" of a physically built set.

paper

figure

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Abstract

FIGURE is an interactive installation. Spectators are invited to take part in the formation process of the cinematic meaning. The interaction is based on the conversation between the moving body and cinematic elements. Spectators are photographed with the thermal camera. The image of the body is combined together with varying cinematic sequences by means of real-time video trick. The result is projected on the screen in the exhibition space.

FIGURE is part of my research project aiming at a doctoral dissertation at the University of Art and Design in Helsinki. The title of the dissertation is "Hypermontage - a Montage of the Interactive Moving Image", a study at the crossing point of media art and art philosophy in the framework of pragmatism.

According to Charles Sanders Peirce, the human existence occurs in a constant interaction between the human being and the world. Experiencing is cultural action. Philosopher John Dewey says that a work of art is not a separate object from the spectator. Art happens in the process of experiencing art. The art experience is the actual work of art.

I'm arguing that the formation of cinematic meaning is strongly dependent on spectator's interaction with the cinematic elements. I have applied a new concept of montage called hypermontage to express the enlargement of tasks and the character of film montage functioning in the interactive cinema.

Keywords: Pragmatism - Media semiotics, Film theory - Hypermontage

Project URL:
http://www.kiasma.fi/figure

FIGURE is also an online work to be seen in the Internet. The Internet audience can watch the real-time stream from a FIGURE installation space and view interactions between spectators and the cinematic elements of the work. The stream is activated and available only when the Installation is exhibited. Meanwhile the web site is serving the FIGURE demonstration video for the spectator.

Project Partners: FIGURE installation is produced by KROMA Productions Ltd, an independent production company for multimedia arts located in the Magnusborg Studios, Finland. FIGURE belongs to the Finland State Art Collection. The first exhibition of the FIGURE took place in the Porthania, Helsinki University, 28.9.-16.11.2000. The exhibition was organized by Kroma Productions Ltd. in collaboration with the State Art Committee, The Contemporary Art Museum Kiasma, Helsinki University and VTT. Production year: 2000.

Credits: Designer, director, producer: Marikki Hakola technical design, camera, editing: Raimo Uunila web design: Riku Makkonen technical installation: Epa Tamminen technical assistant: Miikkali Korkolainen production secretary: Jaana Hertell-Amokrane supporter: Finland State Art Committee, production company: © Kroma Productions Ltd.

FIGURE - Project Description

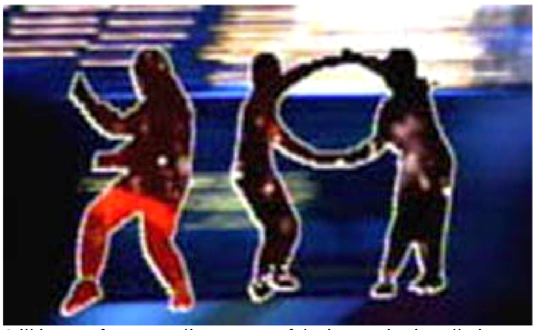
About FIGURE - thoughts behind the work

FIGURE emphasizes the impact of the spectator's personal history and previous social and cultural experiences on the interpretation. The basis for the cinematic structure in FIGURE is the interaction between the elements produced by the spectator's own body language and the visual elements of the work. The parts of the image collage have an impact on each other's contents, interpretation and in that way on the formation of the cinematic meaning.

FIGURE's user interface is the spectator's body heat. The work is produced by shooting the spectators with a thermal camera, which registers the heat and the movements of the spectator and transforms them into a video signal. The image of the thermal camera is combined by using a real-time video trick with two separate DVD-image collages which include varying cinematic sequences. The images created are projected on the white surface in the exhibition space. The spectator views his/her own image in the reflection as part of the visual world of the work. The spectator's play with the reflected image may start...

Most of the spectators of the work were students of the Helsinki University. I followed their performance and making of their own “natural choreography” with my own PC through the Internet online. People cannot be identified by watching the strongly processed image. However, it seemed that the body language of the spectators changed remarkably, when attending the space several times when she or he already knows the name of the game. I could clearly notice the differences in the body language of the “first attenders” comparing to the “heavy users and hangarounders”. The spectators familiar with the work did act in a very conscious way with the work and used their bodies for expressing their feelings or just having fun in an exceptional social situation. After the first surprising experience spectators seemed to start creating their own choreographical patterns related to one´s own social and cultural background.

Making a strongly interactive work of art like FIGURE makes me think of the essence of art and the role of an artist. I approach the theme believing that all works of art are interactive in their nature. A work of art needs an audience to exist in culture. In the case of FIGURE the dependence of the work of art on the spectator's experience and action is taken into extreme. FIGURE doesn't simply exist without the spectator's participation, not only by observing the work but also on a very concrete level of physical action. I hope the work provokes thoughts both on the changing character of work of art and the change in the roles of the spectator and the artist.



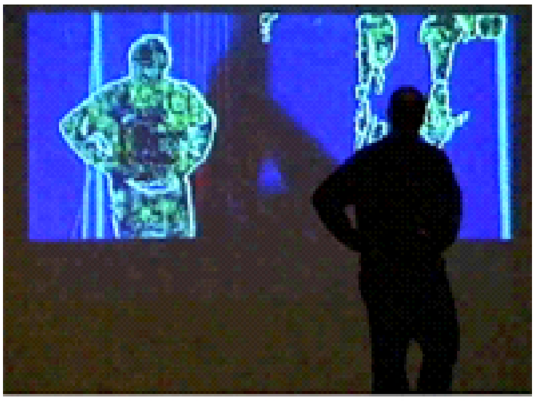
Still images from an online netcast of the interactive installation FIGURE 28.9.-16.11.2000 Porthania, Helsinki.

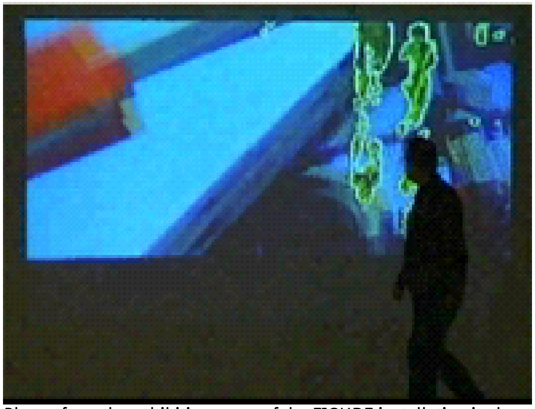
Aims of Research - Hypermontage

The montage of an interactive moving image

In my research, I study film montage in the special case of interactive moving image and as a creator of cinematic meaning. The development and analysis of new forms of montage enable us to understand the central issue of interactive expression in a broader sense – interactive narration. The issue of new forms of montage expands to a challenge to develop a theory of new interactive and non-linear film narration.

In a book Film as Art Rudolf Arnheim introduces principles of montage, which also include the main points of early Russian film makers and theorists Pudovkin and Timoshenko. In linguistic semiology pointed out by Jean Mitry and Christian Metz i.e., montage is defined as organizing individual audiovisual, cinematic elements into a linear unity. Through montage, the individual cinematic elements form together understandable, cinematic language. Montage is regarded as a kind of syntax of film, in which the organization of the audiovisual elements corresponds to sentence analysis or the linguistic code of a natural language.





Photos from the exhibition space of the FIGURE installation in the lobby of the Porthania, Helsinki University, Finland 28.9.-16.11.2001.

These linguistic theories of montage do not, however, extend far enough to cover the new forms of film narration due, on one hand, to the interactivity, on the other, to the non-linearity. Linguistics is an inadequate basis for studying the form of cinema expanding from time-related continuum to time and space-related and active experience. The research that concentrates on the linguistic essence of cinema and formation of meaning, is not enough to explain the complex cognitive action of interactive cinematic experience. It is not possible to outline the basis and motifs for the concrete action of the spectator, which is essential in understanding the interactive experience according to linguistic semiology.

If the concept of montage is used to describe the formation of cinematic meaning in interactive and the non-linear moving image, the concept of montage must be studied from a new perspective, expanding the concept to cover the problematics brought with the theory of interactivity.

An interactive film may be both linear and non-linear in its presentation form. Even though the cinematic material was organized in a non-linear form for the spectator, the experience of watching is always a linear process in time and space. On the other hand, human experience is always interactive by its nature. I study those forms of the interactive moving image where the existence or action of an audiovisual work of art is dependent upon the spectator's active physical participation, participation that surpasses that generated only on the level of mental experiencing.

The theory of interaction applies not only to the moving image, but to all forms of human expression and communication. The question of interaction is at the same time a larger question of human consciousness. This philosophical point helps us to study and develop the theory of interactivity in a larger cultural context, which is more important considering that different forms of expression are in a strong mutual integration process.

Neither the theory of cinema nor the theory of interactive cinema can be studied solely in the discourse of film theory because it most probably leads to a too limited definition of potential viewpoints regarding its future development.

Pragmatistic semiotics

An important support to my process of studies on the field of interactive cinematic narration is given by philosopher Charles S. Peirce. Peirce´s work, in my opinion, plays a significant role in developing a theory of interactivity. Peirce's pragmatism, semiotics and epistemological views open new, interesting perspectives on the study, especially regarding the cognitive and semiotic character of interaction and its relationship to the question of consciousness.

I have been studying Peircean pragmatism under the enthusiastic guidance of Peirce-scholar, philosopher Pentti Määttänen, whose work is of great significance to my studies. According to Määttänen, Peirce´s goal was to enlarge the concept of experience by means of action. In Peirce´s pragmatism beliefs come from our habits. The human being and the surrounding world are not separate entities from each other, but human existence occurs in a constant interaction between the human being and the world.

Also experiencing is not merely the perception of phenomena in the phenomenological sense, but is cultural action, on both a mental and a physical level. According to Peirce, the boundaries of consciousness are defined not only through perception, but also through action. This presumption is significant and interesting from the viewpoint of interactivity. Peirce's idea about action, as a marker of the boundaries of consciousness, is a fundamental condition for interpretations of information.

From the viewpoint of art theory, Peirce´s assumptions mean that a work of art is not only an object of perception and that the experience is not only an inner, psychological reflection, but that experiencing a work of art is a psycho-physical, cognitive activity. Furthermore, experiencing art is not solely a private, relative interpretation of an individual consciousness, but a collective, cultural and social co-experience, where both the artist and the audience are involved.

Peirce's writings have also had a strong influence on those of philosopher John Dewey. In 1934 Dewey published the book Art as Experience, in which he extensively studied the essence of work of art from the pragmatist philosophical point of view. According to Dewey, a work of art is not a separate object from the spectator. Dewey thinks that each art has its own medium and that medium is fitted for one kind of communication and language. Dewey asks where art actually happens and claims that art exists not in the object of art. Art is not oil on canvas or notes on a sheet of paper, neither is it light and shadow projections reflected on a white surface. Dewey thinks that art happens in the process of experiencing art.

The conclusion is that the art experience is the actual work of art, and the work of art happens in an interaction between the human being and the object of art. The interpretation of an art experience is ultimately always a process happening within the spectator. There is, however, a great difference between the work of art whose existence requires physical and concrete activity through a human-computer-interface, and the work of art where the spectator's physical performance is not needed.

Hyperformat multimedia works are primarily a result of the user's concrete, physical action. Without this physical experience, the mental experience would not be possible either. An interactive cinema producer has to take into account, besides the mental interaction, also the physical performance and involvement of the spectator.

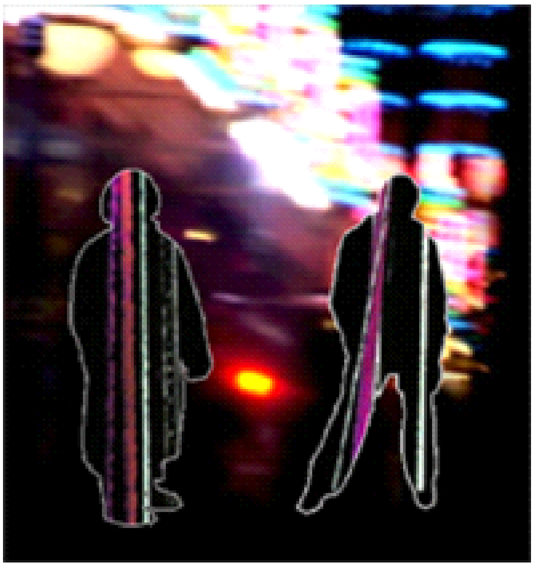
Hypermontage

Following the ideas of Peirce and Dewey, we can argue that the formation of interactive cinematic expression, and the spectator's interaction with the work, happens in the first instance through montage. Montage is, in a semiotic sense, an essential key to the formation, processing and interpretation of cinematic meaning. The question is, what kind of concept of montage is needed when montage becomes an essential part of a human-computer-interface?

I have applied a new concept of montage, which I call hypermontage, to express the enlargement of tasks and the character of montage functioning in multimedia. Hypermontage is a concept for construction and modeling audiovisuality in a virtual space, and a semiotic interpreter of the cinematic human-computer-interface. Hypermontage is a formation of meaning in a non-linear information context.

Hypermontage works both in time and space. In a non-linear moving image, the content is organized by the means of hypermontage into a kind of action-space. This action-space forms the cinematic architecture of multimedia. It may contain time-based, cinematic elements, as well as other forms of information, such as spatial elements and text. The action-space awaits and allures the spectator into interactivity. The spectator's physical action is a fundamental condition of interaction with the work for establishing the levels of experiencing and interpreting it.

Hypermontage is a tool for producing and processing the cinematic meaning of the moving image in a complex, multi-layered multimedia. The maker of the non-linear moving image is no longer "the master of the universe" of her/his work. And the spectator is not anymore just the one watching or perceiving the work of art. Depending upon the character of the work and the diversity of interaction, the spectator – or interactor – is more or less the co-author or co-maker of the work. This does not mean that the responsibility of the artist is diminished. It means rather that the artist's role, tasks and challenges are changing radically from those of the individual thinker or "art transmitter" to those of one elaborating the levels for participation in a social experience of art.



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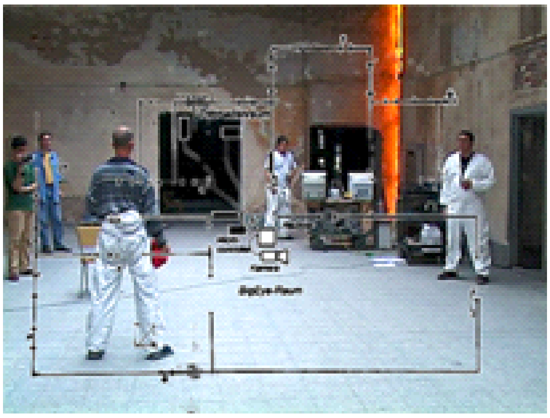

interdisciplinary workshops between media and theatre

artists as a means of cultural education

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Abstract

Co-operative workshops between theatre and media artists realised since 1999 show, that the performative use of technology can have today three functions in a cultural education of competencies in dealing with digitally supported realities. These are (1) the training of the body as a fluid medium, (2) the construction and the embodiment of a transitory identity and (3) the reflection of this human self-understanding, which is enabled by the ambivalence of the present concept of performativity, constituted on the one hand out of a contingent and transitive and on the other hand out of an intentional process of acting.

Keywords: Technical history of man, performativity of technology, performativity of performance, transitory identity, transitory body

Year the work was created: Summer 1999, Festspielhaus Hellerau, Dresden/ Germany (artistic direction: Martina Leeker), Summer 2001, Choreographisches Zentrum, Essen/ Germany (artistic direction: Söke Dinkla, scientific research and viewing: Martina Leeker).

Project partners: Europäische Werkstatt für Kunst und Kultur Hellerau e.V., Choreographishes Zentrum NRW and transARTES Berlin, Academy for Live Arts, Media and Culture.

Introduction. Why and how intersecting live art and technology?

For the conceptualisation of interdisciplinary workshops between media and theatre artists a development in the actual cultural situation became crucial. We can observe since the 1995th in media theory and in the arts a new definition of mediality as performativity (Sybille Krämer, 1998b). Technology and media are seen as auto-generated systems, which cross through human communication with their own materiality (Sybille Krämer 1998a).

The encounter of theatre and digital-electronic technology in the actual cultural and discursive context is legitimated and interesting because of two things. By dealing with technology bodily the interdisciplinary workshops firstly should give us more and deeper knowledge about the redefinition of the human effected by technology - especially concerning the perception of the body – by this - and the techniques of constructing self-representation and identity. The interdisciplinary workshops between theatre and media artists should give secondly inputs to the question, which functions has the encounter of performance performativity, which is still linked to the intentionality of a performing and acting subject, and the performativity of technology, which is subverting these intentions by his technological independence.

Aims of research

In this context two series of workshops had been realised, 1999 in Festspielhaus Hellerau/ Dresden and 2001 in Choreographisches Zentrum Essen. Both have been financed by the German Federal Ministery of Education and Redearch.

The workshops had two aims.

Firstly is was intended to research prototypes for the education of theatre artists in dealing with new technologies.

Secondly it was the aim, that these prototypes shouldn't be only an education for theatre artists about technology and its possible artistic use, but also an exemplary research on the interferences of live art and technology for enabling and training a self-understanding of culture.

Project Description. Performativity of technology and of performance in interdisciplinary workshops

The two workshops had different structures. Two formats of the education were tried out.

In the workshop in Essen theatre people had been informed by one aesthetic of using technology as a kind of prototypical format. This could be organised from the viewpoint of a media artist, who wants to share the experience of performing art as - for example - spatial imagination with the normal public by the help of interactive, mediated spaces. Or this could be from the viewpoint of a theatre artist, who wants to use the specificity of digital technology in creating and processing mixed reality or telematic stages for a live performance in a traditional theatrical setting.

The workshops in Hellerau had been part of a summer academy, in which the interferences of live art and technique had been researched in a 3 days seminar/ symposium. In the practical ateliers the education was organised as a co-operative research of media and theatre artists, in which both art forms influenced each other and came to a transfiguration of their traditions. The practical work was referred by mediators/ dramaturgs to the theoretical inputs of the symposium. By a documentary group it was tried out to find formats to reflect the intersecting of the technical and the human.

In the following description of the workshops they will be discussed under systematic, content orientated viewpoints concerning the effects of performativity of technology and the possibility to reflect it as a new way of technical history of man by treating it with performance performativity.

Co-operation of theatre and media art as intersecting the human and the technical in the new format of performativity of technology

a. The co-operation of theatre and media artists for dancing installations (Workshop with Gretchen Schiller in Essen)

The media artist Gretchen Schiller (Canada, France) and the computer artist Robb Lovell (USA, Canada) proposed a workshop in which dancers learned to build interactive installations with computer vision systems. With these systems, detecting and analysing the movements of a visitor, a video-output was triggered. The videos were filmed and composed according to the aesthetic, that the images evoke movement in the viewer. The aim was to share with the normal public the experience of a dancer concerning a connected relation to space, which is that we are – in reference to the French philosopher Merleau-Ponty (Maurice Merleau-Ponty, 1964) - an integral part of the environment, moved by space and moving it.

Figure 1: Presentation of the interactive installation of one group in the workshop from Gretchen Schiller in Essen. (Foto: Clemens Richert)

In the workshop the dancers and choreographers learned how to deal with digital editing, how to program software for processing data from movement (VNS, BigEye, Eyes) and how to build and install the hardware of an installation (video camera, projector, props as boxes, stages).

One of the interesting points in the working process was, how dance experience and the technical possibilities in the mapping of movement influenced each other. Robb Lovell, having himself an education in dance, mentioned, that in the software like VNS and BigEye the three dimensions of human movement could not be mapped by the technical propositions of the camera. For the dancers, understanding via the workshop these propositions, it became interesting to create a choreography which is based on the movement recognition of the camera such as distances, velocity and differences. By this a new aesthetic of movement and dance could be worked out, which would not be possible just by the imagination of the dancer but only by his inspiration of a digital system. On the other hand it became interesting for the co-operation of dancers and computer artists to work out a software, that is able to adapt the possibilities of software and digital video-cameras to the recognition and processing of three-dimensional movement. By this process dance would inform the development of technology.

This co-operation was only possible, because dancers and media artists got an understanding of the art and the techniques of the other by working closely together. They started to learn to speak one language. This "language " deals with the way, how human movement is influenced by what is detected by a camera and processed by a computer and it deals with the way, how man understands human movement and give it to a computer. In the co-operative exchange of art and technology it became more clear and visible how human movement as the basis of experience of environment and self is constructed technically and how the self-understanding of man informs or even limits technology. The human-machine-interaction is one of de/construction of self and world. The performance of this interaction is for the embodiment of this de/construction.

The construction of self is specified in Gretchen Schiller's approach to mediated spaces. With her concept, in which body and outer space are synthesised to one interrelated moving architecture, the tradition of a clearly limited body and self is intrigued. The mediated space is – in allusion to the actual concept of performativity of technology - a performative one, a space of transitory and unpredictable situation. In the performative intersection of the human and the technical a state of permanent bodily and psychic disorientation and the disturbance of intentional actions become the new state of identity in digitally supported environments.

b. Dance as an interpretation of virtual spaces (Workshop with Wayne McGregor in Essen)

The dancer and choreographer Wayne McGregor (GB) proposed a workshop with two topics. On the one hand dancers and choreographers learned choreographic strategies to dance in and with remote virtual spaces. To do so the stage in the workshop was built out of a real space with real dancers and the projection of a remote stage and the video image of remote dancers. On the other hand the participants worked with software for movement animation as Poser and LifeForms, which had been used to inspire choreography.

One of the interesting points in the workshops was McGregors use of LifeForms. In contradiction to Merce Cunningham's use of this animation program (Sabine Huschka 2000, Kerstin Evert 2000), who composes with the figure of a dancer in the program a sequence of movement, that the dancer is asked to dance, Wayne McGregor uses the program only as starting point for a working process of indefinite transfigurations. McGregor takes the abstraction of the figure's movement in the program, in which it is dissolved in flowing lines and intersections of lines. These images have been used as inspiration for movements in the vision of a "full space". To create this full space for the dancer and the public the dancer is asked to construct in the floating lines of the animation program a three dimensional "negative space". To come to this, the dancer concentrates first of all on the space between two lines, imaging it as a shape, that could be put into the real room as a three dimensional case, who's shape and volume he can show and fill with his movements.

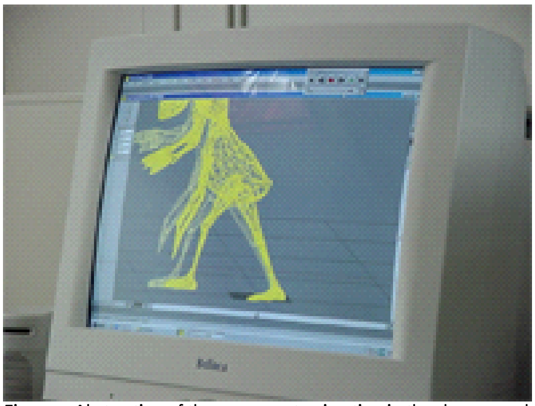

Figure 2: Abstraction of the movement animation in the choreography program LifeForms, used in the workshop with Wayne McGregor in Essen. (Foto: Clemens Richert)

In McGregor's dance human movement and the conception of space are informed and inspired by a digital system and imagery. That is to say, that the human is intersected with the technical. At the same time the technical is interpreted by human movement. This is done, when McGregor puts the technically inspired movements either on a stage, where images and architectures constructed by a computer are projected, or if he integrates a choreography directly into the internet. Now the movements of the dancers become the interpretation of a digital, virtual space. Only by this the internet is interpreted as a full space, full of data and networking systems. And at the same time, the imagery and the body-feeling of the human is intersected with the technical possibilities of mapping and transporting movement via digital and telecommunication technology.

The human mind and cultural discourse are defining technology and vice versa. Technology is made understandable to man and at the same his range of perception is changed to new forms and concepts. With the dance in an invisible and imagined space the dancers put forward a method and a body-feeling for the co-operation in virtual spaces and enable thereby the development of strategies to move and to find orientation in mixed realities in a networked situation. At the same time McGregor is working with his concept of a full space of networked lines and intersections on a new understanding of body and self, being as fluid and changeable as the flows of immaterial data.

New notion of performativity and the creation of a transitory identity

a. Performative co-operation in a remote space and the constitution of a transitory body and identity (Workshop of Paul Sermon in Essen)

The media artist Paul Sermon (GB) proposed a workshop for the co-operation of partners in remote spaces, that are linked via telecommunication technology. He wanted to research with dancers, what will be the specific input of dance in these spaces.

The most important in the aesthetics of Paul Sermon in telematic performance is, that he doesn't treat technology as a mean to overcome long distances by telecommunication and to extend the human body by the help of avatars in a virtual environment. This concept is linked to the media theory of McLuhan (Marshall McLuhan, 1994), which is read today as an anthropomorphic concept of technology (Georg Christoph Tholen, 2001). Sermon is on the contrary interested in a concept of telematic, in which the telecommunication technology is treated in a non-anthropomorphic way as an ensemble to create worlds, that are not possible without it (Sybille Krämer, 1998a), but to which the human is related for example in performing with it. According to this concept the users in Sermon's installations co-operate in a remote virtual space and are confronted by this with a double body composed out of their physics and the "body of data" (the video-picture in the remote space), which are in contradiction to each other. This contradiction is created by means of the technology of the video camera, which is not mirroring the human body, but which is mapping it with the view of the other. That is to say, that a movement of the body from left to right in real space is shown in the projection medium, for example a monitor or a screen, to the left side. Asked to co-operate in a remote, third space, created in a monitor by the technique of chromakeying, in order to dance a duet, the actors are completely disorientated.

This use of technology is a work on concepts for a transitory body and identity. Because by relating the body to a body of data the physicality of the "real" body is questioned as a solid reference. Disorientated by the technologically constructed body of data the real body is decoded as an effect of cultural and technical based performances. There is not the one body with a kind of natural feeling, but the body-feeling is the product of habitualisation. By this the idea of a fix identity and self are intrigued. The tradition to develop a solid human self-representation by the mean of a non mediated body as the essential point of reference is interrupted. If the body is deconstructed as a fluid and transitory medium, the fix self in this body becomes a cultural construct also.

Figure 3: Performing with remote places with chromakeying on the monitor and on the screen in the workshop with Paul Sermon in Essen (Foto: Clemens Richert)

For Sermon technology obviously enables the creation of an artificial world and it is not the reproduction of human face-to-face communication. In this sense he proposes a performative approach to technology as a new form of communication, co-operation and existence in remote spaces with mixed realities. This kind of performativity is specified as actions of a auto-generated virtual body, that is from another world, intriguing by performing ideas of intentionality and shifts anthropomorphic interaction towards performativity. By this Sermon deconstructs on the one hand the idea of a technical history of man, in which he identifies himself with his technological extension. On the other hand Sermon works on the discursive and practical construction of a transitory body and identity as a prototype of relation to digital media, which seems to be the discourse and its psycho-physical adaptation for the new technical history of man..

Dancing in this remote third virtual space makes a precision on this new prototype, because it emphasises the experience of disturbance of the so called real body. Whereas the non-dancing attitude to the third space is like a pantomime play in a black theatre, that is based on a anthropocentric co-operation of real and virtual, the dancing consists of an architectonic montage of the real and the virtual, in which the boundaries between them are not always clear. They are on the contrary forced by the dancers moving through each other images into the fluidity of a performance.

b. From interaction to performativity of technology (Atelier "Interactive Performances" in Hellerau)

In the experimental research in the co-operation of theatre and media artists a shift form anthropocentric interaction to performativity was created. In the atelier "Interactive Performances" with Thomas Gerwin (Germany), Robert O'Kane (USA, Germany), Daniel Aschwanden (Switzerland, Austria), Claudia Bosse (Germany, Austria) and Harald Begusch (Austria) the computer vision system BigEye was no longer used as mean of human-machine-interaction, in which man and machine are relating to each other. On the contrary, it was reinterpreted and treated as a performative, auto-generated machine for processing data in an archive of dramatic plots.

The idea of the computer as an archive (Sybille Krämer, 1997) influenced the behaviour of actors in the performance. They didn't play a scene, but they transported plots from on place to another, being a point of intersection for the network with other messages and plots.

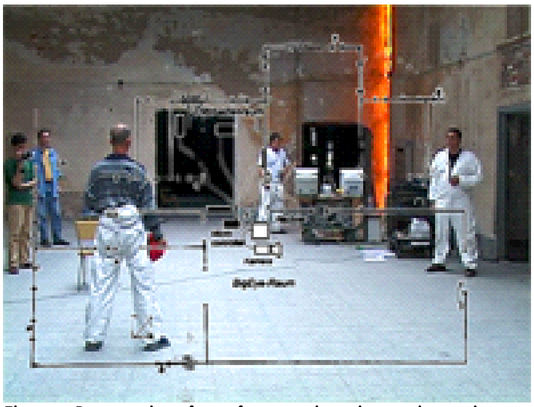

Figure 4: Presentation of a performance in an interactive environment of the atelier "Interactive Performance" in the summer academy in Hellerau (Foto: documentationgroup summer academy, Montage: Irina Kaldrack)

This shift from interactivity to performativity influence concepts of subjectivity. The actors didn't express themselves or represent a figure. Both forms of acting are strategies from theatre to construct an inner self, a personality. Being a "transporter" of plots disturbs this notion of an inner, private space and creates a psychological existence of being a part of an outer cultural archive, that is linked to the body without a deep and authentic personal confirmation.

c. Media in performance and the loose of subjectivity (New form in Jo Fabian's theatre after the workshops in Hellerau)

The choreographer and director Jo Fabian (Germany) refused during the workshop in Hellerau the integration of interactive system into theatre. Two years after the workshop he created a performance based on interactive systems and dealing with interactivity in theatre. In the interrelation of theatre and technology it came to a transfiguration in which both constituted a new form of performativity. Fabians theatrical form was changed by the technology form the reproduction of a fix piece to the unpredictable of an open situation. The technology was changed by the performative use from being a system for human communication or interaction to a simple technical system of processing orders and effecting the control of human behaviour and the restriction of perception.

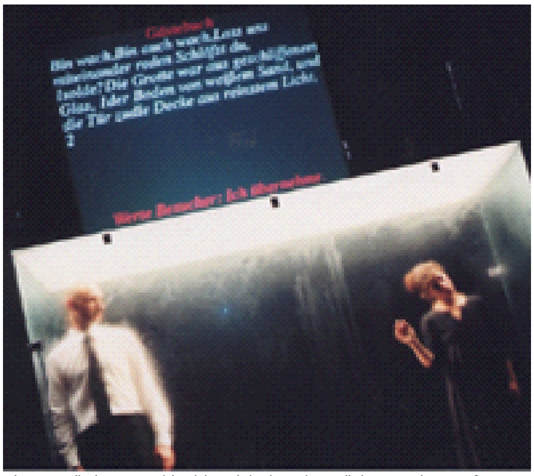

Figure 5: "tristan und isolde. nicht berühren.", interactive performance by Jo Fabian, with Annegret Thiemann and Ralf Kittler (Foto: Andreas Stirl)

In ”tristan and isolde. don’t touch” the visitor can interact with the actors via the keyboard of a computer. The dancers translate the written phrases into movement via the so called ”Alpha System”, in which every letter of the alphabet is coded in a movement phrase representing the graphical architecture of the letter. The problem of the visitor’s interaction is, that by making the dancers move he is hiding what he came to see, the performance. That is, because the dancers are enclosed in a glass case. By dancing the glass of the case got tarnished by the breath of the dancers. The interaction of the former public interrupts communication.

This experience has a deep influence on the concept of self. The visitor is mingled in a dramatic conflict with himself. He wants to see the performance and these intentions destroy it. At the same time this interaction is the performance and the only thing he can see and what he paid for. The visitor discovers in this conflict, that even his personality may be a kind of construct of decisions. Put into another architecture of decisions, which is linked to another situation and his person my be another one. His identity and personality becomes just a selection in an ocean of possibilities. The self seems to be a performance of conflicts and settings and the ”Me” is a performer in the archive of unknown possibilities. Realising one means to loose another one but it doesn’t mean to become an authentic self.

Conclusion. Intersecting performance and technological performativity as a form of cultural education

1. The workshops give answers to the questions, which effects the new understanding of technology as performativity has concerning the human self-understanding. By the shift to performativity of technology (Sybille Krämer, 1998a), the concept of body and self is affected profoundly. In the performative use of technology they became elements of permanent transformation. Man will never get to know himself as an authentic entity, he is always the other. The workshops clearly showed, that the actual self-understanding of man comes out of the intersecting of human knowledge and technical possibilities, which created a new format of technical history of man (workshops Schiller and McGregor).
2. The workshops showed, that within the shift to a new concept of performativity the specific function and effect of the encounter of live art and technology is double. The encounter leads to the construction and embodiment of a new fluid and transitory identity (Martina Leeker, 2001) and – at the same time - it remains moments of a subjectivity by performing, which gives the feeling of directing and controlling and by this of sovereignty. This feeling of subjectivity is generated by (1) the possibility of making decisions (Jo Fabian) and (2) by the confrontation with open situations, in which one puts one’s own imagination (Paul Sermon) and (3) by identification/ differentiation by embodying an outer, cultural archive (Atelier: Interactive Performances). In this ambivalence the performative use of technology gives us by means of the confrontation of performing and being performed the possibility to come to a reflection of our mediated existence. In this way this use can be like the training in the creation of subjective points of reference and orientation in the flow of data and technological performances.
3. In this way the interdisciplinary workshops between media and theatre artists are a method to enable a self-understanding of culture for artists and for the normal public.

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paper

simulating net-structures in theatre.

the cyberstaging of richard wagner's "parsifal"

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Abstract

This paper introduces the opera project «Parsifal – an opera for singers, musicians and wanderers» by Anja Diefenbach and Christoph Rodatz. The most prominent of this project is, that with the use of conventional low-tech an artwork is built, that generates and simulates network communication structures on a typical theatre stage. This is achieved by fragmenting Richard Wagner's Gesamtkunstwerk into parallel sequences of action and letting the spectator become a flaneur wandering through audiovisual spaces. Main focus of the project is to question the established vis-á-vis of spectator and stage in theatre and to evolve a staging of «Parsifal» that deals with influences of new technologies on a changing attitude of perceiving media. In this paper I will discuss three facets of new technologies that influence our attitude towards perceiving media that are also incorporated in our artwork: first, structures of hypertext that oppose against linear narratives and perception. Second, the growing aspects of processuality in using new technologies, that lets the spectator become an interactive user. Third, tele-presence as possibility of making the invisible visible and the un-present present.

Project URL:
http://www.ipsi.fraunhofer.de/~rodatz

Project Partners:
Anja Diefenbach.
Wagner Forum Graz.
Bühnen Graz.

Introduction

Analyzing actual German theatre it can be observed, that next to conventional and traditional settings more and more productions and artists refer to new technologies. For instance Stelarc [1] or William Forsythe [2], to name only two of them, very specifically reflect structures of new technologies and use them. Next to these projects there are also stagings where a connection to new technologies is not very obvious. More in terms of changing dramaturgy, structures and of digressing from the normal one can find the connection to new technologies. In this second category I would set my own work.

My goal is to analyze a changing attitude of perceiving media which is forced by the influence of new technologies. My main question is how theatre can react on these changes and how the established vis-á-vis of spectator and stage can be reorganised. How for instance can theatre react on fragmentation or non-linear narration? How can theatre take up the changing perception of a lonesome computer user in front of his screen? How can it adapt to the visual flaneur who wanders through computer networks and withdraws from the mass, seeking for free information and products?

In this paper I will discuss three facets of new technologies that influence our attitude towards perceiving media and which are incorporated in our artwork: first, structures of hypertext that oppose against linear narratives and perception. Second, the growing aspects of processuality in using new technologies, that lets the spectator become an interactive user. Third, tele-presence as possibility of making the invisible visible and the un-present present.

Hypertextuality: walking through theatre

Hypertext structures have a strong influence on the way of perceiving all linear media. Reading a book, watching a movie have changed since the invention of remote controls and the highly availability of CD-Roms and Internet. How can theatre react on this change? Within opera the music makes it almost impossible to fragment the chronological flow. The fundamental source of classical opera, its score and libretto are too tight and sacred to its origin as if a director would make an attempt to manipulate them. But also the static position of the audience in front of a stage makes it impossible to zap or to have more then one perspective.

That's the reason why we were looking for an established possibly old fashioned structure, which should be accepted by the theatre audience although it should not belong to the traditional repertoire.

We were looking for a structure, that could be flexible experienced. We were looking for an open structure with plenty of space for associations, without constriction or even exclusion. At the end we were looking for a structure outside Cyberspace which, like the Internet, can include a variety of media and owns hypertextual qualities.

We found the museum. Its way of organization and structures offers an extraordinary common ground for our request. The museum as traditional but still very present concept of presentation can be understood as real-spatial hyperstructure. The visitor is independent. He can walk through diverse connected spaces of information. It is up to him how long he stays and where he goes. But also its architecture is related to hypertext structures. The single rooms are mainly staged in a self-contained manner. Their task is to draw the visitors attention to special aspects within context.

In our opera project Parsifal01 – an Opera for Singers, Musicians and Wanderers we therefore developed a concept in which the museum serves as a basis of organizing stage and auditorium. Figure 1 shows the fundamental idea of our staging, which was to separate the auditorium from the stage with the iron curtain throughout the entire performance. As concerto version the opera «Parsifal» is broadcasted as live stream from behind the iron curtain where the singers are placed. A video projection onto the iron curtain supplements the acoustic level in the auditorium. On stage however a museum is set up, dealing with the myth «Parsifal». The visitor is free to travel between both locations.

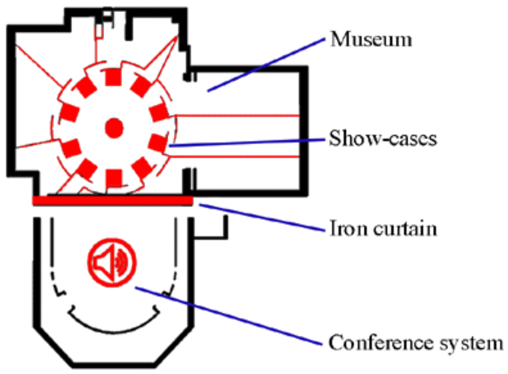

Figure 1: Floor plan of «Parsifal01» at Schauspielhaus Graz.

The museum space is divided into an open revolving space and ten exhibition spaces. Within the borders of the revolving space ten glass show-cases are located with the performers acting inside. The scenic action is reduced to the responsibility of singing and to tell individual stories in between their pause of actions. Outside the revolving stage area ten exhibition spaces are designed. art installations visualize topics of «Parsifal» in an associative manner. Choir and orchestra are located in their rehearsal rooms. These are also accessible by the audience.

Musicians, singers and conductor, are connected via video and sound technology in order to receive their rhythmic guidance. All musical levels meet in the auditorium as uniform soundtrack. In case the visitor wants to face the individual performer in his show-case, he then can find his way through the theatre building to the established museum on stage. The used technology does not only serve to overcome distance between audience and performer. On the contrary, it should fragment Wagner's hermetic Gesamtkunstwerk to a spatial heterogeneous, single parameter happening. With the aid of audio visual technology two different models of presentation, theatre and museum, sending out and just providing information are translated in to action at the same time.

Our concept is aiming for a link between theatre and museum as well as theatre and hypertext structures. From the beginning it was of importance to us to give the audience the possibility to opt among a traditional and hypertextual approach. The traditional approach, even if only in concerto, is there to provide traditional and known settings and thereby to give guaranty. The museum approach is our way of translating Cyberspace into 'real-space', of making modes of functioning of new technologies accessible for the theatre.

Processualty: zapping through theatre

The term of interactivity plays a major part in theatre. The only question for us is which new modes of interaction can eventually take place within theatre? Within the traditional dialogue between spectator and actor the interactive part is reduced to an awareness of the moment. Ones own subjective space can be opened while watching. For this reason interaction often is forced by the use of direct physical and verbal confrontation with the audience. It can reach the level where the spectator becomes part of the performance. But also very often performers penetrate the fourth wall of stage. This is a quite offensive way to demand interaction, with the danger of uncertainty and restrictions of receptivity. Nowadays in the world of computer games and Internet, the spectator demands his safety in front of a screen. Not only because it is more convenient for him, but also because in dialog with the screen he has the power to decide who is to be contacted and even when to interrupt the link. As spectator these possibilities let him become a zapping user.

A further approach – which tried to establish these possibilities - was tried out with our staging of «Parsifal02» in Graz in June 2000. In our changed concept we had to find a substitute for the museum, which we found in the use of conference technology. It gave us the possibility to exchange the physical action of walking, with the introduction of zapping into theatre. As in figure 2 shown, each member of the audience was equipped with headphone and receiver. He could permanently choose between five audio channels. At the front stage five show-cases where place, where the actors of the second act of «Parsifal» where seated. Only when not singing the actors came from the back to the front of the stage, to have a seat in the show-cases. During their stay inside they had the chance to tell stories concerning their life, their attitude towards our staging or «Parsifal».

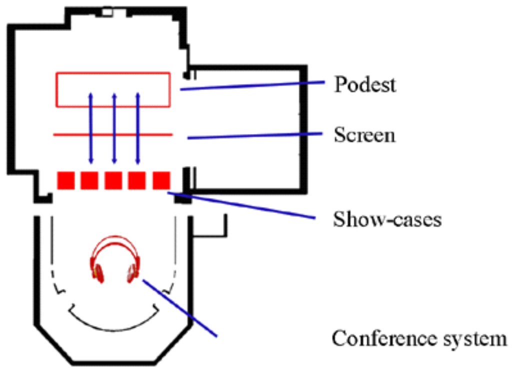

Figure 2: Floor plan of «Parsifal02» at Schauspielhaus Graz.

Similar to the zapping through television channels our spectator had the chance to zap between the storytelling of five performers. This mode of activity reinforces participation beyond catharsis. More strongly it gives the audience the feeling of missing something and therefore having a lack of information. After the performance the discussion was not only about what one had seen but also what one had missed. Although the audience had experienced the original opera soundtrack it also had experienced additional information which Wagner could have not included. So with the aid of the conference system a much broader spectrum of information was retrievable.

Figure 3: Klingsor (Hendrik Böhme) at work

But not only zapping as reduced form of interactivity has an influence on the way of perceiving media. Also the change of attitude towards visual surfaces has its share. The screen has become a diverse surface between consuming and active process. The screen –used as synonym for stage, movie screen, television or also display – has always been a medium of physical passiveness and consumer based reception. Since the introduction of the remote control and finally the computer this has changed. The worldwide growth of monitors on the working desks and thighs, has brought about a change. The screen is tool and entertainment hall at the same time.

Performative process for the fine-arts, but also for the theatre has to be seen in connection to the development of the performing arts since the 50ties, where primarily fine artists stepped out of their studios to make their working process visible to the audience. Not the originating artifact, but the temporal process of action of the present body is exhibited. Especially working process of the artistic is shown. But the growing establishment of processual actions within current German theatre practice should also be seen in connection with the linking of consuming entertainment and working with the computer.

The possibility of interaction with technical interfaces - likewise in games and maintenance software, at leisure and work, the demand of activity with the use of screens gets stronger. The emphasize is growing to a lesser extent on the intention to escape into a space of narrative illusion. Zapping through TV channels or surfing within hypertext supports decentralization. But also traditional dramaturgy of narrative is being fragmented by privileging performative structures.

In «Parsifal02» we established according to traditional performance-art a system of rules. Next to the cues when to sing given by the conductor, our actors also had particular places where to sing or not to sing. So the action, given through the libretto, we widely tried to fade out. For us the actor as embodied producer of sound stood in the foreground. Our goal was to arbitrate the process of singing as important product within Wagner's opera.

In addition to the jet mentioned conference system and the five show-cases located on the front stage area, in our staging of «Parsifal02» in Graz, a large screen floated above the show-cases. Pre-produced video projections and the life recorded portraits of the singers are projected onto the screens. The performers, when singing, were located on the podium at the backstage area, facing the recording video camera. Due to the show-cases - restricting the view - and the low lighting, they where hardly visible to the audience.

We had given the task to reduce the mimic by preserving the maximum quality of the voice. Aim was to eliminate extensively the interconnection of music and performance which was planed by Wagner, in order to only portrait the performers work on stage. During the pause of singing this intention was supported with the actors sitting in their show-cases and telling about their work as singer. Insofar the individual biography was told by each performer, from the delicate childhood in Denmark as adopted son, with an illusionary portrayal of his mother being a German opera diva or telling about the process of rehearsing «Parsifal02» in Graz.

The usually with symbolism as well as pathos afflicted and plot oriented opera action was to be eliminated to emphasize the action of singing and the performer working for his audience. The almost exclusive tele-present faces on the screen, waiting for their cue, moisten their lips or singing their part, intensively put across the process of the physical presence of singing. Where as the actors placed in their show-cases, mediate the private individual, who is spending his time with narration while waiting for his entry.

Tele-presence – (in)visible in theatre

The last issue, which for us is related with transformation of Cyberspace into theatrical real space, is that of tele-presence. Internet and media of telecommunication nowadays strongly refer to audiovisual communication. At least UMTS is currently praised as standard that likewise mediates sound and image in real time. But in general, new technologies are principally used for the mediation of information, whose sender is always present within the information and thus not present - tele-present. For our staging of «Parsifal02» the issue of real personified presence of the actor on stage and simultaneous tele-presence on screen was of great importance. Therein we see the textual closeness to Wagner's work.

Friedrich A. Kittler, particular known as German media philosopher, has described Wagner's musical drama in his essay "Weltatem. Über Wagner's Medientechnologie" [3] as the first attempt of creating mass media in its modern terminology. He describes the motif of the breath as part of Wagner's oeuvre. To him Wagner lets breath become the embodiment of sonic space, which is even capable of appearing in score and libretto. Kittler describes this for the life time of Wagner as a new symbiosis. He calls this "materiality of music dramatically data streams" [3, p. 94], whose origin is based „on the intensity of life in diaphragm, lung, throat and mouth" [3, p. 96]. Therefore Kittler says, singing is the last and important transformation of the breath. In so far this it is not surprising, that in Wagner's work sonic space is playing an important role, where the breath expresses the physical expressions. And as Wagner did not only hide the conductor and orchestra, he also mentioned his plans of an invisible actor. "This and all others of Wagner's Leitmotivs are inhabitants of an 'absolute world of hearing', as Nietsche has recognized clearly." [3, p. 103]

Out of this reflection Kittler now draws the conclusion, that finally with the possibility of an invisible orchestra and actor a technical visibility like within film gets possible. "A sonic space, in which thanks to its feedback, the old fashioned visibility of the actors bodies become obsolete, enables the parallel treatment of the new, namely the technical visibility of film." [3, p. 103]

William Gibson gives us his definition of Cyberspace when saying: „Well, you know, I think in a very real sense Cyberspace is the place where a long distance telephone call takes place." [4] Translating metaphorically Kittlers version in the way, that it can be applied to Gibson, one must say that in Wagner's operas long distance phone calls take place. Only that Wagner overcomes the disadvantages of mediating information technically, with acoustic perfection.

This we made use of. Our performers although corporal present where in big distance to the audience. And also the show-cases interfered with the view. Primarily with the aid of video technology their portrait was brought close to the audience. The link between the 'sound producing body' and the video projection highlighted the portraits of the singers as working process. Slightly invisible our, performers where made visible via video.

Conclusion

Finally one can say, that our approach of simulating net-structures in theatre, reconfigures three theatre standards. First, the architectural structure of theatre is being redefined. The spectator becomes an active visitor of a museum. The stage looses its claim of being visible and all at once seen by the static spectators in their seats. Second, we change the way of perceiving the opera, without leading the spectator in a structure where he gets lost or is disorientated. We even achieve a structure which enlarges the content of the original opera. Third, we change the attitude of the actors. They lose their common setting which surely influences the intensity of acting. Being caught in a show-case or projected as close-up on a huge screen isolates the singer.

All this is part of living in mixed realities. And it shows that for theatre its impact on the architecture, spectator and actor is of most intensive concern. Important to me is, that all these radical intrusions are not meant provocative like it was in the end of the sixties. They are a reaction on changing attitudes and great demands of spectators on media. And that's why they are appreciated and not dammed.

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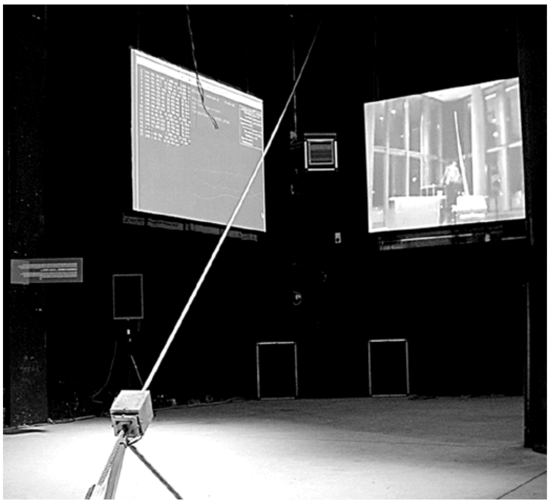

global string

a musical instrument for hybrid space

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Abstract

Creative and technical considerations in building a musical instrument to traverse acoustical space and network space. Conceiving a musical instrument for heterogeneous space and democratic use requires implementation of diverse modes and techniques satisfying needs of tactile local presence, and tangible telepresence. The result is an artistic project destined for multi-site gallery installation and performance. It is a musical instrument that exists in the mixed realities of acoustical space and network space.

Keywords: Network music, sensor instrument, gallery installation

Project URL:
http://www.sensorband.com/atau/globalstring/

Year the Work was created: 1998 -2000

Project Partners: GMD, WDR, The Daniel Langlois Foundation, V2, Ars Electronica Center

Introduction

1.1 Overview

Global String is a multi-site network music installation. The idea was to create a musical string (like the string of a violin or guitar) that spans a large geographical distance.

The installation consists of a steel cable (12mm diameter, 15m length) connected to a virtual string on the network. The real part of the string stretches from the floor diagonally up to the ceiling of the space. Vibration sensors translate the physical vibrations to network data. These vibrations are transmitted to the other endpoint of the string, an identical steel cable. Striking the string on one side makes it vibrate on the other end.

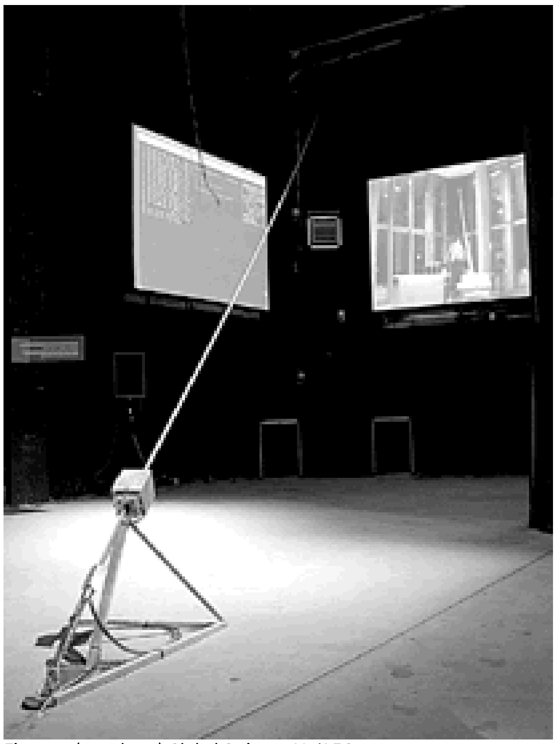

Figure 1. (see above) Global String at V2/AEC

Sound is synthesized in real time by a software algorithm implementing a physical model of a string of unreal proportions. Audio, video, and sensor data is streamed between the sites, providing a live connection between the players.

The system made up of these components conceptually comprises a single vibrating string. It is a musical instrument where the network is its resonating body. This paper discusses conceptual and technical issues confronted during development and realization of the project.

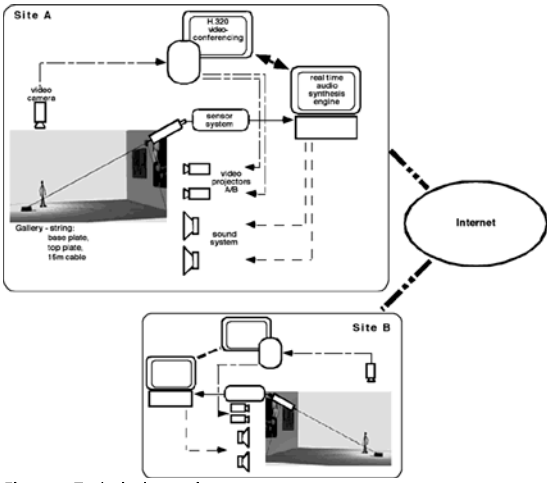

Figure 2. Technical overview

1.2 Hybrid space

Global String exploits network infrastructure to connect two (or more) parallel physical acoustical spaces. As the vibrations of the string traverse network space, one can think of Global String as a stringed instrument that is made up of heterogeneous materials, or mediums. Change of medium for signals typically requires transduction from one medium to the other. The bridge of a violin is the transducer through which the string vibrations pass to resonate the wooden body. A speaker coil and cone are the transducer that permits audio signals in an electrical cable to become acoustical sound pressure waves. In Global String, a series of sensors and encoders transduce vibrations from the physical part of the string to the network part of the string and back.

The use of the Internet in this case is as a transmission medium and not as a storage or information system. It is a resonating chamber, and not a canvas [1]. The instrument cannot be accessed from the web. It is not a means to connect network surfers with people in the gallery. It is a single musical monochord [2, 3] that traverses physical space and network space, and in doing so, connects people in remote locations.

Methods

The Global String as an instrument uses several sensor and actuator systems to interface multiple the player and the computer. Following the classical control loop model as described in [4], several stages can be discerned and are described here. The choice of audio synthesis technique and network protocol is outlined.

2.1 Sensing

Global String implements two sensor systems, one detecting rapid action on the string and the other following slower gross movement. These reflect two distinct modes of player interaction with the string. The igh frequency information is derived from a piezo transducer mounted on an aluminum block attached to the string. This signal is amplified, then enters the audio analog-digital converter (ADC) of the computer (sampling rate = 44,100hz, 16 bits). This signal is utilized as an audio rate control signal and for excitation of the audio synthesis engine.

Low frequency data is obtained from Hall effect sensors [4], that translate magnetic field perturbations into control voltages. Two small neodymium magnets are attached to the string, mounted in the on-string aluminum block, facing Hall effect detectors mounted in orthogonal positions on a housing around the string. Two sensors are used, one for each degree of freedom (DOF) of the string - movements on horizontal and vertical axes. In the mechanical construction room was left for doubling this system, but in practice one sensor for each DOF proved to be sufficient. These voltages enter a sensor interface, and capture movements of the string from 0 Hz (DC) to a software-limited maximum (250Hz). From the 12-bit value, the most pertinent 7-bits of data are extracted.

2.2 Actuator

An actuator translates electrical signals into perceivable physical events. The Global String uses an electromagnet to generate tactual cues to the player touching the string, creating a relationship to actions performed at the remote end. The large electromagnet is excited in pulse mode with a high DC voltage. This pulls the string by an iron plate mounted on an aluminum block, generating a palpable pulse in the string, resulting in a haptic sense of telepresence. 2.3 Audio synthesis

Following the sensors, the transduction process is completed by data encoding. The sum total of actions as detected by the multi-sensor set is treated as excitation and parametrization of a real time physical model synthesis algorithm [5] to generate the sound of the string. The model is a mathematical formula simulating a vibrating string of the total proportions a length of the geographical distance between the two galleries.

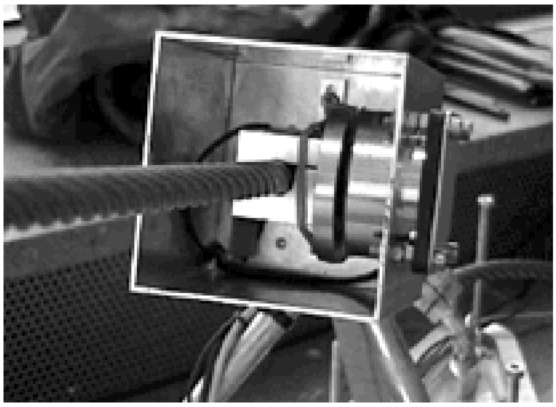

Figure 3. Sensor housing

2.4 Videoconference

Control data from the piezo sensor is multiplexed with local audio and video. The information enters a standard H.323 codec (encoder/decoder) [6]. The H.323 standard was chosen as it is designed for bi-directional audio/visual transmission over IP (Internet Protocol). H.323 is an integrated solution that assures synchronous sound and image transfer. The video image received from the remote site is projected and serves to visualize the far end of the string. Received audio data is treated in two ways - 1. to be processed for peak detection analysis, and 2. to enter the local audio amplification system.

2.5 Display

Audio signal visualization is projected by a second video projector alongside the videoconference image. The analysis consists of a real time amplitude envelope and FFT frequency spectrum of the sound from the two sites. In addition to audio data, network conditions are visualized as readout from the Unix traceroute command [7], mapping the packet trajectory and time from the local site to the remote site

Results

The hybrid nature of the instrument posed the dual problem of creating a sense of remote presence while preserving a sense of local materiality [8]. Remote information is coherent only if aural and visual channels are synchronized. Local information is successfully parsed by the player only if there is a tight causal connection and immediacy in physical presence and action. The 15m steel cable establishes a monumental physical presence for the instrument, but is only one part of the total string. The sound of the Global String is not the acoustical sound of the steel cable, but the sound of the physical model. The challenge was to create an immediacy where this reality/representation dichotomy is rendered musically coherent.

3.1 Server-side vs. local synthesis

The original concept implied that the physical model synthesis should be one model running in network server space. This however posed problems of local immediacy. Server side synthesis suffers from time latency retrieving and returning data from and to each site. Meanwhile the player needs an immediacy to keep haptic coherence with the physical string he beholds. Server side synthesis was abandoned in favor of a dual local synthesis in a closed loop dynamic. This afforded the immediacy - the string reacted instantly upon touching the steel cable, and yet provided the remote sense, as audio and sensor data streamed in from the remote site. Synthesis at each site was realized based on local sensor data. High frequency transients from the piezo sensor became the excitation signal feeding the physical model synthesis algorithm. Data from the Hall effect sensors were mapped to parameters describing the virtual physical makeup of the synthesis. The data packet traceroute data between sites was considered for use in scaling the length parameter of the string synthesis [9]. Piezo data from the remote site undergoes peak detection analysis and activates the local actuator. A strike on the remote end causes the local end to vibrate.

3.2 Telepresence

Visual contact with the remote player complements the audio connection. While most commercial audio/video streaming solutions place priority on the visual channel, the Global String has the opposite priority. As a musical project, sound quality is more crucial than image quality [10]. It was possible to imagine, then, the choice of unequal systems - such as a simple webcam for images and high quality audio streamer. Separate webcam and audio streaming combinations were considered and rejected, as they do not synchronize the audio and visual channels - an fundamental quality for remote performance. The need for audio/video synchronization was overriding to capture and convey physical and musical gesture. We have found in practice that low bandwidth connections to the internet (< 256kbps) tend to experience more significant data bottlenecks that risk to cause dropouts and failure of Quality of Service (QOS) [11]. The ideal system, whether standalone or PC based, is one that accepts external camera input, and accepts external stereo line level audio.

Discussion

Global String is not a utilitarian device, but a musical instrument that encompasses the technology described above. As the technology is not brought to the fore, the apparent simplicity could be misconstrued in presentation. The naïve visitor could perceive the steel cable to be the total extent of the string. The physical model audio synthesis is natural sounding enough that it could be misperceived by the untrained ear as simply being the sound of the big cable. If quality of the projected image of the remote site is sufficiently high, it could easily be misconstrued to be a documentary videotape of the string at another time or another exposition. The challenge arose then, without resorting to demonstrative techniques such as auditioning the sound of the piezo pickup alone, or labeling the remote screen as such, how to give an intuitive sense to the casual exhibition visitor of the whole instrument.

4.1 The sound of one string...

The issue arose that the choice of local synthesis defeated the concept of a single string. Generating sounds separately at each site risked to break the "one string" concept that is the fundamental basis of the project. The solution proposed here maintains the single instrument dynamic while providing the local haptic response. The analogy can be made of an electric guitar whose sound is amplified by the mixing of more than one pickup along the length of the guitar. The distance of each pickup relative to the bridge determines the harmonic content in sound of that pickup. Pickups closer to the bridge tend to be brighter in sound. Different pitches also create varying nodal vibration patterns that create a location dependent frequency response for the pickups. The use of two sets of multi-sensors, one at each end, to synthesize the sound of the string is akin to this multi-pickup approach. The physical modeling algorithms running at each site utilize the same parameters as a point of departure, so would generate identical sounds. The sounds diverge, as input data exciting the model and sculpting the parameters differ. The traceroute data too is not identical - the number of hops and packet delay time from one side to the other is not at all the same as for the opposite direction. This is consistent with the theory that a vibrating string can be modeled as a bi-directional delay line [5, 12].

The stereo audio capability of the videoconference system is utilized as two discrete channels - one to transmit the sound of the remote synthesis, and the other to transmit the sound of the raw remote piezo, to be used locally for analysis and trigger of the actuator. In such a configuration, all local and remote performance data is combined into a single synchronous bidirectional H.323 connection.

4.2 See you, hear me

With the choice of a proper videoconferencing system, the work of adapting it to musical use begins. External video input to the system is useful for the connection of a video camera with adjustable zoom lens. The installation of the string is such that the camera will be as far as 10m from the performer it is aimed at. The camera orientation and projection screen position are of utmost importance to facilitate musical communication and the sense of continuity of the string as one entity. The data transduction from physical to network space can be successful only if the mediation in physical space is correctly implemented. In the case of Global String, this entails arranging the physical orientation of camera and monitor to faithfully recreate the sense of playing along one string. The orientation should preserve eye-eye contact between the remote players [13, 14], and allow the local player to envision the remote end of the string as a natural extension of the local end. The camera and projection screen should coincide in position. They are placed at eye level beneath the high point of the string, aimed back towards the base of the string. The performer then plays looking towards the high part of the string - in effect, looking at the other site of the string. If the camera/screen position at the two sites is consistent, this gives a visual continuity based on the arch of the string. The performer sees the local end of the string go up, and sees onscreen the other end of the string coming down, creating a visual coherence between real and virtual space. The eye to eye contact creates the communicative immediacy across the network distance.

4.3 Machine states

Whereas in most videoconference applications the goal is to provide a seamless remote communication where the network becomes a transparent intermediary, this is not the case with Global String. Inasmuch as the network, and therefore the string, becomes the conduit of musical communication between remote locations, it is not meant to be completely transparent. If audio quality from the remote side was not ideal, this can be said to reflect the distant nature of the far end. The goal is to create an awareness of the network as an visceral entity equal to the imposing structure of the physical string. The FFT projection being the sum total of sounds of both ends serves to visualize the shared action nature of the instrument. Although the performer will see the projection react as he hits the string, this is not the only movement in the image - it is also moving in response to sound from the other side. This gives evidence that the local performer's actions are contributing only part of the total sound of the string.

The traceroute readout establishes visual evidence of the varying organic nature of the network, as data packets take different paths and different transmission times from one side to the other, representing string length that is continuously varying.

4.4 Feedback

The actuator circuit provides physical manifestation but is not configured to give simple tactile feedback. Instead the actuator circuit functions to give one player a tactile sensation of what the remote player is doing. As for tactile feedback, this takes place naturally, as the physical part of the instrument is a massive steel cable. Feedback loops do exist in the instrument, as sounding on one end causes vibration on the other end. What keeps the actuated vibration from again causing the opposite end to vibrate, resulting in an infinite loop? The separation of the low and high frequency vibration sensing circuits helps to avoid the problem of infinite feedback. It is the high frequency channels of the remote end that are analyzed to cause pulsing of the actuator on the local end. The resulting movement of the string is as if the string had been tugged from the other end - a low frequency effect. The result of the actuator is then picked up by the low frequency sensors, but not by the high frequency sensors. This avoids the actuator on the remote end to be re-triggered.

Conclusion

Through this amalgamation of diverse technologies, the objective was to create a musical instrument. As an instrument, it should be musically expressive in the hands of the player [4] be they a non-musician or virtuoso [15]. With Global String, we sought to span this gap with the notion that a rich musical instrument should respond to any of these situations or contexts in a musical way. The goal, then was to create an instrument that was accessible without being a demo or game, and at the same time challenging for the experienced performer. It should respond to a wide range of human input and still sound musical. It should also have the possibility to respond to non-human input, such as network traffic data, to generate sound and physical action.

The choice to exhibit Global String as an installation was partly to address these issues. The instrument is in public space, inviting the casual visitor to try it. A simple touch will produce sound. The more inquisitive visitor might find other ways of hitting the string, see that it responds accordingly. The visitor may have the luck to have someone on the other side to play with. If not, the traceroute and FFT data may give an indication to the astute viewer that the string exists beyond the local physical space. The audio synthesis model has parametric input for external data, causing the string to make an ambient sound - inviting the visitor to approach the string. The ambient sound from the remote site gives the player a sound from afar in the absence of a remote partner.

This continuous nature of an installation is well suited for the temporally imprecise nature of the network [16]. The string is always there, vibrating, checking traceroutes. At specific moments during the exhibition, performances can be organized. Suddenly this timeless public space becomes a stage, an event space. Having a remote partner is no longer a question of chance, but a rendezvous for performance. In the hands of the artists who created the instrument, its sonic depth becomes apparent. These are the virtuosi of the instrument who are able to exploit the expressiveness of the instrument. The original motivation of the Global String was to create a musical instrument that spanned a wide geographical distance. The project brought together considerations of instrument building, interface design, and network architecture. The design is polyvalent and multimodal in nature. The instrument exists across time and across multiple mixed spaces.

Notes

Global String was conceived in collaboration with Kasper Toeplitz. It was developed and realized with the participation of Theo Borsboom, Frederic Voisin, Helmut Schaefer.

The project was awarded 2nd prize at Cyberstar98: Shared Visions, organized by the GMD and WDR. It was produced with the financial assistance of the Daniel Langlois Foundation for Art, Science and Technology.

It was premiered at the Dutch Electronic Arts Festival (DEAF), 2000, between V2 in Rotterdam and Ars Electronica Center (AEC) in Linz. It has also been presented during the Science + Fiction festival organized in 2001 by C3, held at Trafo in Budapest, connecting to AEC.

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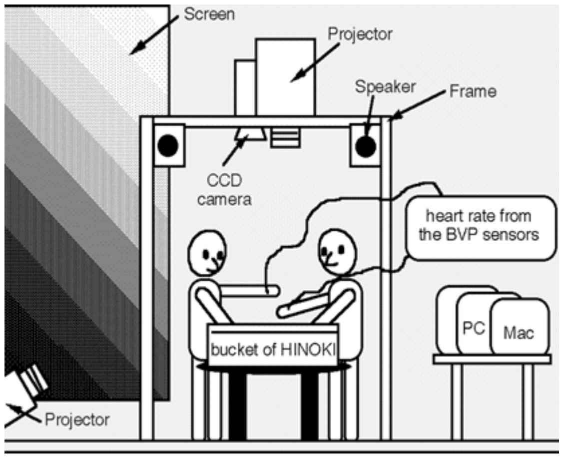

interactive art for zen

unconscious flow

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Abstract

In face-to-face communications, the occasional need for intentional lies is something with which everyone can identify. For example, when we get mad, circumstances may force us to put on a big smile instead of expressing our anger; when we feel miserable, good manners may dictate that we greet others warmly. In short, to abide by social norms, we may consciously lie. On the other hand, if we consider the signs that our bodies express as communications (body language), we can say that the body does not lie even when the mind does. Considering this phenomenon, we propose a means of “touching the heart” in a somewhat]apanese way by measuring the heartbeat of the “honest” b¡ody and using other technologies to develop a new code of non-verbal communications from a hidden dimension in society. We call this “Meditation art” or “Zen Art.”“Zen” is Buddism style meditation.

Keywords: HCI (Human-Computer Interface), Mixed Reality, Real-time Animation

Project URL:
http://www.mic.atr.co.jp/~tosa/

Year the Work was created: 1999-2000.

Project Partners: Sony Kirara Research Laboratories

Introduction

The author believes that interactive art is one type of component that provides sympathy in communications. Interactive art can be thought of as an emotions and sympathy interface. It is familiar to us and forms agents or characters that can handle sensitive communications. In addition, such agents/characters work on our mental states and emotional expressions, and on our character and intelligence. This means that a person can also self-create his or her own personality. On the other hand, emotion recognition technology recognizes only the surface emotions of people [1][2][3].

The authors are interested in how to recognize unconscious feelings by using computer-based interaction (Figure.1). Art is a natural way to portray human unconscious emotions. We have been trying to achieve this in interactive art by using the technologies and techniques of art.

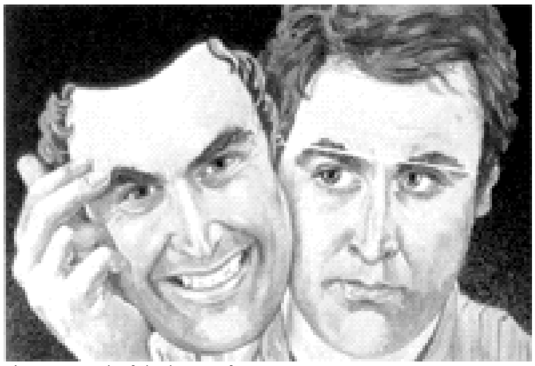

Figure 1. Mask of the human face

Aims of Research

Two computer-generated mermaids have been function as individual agents for two viewers. Each mermaid agent moves in sync with the heart rate detected by a BVP (blood volume pulse) sensor attached to a finger of its viewer. Then, using a synchronization interaction model that calculates the mutual heart rates on a personal computer, the two mermaids express the hidden non-verbal communications of the viewers. The relax-strain data calculated from the heart rates and the level of interest data calculated from the distance between the two viewers are mapped on the model. The synchronization interaction model reveals communication codes in hidden dimensions that do not appear in our superficial communications.

Then, using a camera to pick up hand gestures and a personal computer to analyze the images, the synchronization interaction model is applied to determine each mermaid´s behaviours. For a high degree of synchronism, the agents mimic the hand gestures of their subjects, but for a low degree of synchronism, the agents run away. As for the background sound, the heart sounds of the subjects are picked up by heart rate sensors and processed for output on a personal computer for bio-feedback.

Project Description

For the installation, a space of four meters wide, four meters deep and three meters high is required. A dark and quiet space is preferable. Interactive actions are displayed on one main screen and two Japanese shoji screens. A Japanese hinoki wooden bucket with a diameter of one meter that is filled with water is placed in the center of the installation. Two persons, each fitted with a stethoscope, experience non-verbal communications by touching their Computer Graphics embodiments in the bucket. This was shown at the SIGGRAPH'99 Art Show and Ars Electronica 2000. People of many nationalities interacted with the [Unconscious Flow].

Synchronization Interaction Model

The relax-strain data calculated from the heart rates and the level of interest data calculated from the heart rate variations are mapped on the model. The synchronization interaction model reveals communication codes in hidden dimensions that do not appear in our superficial communications (Figure 2).

Depending on the levels of the users' feelings as evaluated by the interested/less interested and strained/ relaxed axes, the following four types of animations are generated.

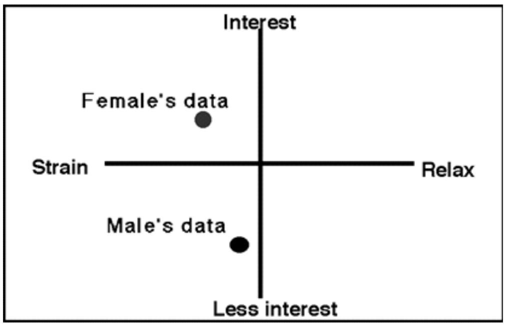

Figure 3. Synchronization interaction model

(1) When both people are in a situation where they are highly relaxed and interested, they are considered synchronized. An animation is generated in which, for example, their Computer Graphics-reactive embodiments join hands in companionship or enjoy friendly actions (Figures 3-1 and 3-2).

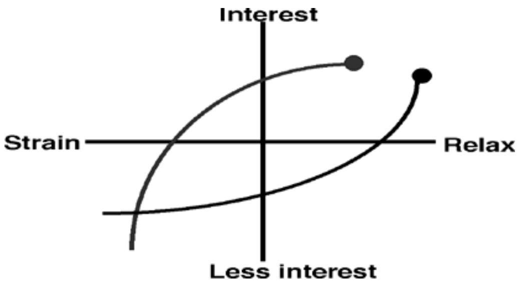

Figure 3-1. Highly relaxed and interested

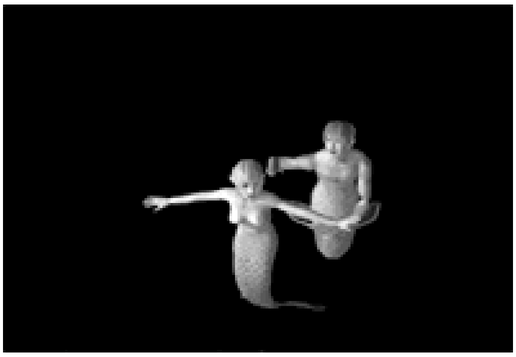

Figure 3-2. Highly relaxed and interested

(2) When both people are in a situation where they are highly strained and less interested, unfriendly communications is generated. An animation is generated in which, for example, their Computer Graphics embodiments quarrel with each other (Figures 4-1 and 4-2).

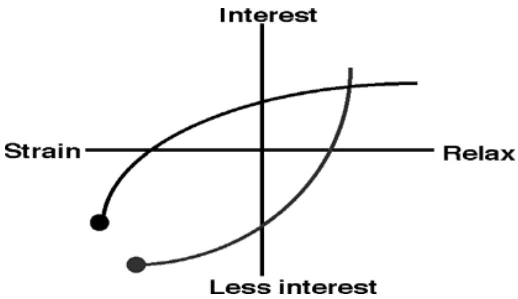

Figure 4-1. Highly strained and less interested

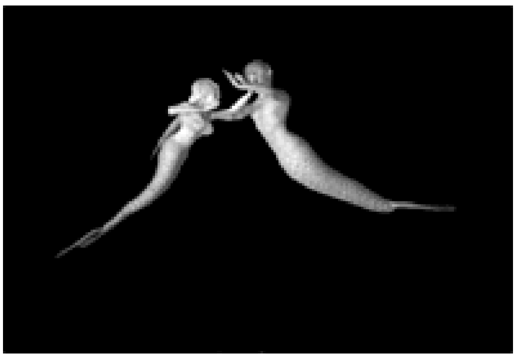

Figure 4-2. Highly strained and less interested

(3) When both people are in a situation where they are highly relaxed and less interested, they are considered indifferent and "going their own ways". An animation is generated in which, for example, their Computer Graphics

embodiments do not interfere with each other (Figures 5-1 and 5-2).

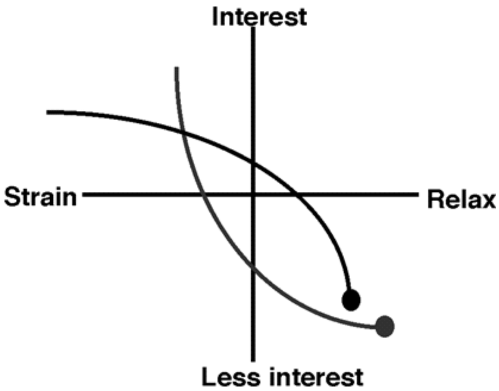

Figure 5-1. Highly relaxed and less interested

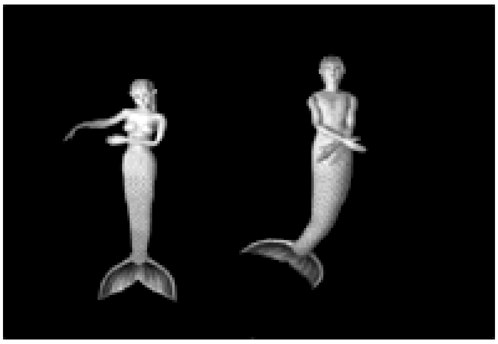

Figure 5-2. Highly relaxed and less interested

(4) When both people are in a situation where they are highly strained and highly interested, they are assumed to have stress and feelings of shyness. An animation is generated in which, for example, their Computer Graphics-reactive embodiments behave shyly, in the way shown below (Figures 6-1 and 6-2).

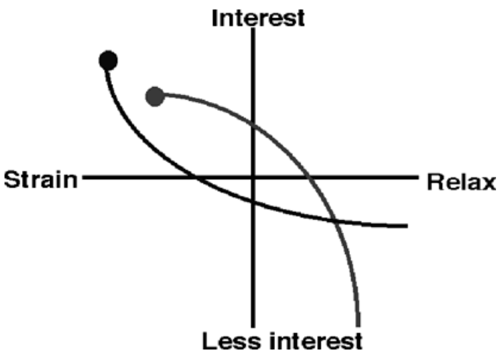

Figure 6-1. Highly strained and highly interested

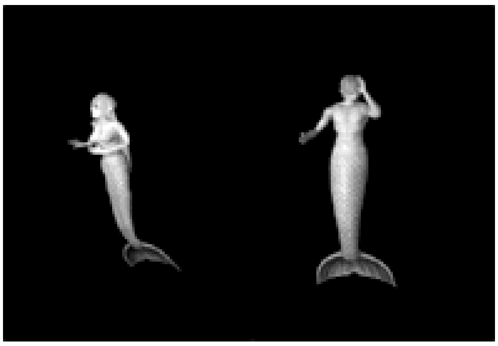

Figure 6-2. Highly strained and highly interested

As described above, new codes of non-verbal communications that cannot be seen in face-to-face communication are found through Computer Graphics embodiments.

Hardware

The synchronicity based on the heart rates from the electrodes of an electrocardiograph is calculated by a PC, and the PC generates an arbitrary feeling in Computer Graphics form. The hand movements of the two persons are captured by an installed camera, and an image analysis of the data is performed. In accordance with the synchronicity interaction model, a Computer Graphics embodiment either follows the movement of the hand of the partner with high synchronicity or goes away from the hand of the partner with low synchronicity. When one touches the Computer Graphics embodiment of the partner, a vibrator gives him or her a simulated feeling of touch. The heart rate sensor measures the timing of the heart, which is processed by the PC and outputted (Figures 7-1 and 7-2).

Software Configuration

A Heart Rate Analyzer is used to analyze the input data and to send the data to the Event Control as event data. The Event Control sends the heart rate data as MIDI commands to a MAX/MSP program on a Macintosh and some commands to the Computer Graphics Generator if some Computer Graphics need to be changed depending on the synchronization interaction model. The Computer Graphics Generator creates Computer Graphics based on these commands and outputs the Computer Graphics. The MAX/MSP program processes the sound data and the heart rate sound as required and then outputs the result. The Image Recognition analyzes the image data fed from the CCD camera and the relational information of the hands, and the Computer Graphics displayed is sent to the Event Control and the Computer Graphics Generator. The Event Control sends some commands to the Computer Graphics Generator if some Computer Graphics need to be changed depending on the data (Figure 8).

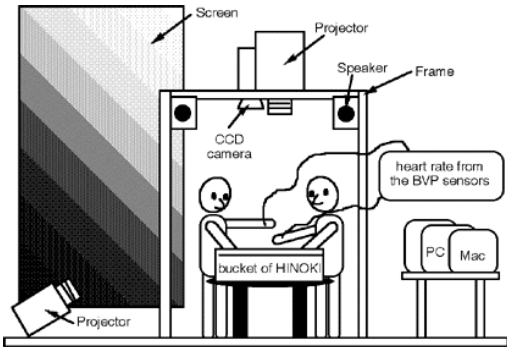

Figure 7-1. Setup of [Unconscious Flow]

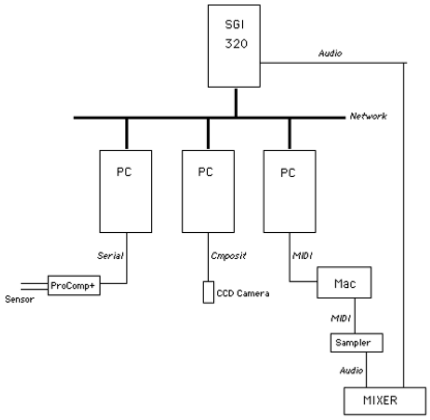

Figure 7-2. Hardware configuration

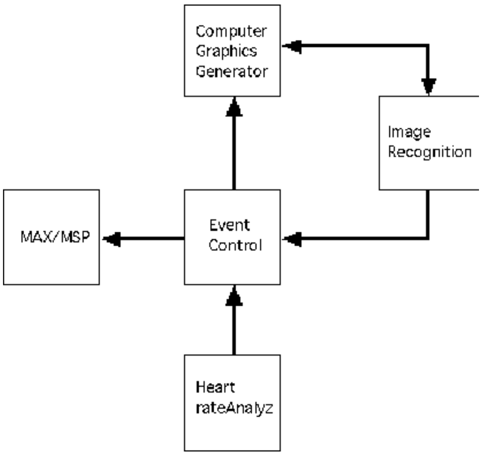

Figure 8. Software configuration

Conclusion

This work was exhibited at SIGGRAPH'99 held in Los Angeles. Many people visited the exhibition site and enjoyed interaction with this Unconscious Flow. On the west coast, the idea of healing and meditation is quite familiar. That is the reason why this work accepted by so many people. To date, this work has been using a biofeedback function based on the heart-rate of oneself. Other areas related to this work are sound healing and healing psychology. Future study will integrate Unconscious Flow with these areas.

Meditation and bio-feedback with Interactive art will become very important in the future for human-to-human and even human-to-computer interaction. In the present day, people are exposed to various kinds of stresses in daily life. In human-to-computer interaction as well as in human-to-computer communications, people will want to have relaxed and less stressful communications.

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panel 7:

media art education

teaching new media

– see poster section – 329

poster section

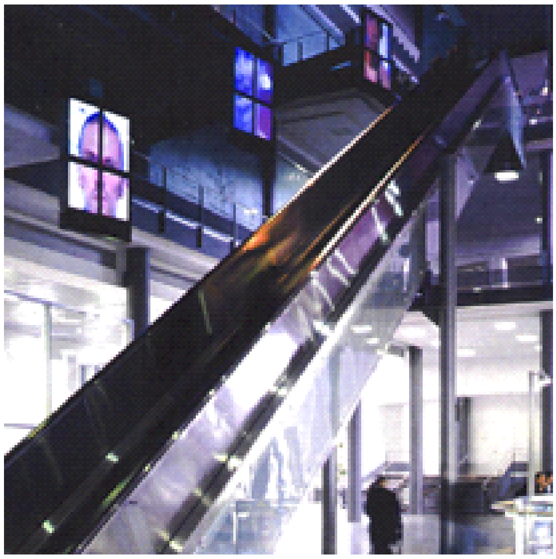
content

panel 1:

understanding mixed reality

spaces of emergent communication

poster



public narcissism

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Abstract

The installation "Public Narcissism" is concerned with the representation of the exhibition visitor and his narcissistic relationship with his own image. In doing so, the project "Public Narcissism" merges two classical themes: the motif of Narcissus who falls in love with his own reflection encounters the enchanted mirror in Sleeping Beauty, the fairytale in which a mirror classifies and pronounces judgment on the person facing it.

"Public Narcissism" is an installation designed for experimental image processing. Face finding/tracing programs extract facial cutouts of exhibition visitors from the stream of images generated by six video cameras. These portraits are being presented to the visitor via large displays. On a second and third level of processing these portraits are classified by the installation's 'long-term-memory'. Faces grouped into the same category are blended into one image and projected onto a large projection screen.

Project URL:
http://movingmicrooffice.cjb.net/

Year the Work was created: 2000

1. Project Description

The Portrait is a traditional discipline in visual arts. The very elaborate human ability to recognize and classify faces always had strong impact on painting, photography and sculpture. It appears to be an intrinsic desire of artists to figure faces, to portray. Equally, it appears to be the desire and the pleasure of the viewer to perceive himself as well as others in the artist's work.

The fascination our own mirror image holds over us has an elementary bearing on what we call self-consciousness. This explicit knowledge we have of ourselves which is derived from recognizing our own mirror image is found only among human beings and some few varieties of mammals.

The magnetism exerted by one's own reflection appears to be an archetypal factor in the attainment of self-consciousness. Even small children - long before they learn to deal with the abstract symbols, say, of language- can be observed dwelling over reflective surfaces to be entertained by their likeness. Then, in the passage to adulthood, however, this pleasure is spoilt for us, for among adults the "mirror monkey" is looked down on. It is only with the advent of the new media such as video that this form of self-gratification has returned to being socially accepted. Just think of the effect a combined video camera and monitor mounted in a shop window has on passers-by: they are arrested by their video image and seduced into playing with themselves. We readily exploit the increased distance created by a camera image on the monitor, as compared to a simple mirrored reflection, for our own amusement.

The human face is asymmetrical. The features of the two half-faces are often very different. Due to this fact it makes a severe difference whether we see our image mediated by painting, photo, video etc. or in the mirror. It is part of our daily rhythm to regard the own portrait in the mirror at least a few times. But the mirror shows the image inversely. With the actual picture of us (as others see us) we are less often confronted. This is the reason, why our real, mediated face appears to us somewhat unknown or foreign. "Public

Narcissism" avoids this visual alienation by simply mirror-inverting the facial image for display.

"Public Narcissism attempts to detect human beings and to create a succession of, in the system's sense, idealized portraits. These portraits serve to seduce the visitor into further communication with the system. Portraits are displayed at a maximum rate of approximately ten frames per second so in order to start an interaction all the user has to do is to be present in the cameras angle of view for a short moment. The average user approaches the system very naturally. As expected, visitors start exploring the systems reactions instinctively after being portrayed once.

"Public Narcissism" is an interactive computer installation (see fig.1, 2), which enables visitors to interface with their own image. During their ride on the big escalator (length 26 meter) in the Konzernforum in Wolfsburg's Autostadt (see fig.3) and while staying on the building's second floor (see fig.4), their image is picked up by six video cameras. These images are captured and processed by several computers. By the time the face-finding software (based upon [Ko, Sc, Ca]) running on this first group of computers is certain enough about having detected a human face, this particular part of the digitized image is magnified and visualized on a large split-screen display located next to the camera the image was taken from.

These selected visitor portraits are also transferred to a second group of computers. This group of PCs constitutes processing level 2 and level 3 of "Public Narcissism" where the installation filters, distributes, classifies and fractional stores the received faces in artificial neural networks (based upon [Ko, Sc]). A wide-screen projection canvas (14m x 4.5m), stretched and suspended from the ceiling, serves as a screen to five data projectors that visualize the currently activated nodes in level 2 and level 3 neural networks (the installations long-term memory).

Over a long period (months, years) the computers compare the portraits of the visitors and combine equally classified human figures to a joint portrait (see fig.5). Five Kohonen networks classify the pictures gathered in the course of face recognition. For each of the approximately 300 classification categories the system creates idealized images composed of all the faces, which are grouped in this category (see fig.6). Thus in one learning cycle (the longest cycle so far was approx. 8 months, over Ω Mio. visitors) about 300 images are generated, theoretically containing fragments of each visitor's individual portrait.

The system actually disposes of no prior knowledge. All criteria for classifying the faces are generated directly from the facial traits of the people visiting the installation.

Not unlike the enchanted mirror in Sleeping Beauty, "Public Narcissism" comments on those to appear on its reflective surfaces by offering its internal likeness that was associated with the person facing the installation. While the mirror in the fairy tale makes its interpretation verbally, "Public Narcissism" does so visually.

The visitor and "Public Narcissism" appear to form a symbiotic relationship where the computer system is interested in receiving the images of human faces and in turn delivers dynamic portraits that the visitor joyfully consumes, driven by an essential motor of the human mind: the search for self-consciousness.

Observations showed that many visitors, after playful evaluation of the systems functionality seek assistance in gaining a theoretical understanding of the mechanisms inside "Public Narcissism". An illustrated brochure explaining the details of the project was printed and is handed out by the Autostadt personnel upon request.

2. Image (Painting) production

For twelve hours a day the installation is in operation. The long-term memory is modified every time a facial image has been collected by one of the face recognition programs and has successfully passed filtering for erroneously recognized objects (filtering occurs on processing level 2). Every evening the synaptic weights of the Kohonen networks in processing level 3 are saved to disk, overwriting previous versions. Examples of theses weight files were collected and converted to image files. So far, a series of postcards, which shows both single long-term-nodes and groups of such nodes taken from the Kohonen networks, was printed and published.

Preparations are in progress to run four succeeding training cycles. Each training cycle will span one quarter of a year. The idea is to let the system generate four allegoric paintings that are intended to represent one season (spring, summer...) each. Detailed information about the particular season will be present in each of the four paintings. Not only will seasonal changes in daylight have a strong influence on the images. Also seasonal differences in visitor clothing and behavior will be represented by the four tableaux. Many other, unpredictable peculiarities of "The four seasons of Public Narcissism" will hopefully condense too in the four allegories and become accessible once the images are printed on large canvases for exhibition.

3. Pre Public Narcissism

"Public Narcissism" is an advancement of an earlier project: "Narcissism Enterprise". This preceding installation (developed in the years 1996-1999) operates two cameras and three projectors. The long-term memory has only one processing level contrary to the five levels of "Public Narcissism". The installation presents itself as two separate spaces. 1. The interactive user-space. A triptych of projection screens creates a room where two cameras pick up the users image. 2. An exhibition space where selected nodes of the long-term memory (see fig.5) are on display as hardcopies on stretched canvas. The neural networks that created these paintings were trained in different cities in preceding exhibition cycles of the installation "Narcissism Enterprise". The installation was previously shown in five cities: Rotterdam, Chicago, Budapest, Hamburg and Venlo. Reactions to the piece were manifestly different in each location. Furthermore, in each country the various classifying facial categories turned out to possess entirely different sets of traits (such as, in the American tableaux, the incidence of categories of people with black skin). The aim of presenting this work over the coming years in various countries and cultures is to assemble a comprehensive collection of facial tableaux.

Going further back in the history of the Narcissism cycle one meets the "Elizabeth Gardner" robot project, a machine, four meter in height and very much inspired by the human vocal apparatus. This robot perceives the museum visitors via a video camera and a microphone and it reacts upon visitor presence with guttural sound expressions. The origin of the software of "Narcissism Enterprise" and "Public Narcissism" lies in the visitor-tracking program of this museum-robot build in 1993.

4. Post Public Narcissism

Also within the field of robotics lies the planning for the next project belonging to the Narcissism cycle. In the near future a miniaturized version of "Public Narcissism" will be developed to help the minirobot "Quasi N" (see fig.7) with orientation. "Quasi Narcissism" is an interactive installation centered around the small robot named "Quasi N". In its habitat, the robot will walk on two legs using its body as a third, supporting leg. It will carry a video camera and transmit the images to a computer installation for analysis and display. This setup will enable the audience to see themselves through the eye of a robot looking for them. The Narcissism Cycle Code in the installation will assist the robot in finding visitors gazing into its habitat.

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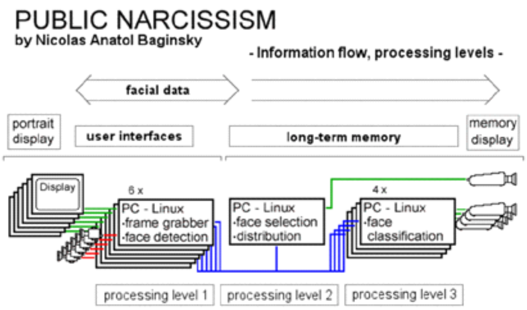


fig.1: Information processing schematic

fig.2: Hardware schematic

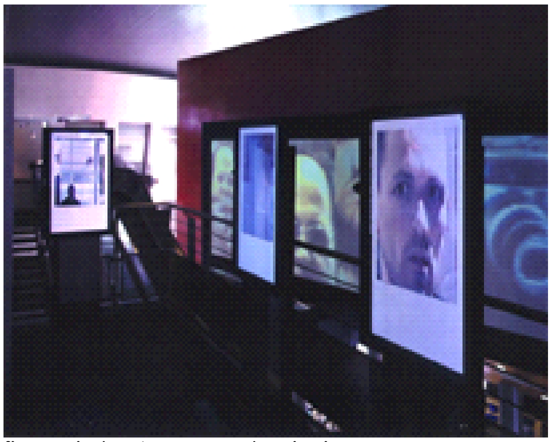


fig.4: 3 Displays/Cameras and Projections

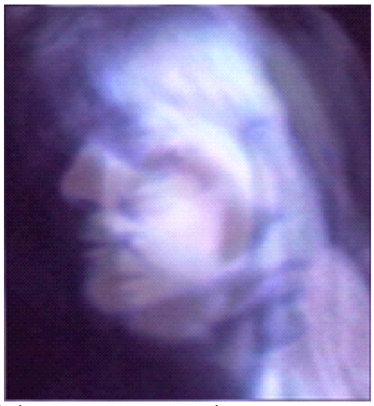


fig.5: Single long-term memory node

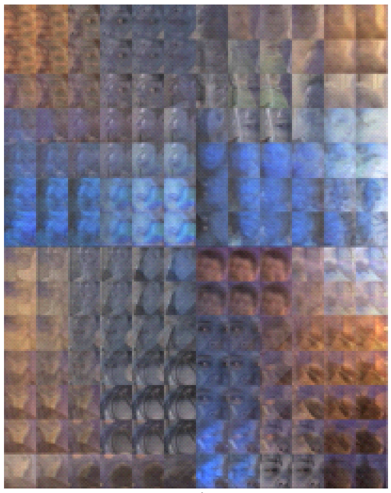


fig.6: Long-term memory example

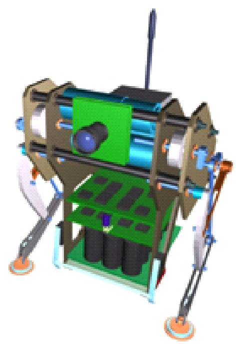
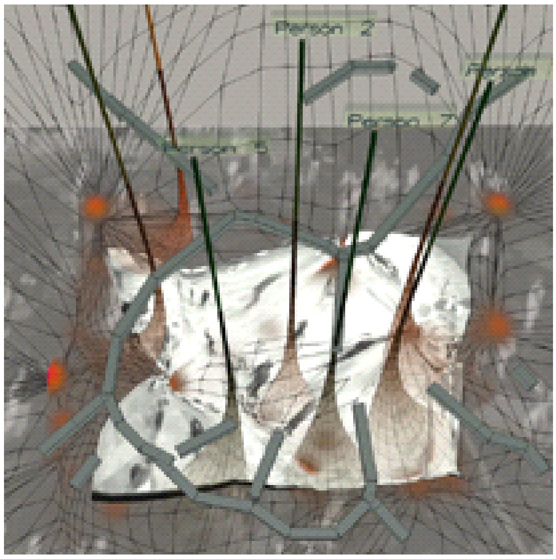


fig.7: Quasi N

poster



memory of space

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Abstract

"Memory of Space" is an interactive computer installation that observes life on a city square, and makes visitors aware of events at the location by showing a stratification of traces of people's presence there. From the individual paths of passers-by, a system of routes is calculated which gives structure to the square: lines are created (marked in grey), which can be checked for their reference to large-scale traffic routes. A system of coordinates which corresponds to the coordinates of the video-monitored square is distorted by people who cross the square. The square loses its geographical coordinates and acquires an individual form that corresponds to the way the square is used.

By means of the aerial photograph, events at the square are integrated into the geographical location. At the same time, due to its integration into the virtual image, the square takes on a greater importance - passers-by see themselves as shapers of an installation that can be seen by everyone.

Keywords: virtual architecture, synthetic urbanistics, unplanned network of routes, video tracking

Projekt URL:
http://www.inoutsite.de/mos.html

Year the Work was created: 2001

Projektbeschreibung

"Memory of space" ist eine Abbildung eines Kamera überwachten Raumes in seinen zeitlichen Veränderungen. Eine digital simulierte Gedächtnisstruktur (ein neuronales Netz) interpretiert die Bewegungsdaten. Wie in Abbildung 1 zu sehen, liegt auf dem "Boden" des virtuellen Bildes ein gitternetzartiges Koordinatensystem, welches über eine self organizing map (eine Kohonenkarte, also ein einfaches neuronales Netz) entsprechend der Nutzung des Ortes verzerrt wird.

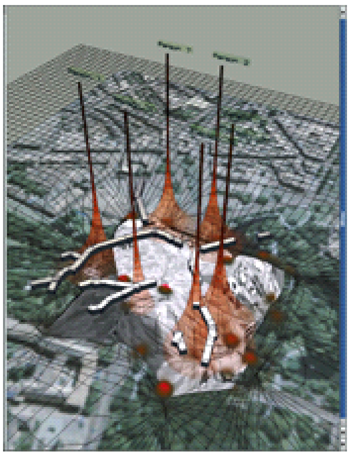

Abbildung 1: Von der Visualisierung einer self organizing map überlagertes Kamerabild eines Platzes unterlegt mit dem Luftbild der städtischen Umgebung.

Gehrichtung und Gehgeschwindigkeit werden auf die Koordinaten aufgetragen und schieben diese in die jeweilige Richtung. Das Koordinatensystem ist von einer Videotextur mit dem Videobild des getrackten Platzes überlagert, es liefert für den Zuschauer Referenz zum wirklichen Ort und zeigt gleichsam, wie die individuellen Orte das kollektive Abbild zerstören.

Der beobachtete Ort in "Territorien" aufgeteilt: In Bereiche des Verweilens und in Durchgangsschneisen. Diese Schneisen werden als Wegesystem (graue Linien) dem durch die Bewegungen verzerrten Abbild des Platzes eingeschrieben. In den ausgesparten Bereichen werden Orte, an welchen sich Personen vermehrt aufhalten (Gehgeschwindigkeit ?0) mit roten Punkten markiert. So entsteht eine Topologie des Platzes. Diese wird unterlegt mit dem Luftbild des überwachten Gebiets, so dass mögliche Referenzen der neu entstandenen Wegestruktur zu dem existierenden Straßennetz zu überprüfen sind.

Abbildung 2 Installationsaufbau an der Universität Aachen.

"Memory of space" beobachtet, wie individuell erlebter Raum zur gesellschaftlichen Konstruktion von Stadt gerät. Die Arbeit diskutiert, inwieweit das Erleben von öffentlichen Plätzen etwas ist, das durch mich und meine (einzigartige) Erinnerung bedingt ist oder inwiefern es Konventionen bedingt, die aus dem Umgang mit anderen Menschen und architektonisch/geographischen Gegebenheiten resultieren.

2 Installationsaufbau

Ein großer, vielbegangener Platz wird mit einer zentralen Kamera erfasst. Das Videosignal wird weitergeleitet an zwei Computer, die das Video verarbeiten. Der erste analysiert das Bild auf Bewegungen von Menschen, die den Platz überqueren, sich dort treffen und/oder aufhalten. Der zweite Computer berechnet aus den gespeicherten Bewegungsdaten der letzten Stunden ein Bild, das die Eigenschaften des Ortes beschreibt.

2.1 Platzbedarf

Der Tracking-Bereich ist optimalerweise ein Eingangs- oder Durchgangsbereich, wo viele Personen sich aufhalten (die Installation funktioniert nur, wenn wirklich Passanten im Bild sind. Ansonsten bleibt das Bild leer und es entsteht kein Klang). Die Kamera sollte in einer Höhe von mindestens 3,40m angebracht sein, der überwachte Bereich sollte eine minimale Grundfläche von ca. 20 m2 besitzen. Idealerweise sollte die Projektion von diesem Bereich einsehbar sein, damit Besucher die Funktionsweise der Installation testen können. Die Projektionsfläche sollte ca. 2,40m auf 3,60m betragen.

2.2 Benötigte Technik

- Pentium PC (Linux) mit 550MHZ
- Überwachungs-Kamera
- 1 1,2 GHz Athlon PC (Linux) mit 3D-Beschleuniger-Grafikkarte
- MIDI-Expander, 2 Boxen, Verstärker
- 1 Videobeamer mit ca.\ 1000 ANSI Lumen

3. Softwaretechnische Realisierung

Die Installation wird im wesentlichen durch zwei PC realisiert. Ein Rechner dient der Analyse der von der Überwachungskamera gelieferten Videobilder. Dieser bestimmt die Positionen der sich über den Platz bewegenden Objekte. Diese Positionsdaten wiederum dienen dem zweiten Rechner als Eingabe zur Berechnung und Visualisierung des Wegenetzes und der Bewegungsspuren. Die Videobildanalyse läuft in einem vierstufigen Prozess ab:

1. Segmentierung eines Videobildes in relevante Bereiche (Personen, Objekte) und irrelevante Bereiche (Hintergrund, Boden) mittels einer farbbasierten Methode, wie den Schwellwert-, Differenzbild- und Seeded-Region-Growing-Verfahren [2].
2. Analyse des segmentierten Bildes auf zusammenhängende Pixelbereiche mittels einer rekursiven Nachbarschaftsanalyse [1]. Dabei werden Bereiche deren Größe einen bestimmten Schwellwert unterschreiten von der weiteren Analyse ausgeschlossen.
3. Mit Hilfe eines stochaistischen Nächster-Nachbar-Verfahrens werden die während der Analyse des letzten Bildes bestimmten Positionen mit denen im aktuellen Bild verglichen. Daraus ergibt sich die "Verfolgung" von Personen/Objekten über einen Zeitraum.
4. Die so gewonnenen Daten werden über das Netzwerk verbreitet und sind so theoretisch für eine beliebige Anzahl von Rechnern abrufbar.

Die Berechnung und Visualisierung des Wegenetzes und der Bewegungsspuren läßt sich ebenfalls in vier Schritten zusammenfassen:

1. Erstellung eines Wegebildes, mittels einer Kombination aus einen non-maximum-suppression und einem Hystereseschwellwertverfahren.
2. Verarbeitung der Daten mit Hilfe einer self-organizing-map. Die SOM wird auf das Koordinatensystem des aufzunehmenden Bildes initialisiert. Eine durch das Bild laufende Person verzerrt dann die SOM genau an der x-,y- Position der Person. Wobei gerade langsam laufende oder stehende Personen die SOM stark verzerren. Mit der Zeit bildet die SOM eine Art von "Erinnerung" der von Menschen begangenen Wege aus.

3. Das Wegebild aus Punkt 1 wird zur Erstellung des Wegesystems verwendet. Zuerst werden aus dem Punktebild mögliche Wegeteilstücke errechnet. Ein Algorithmus zum Aufbrechen von Geraden approximiert dann Geradenstücke mit Hilfe der möglichen Wegeteilstücke. Dadurch entstehen die tatsächlichen Wegeteilstücke.
4. Es werden gleichzeitig ein in Schritt 1 gewonnenes Gradientenbild, die SOM, das gefundene Wegesystem und die gerade aktuellen Positionen der Personen dargestellt. Hierbei sei noch zu erwähnen, dass das Gradientenbild mit einem Schmierfilter geglättet wird und dass die aktuelle Position der Person mit den auf die SOM gemappten Koordinaten durch eine entsprechende Visualisierung in Verbindung gebracht wird.

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poster

public communication sculpture

the art project for interactive installations in public space

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Abstract

This paper introduces our project: Public Communication Sculpture (PCS), artworks and exhibitions. We conclude with short descriptions of our work to date.

PCS is the art project which creates and produces interactive artwork installations in a public space, where the audience consists primarily of passersby. This project aims to create unexpected encounters and communication between these passersby.

Keywords: Public space, Shared environment, Communication, Interaction, Public art, Role of art in society, Interface without instruction, Urban planning,

Year the Work was created: Since 1998

Project Partners: Nathaniel T PHILLIPS, Keizoh FUJII, Kohji SETOH, Yukari SHIBUYA, Christopher T PENROSE, Shohjiro SAITOH

1. Introduction

The art project Public Communication Sculpture (PCS) produces interactive installations in public spaces, where the audience consists of people present coincidentally-passersby.

This project aims to create unexpected encounters and communication between these passersby. Each installation has opportunities for participation, and through this participation people communicate each other.

Our interest is to create and produce different types and ways of communication through the interactive installations with simple interface in the real public spaces, not in museums.

Also our background idea is to use Japanese public spaces, which are under utilized and possibly ignored, as spaces for communication. To do this we use interactive installations that enable citizens to participate and experience a kind of communication with others and find their own ways to manipulate this shared space.

2. Project concepts

2.1 Public space in Japanese cities

Public spaces, like building plazas or town squares, exist in both Japanese and Western cities. Historically, public space in Japan was not like that we have now. Only after the Meiji period (1868-1912), during the modernization of Japanese cities, public spaces were transformed into the square or plaza (borrowed from Western city models).

Physically, public space was provided and more open to the public than allay, like that in western cities. City planners or designers often use it as space for communication between people. But in fact, we use it primarily as space for modern transportation, e.g., train station or bus stop. As a result, we feel a contradiction between the idea of public space by planners and the real use by citizens.

2.2 Artwork to find the others in shared space

Public spaces are not well functioned for communication as originally intended; therefore, what can we do to facilitate communication between people there?

We may represent our idea to let people know and think about this situation. But we thought it's more important and effective that people have an opportunity themselves to interact with each other in this space and then think about what they can do by themselves.

From this point of view, we choose to create installations that require interactions from participants in public spaces producing unexpected encounters and relationships.

But when we put interactive installations in public space, we suppose there are two difficulties.

First, facing the "artwork" like a painting or sculpture, the audience tends to maintain a certain distance and appreciates only the form and beauty of the art—this convention is a barrier to understanding artworks that require the participants interaction. In addition, media art which uses computer supported interaction tends to be complex in manipulating and understanding the artwork and therefore requires instruction.

Second, a public space is not a museum or gallery where people may expect to find or participate interactive artworks there.

Our solution is that we don't let people look at the artworks as artworks but we invite them to directly participate in the artworks and experience that interaction with others. Originally, the purpose of this project is not to tell audiences our opinion or to expose them to technology but to have them experience interaction with other people.

3. The process of approaching artworks

In our exhibition, the audience finds artwork by accident. There is no notification or clue of what it is. In our experience, audiences often think the artwork is an object in daily life. We carefully design the process approaching the artworks such that they may find themselves participants of the artwork simultaneously with triggering an interaction. All installations we produce are different in how participants interact or participate, but they all are created with simple interfaces requiring little or no instruction and for interacting among the multiple participants.

For realizing these artworks and exhibition, we concentrate on the following two process of approaching the work.

Firstly, it is important to use things familiar to us in our daily life like chairs or walls as metaphors or interfaces for the artwork so that they might not be the barriers we mentioned in the former paragraph when people find these kind of artworks in a public space. Also some of the objects, like water or chairs, in our daily life support the environment of communication. We are trying to rethink the meaning of these objects as medium of communication and use them as the tools and interface of communication.

Secondly not only using the familiar object as material, but we give them the interactivities for the audience to participate. Then we must use the interaction which don't require difficult instruction or which is easy to understand what happens. Because another achievement of designing this approach is to bring audiences much closer, not alone but together. Each artwork has a function to promote contact among the audience and to create unique experiences which are then shared within the audience.

In this kind of interactive installation, we use computers and other machines which support this function and experience, but they are hidden behind the principal objects of the artwork. Because the artworks in our project are media between audiences in public space.

4. Artworks and exhibitions

Each art works which we have produced and which are at work has its own specific issue in detail but main concept is for the participants to experience the interaction with others in public space as we mentioned in former paragraphs. And they are similar in the point that interaction in each artworks is very simple, like movements of the objects which the participants can feel tactically in their body, ripples of water, sound, temperature or brightness of a lamp etc.

Also in each exhibition we have held was given its context according to the use or character of the public space.

4.1 artworks

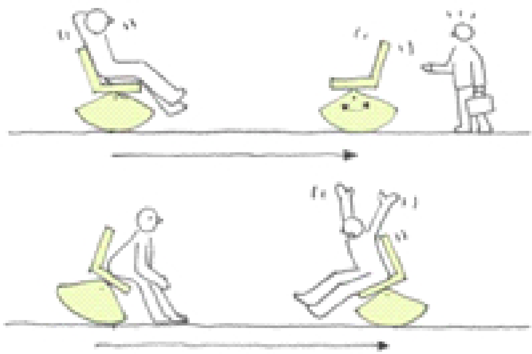
We will introduce 3 artworks we have produced in past 3 years.

- "WAVE RINGS !" 1998
- "Remote Furniture" 1999
- "World/World" 2000 (work in progress)

Remote Furniture : Two rocking chairs are installed on the floor facing each other. The audience sees no interactions between chairs. The trigger of interaction happens when two persons from audience each sit in a chair and rock. Each chair has a sensor and motor.

These devices enable mutual interaction between chairs. It allows one to feel the other's action of rocking the chair. The aim of "Remote Furniture," then, is to make direct and tactile touch.

I arrived at the idea by first considering the meaning of talking. Secondly, I wondered what kind of environment supports it, and what kind of rules are there behind talking. In "Remote Furniture", two chairs facing each other represents the environment, and the type of interaction represents the rules of talking.



Technical requirement: The interaction between two chairs is caused by the control with tilt sensor and linear motor. When audience sits and shakes this chair, tilt sensor detects inclination of this chair and the data is transferred to another chair through control PC and the motor in another chair handles the movement of the chair. Usually this kind of remote object is designed with Master-Slave (one-way) method. But in Remote Furniture, full duplex (two-way) interaction is realized because it is much closer to natural feeling.

WAVE RINGS ! : This installation uses ripples of water and sound as media of communication.

Imagine a pool which is 150 cm in diameter like a table that has 8 speakers submerged inside of it, each equidistant one another butted against the enclosing well of the pool. When someone approaches the pool, the nearest sensor to her attached on the pool will trigger the speaker, the vibration of this speaker is transformed into ripples of water that spread over the surface of water. If multiple people approach the pool at the same time, many speakers will sound forming a kaleidoscopic pattern of sound and water. Each sound and ripple has its own character: energetic, calm, or melodious, so people can choose which they like.

WAVE RINGS! in Exhibition in Keio Univ.

Created by Nodoka UI, sound design by Kohji SETOH

In the past, a public water source like a spring or a well had a very important roll not only to provide people with water but also as a place to exchange daily information,. But now, in most developed countries, we have water supply systems in each house and we don't need to gather at public water sources to fetch water. Therefore, they lost the roll as spaces of communication, and instead became object to appreciate in the form of fountains.

This installation aims to recover the roll of communication space by providing movement of water and the sound that people use as language to participate and communicate with each other.

Technical requirement: Analog signals are input from eight infrared sensors (from A to H) and are digitized by an I-CUBE analog/digital converter. This information is sent to a Macintosh Computer in the form of MIDI data. When receiving the triggering signal from a particular sensor, the corresponding sound is sent to the speaker neighboring that sensor. Max program that demonstrates the mapping from the trigger input to the resulting sound output.

World/World : This is an interactive network installation for tactile communication on a worldwide scale.

This installation consists of a pair of walls, (H300cm/W400cm/D20cm), installed in two different cities. Each wall has two sides, one has objects like poles or lamps, the other projects a captured image from the first wall.

World/World work in progress, model image

Created by Noriyuki FUJIMURA, Nodoka UI

Each object connects to objects in the other wall through the network. If someone acts on a object, the movement made by the participant's action is sent to the object which is in the same place on the other wall. The projection on the second wall shows the actions of the participants on the first wall.

Looking around, we find that many walls surround us in our daily life. We are not always aware of the other side of a wall—the other side may be another room or may be the building's outside.

Even though we know there is another side, we don't know or think about what's there.

We can't see both sides at once. That makes us doubt "is there really another side? What if the other side is another world?" If this happened, imagine that the signals you make on one wall were sent to the another wall in a distant place, and someone saw those signal and responded.

This installation makes imagined world real. Two walls in two distant places are connected to each other through a network (the Internet). The connection enables non-verbal conversations such as sending the body movements or body temperatures amongst the audiences interacting with these two walls.

4.2 Exhibitions

We have produced following 4 exhibitions in the past. The spaces where we have held the exhibitions were normally used for the public transportation or a part of large commercial space and recognized just as passage.

Our exhibition on these spaces provides visitors a shared experience, promoting unexpected encounters between people who gather for the same purpose, shopping or working.

And the aim of our exhibition is for people to rethink the use of these vacant public spaces, and possibly see it as a space of communication.

- PCS exhibition #1 at KeioUniv Campus, Fujisawa, Kanagawa in 1998
- Artworks: "Message Board", "WAVE RINGS!", "Shared Piano"
- PCS exhibition #2 at Sukiyabashi crossing underpass, Ginza, Tokyo in 1999
- Artworks: "Remote Furniture", "WAVE RINGS!"

PCS exhibition #3 at Queen's mall Yokohama,Kanagawa in 1999

Art works: "Remote Furniture", "WAVE RINGS!"

5. User Evaluation

Through these exhibitions, it can be said that we have succeeded in audience participation without hesitation. Some have just experienced the interaction with others through the artworks and noticed the existence each other. Others have curiously participate and tried to understand the meaning of the exhibitions and the space where they had been held.

But we need to investigate in the point that how they can bring broader communication between audiences than those we have intended in our artworks.

One of the answers we are trying to do is to take the relationship between the artworks and the space into the consideration. And we need to make the artworks become a part of the environment in the long term, not just memorized as the special experiences.

6. Recent State

We are now working on the artwork "World/World" in the small version and it will participate the festival "Virtual-Mine" in Neunkirchen, Germany and will be held as the event style exhibition both in Tokyo and in Neunkirchen from 30th Aug to 3rd Sep, 2001.

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poster

augmented reality project – part 1

situations for augmented relationships — 1998-2000

Karin Søndergaard, Kjell Yngve Petersen (kjell.yngve@teliamail.dk), Åke Parmerud

Abstract

We intend to investigate the possibilities of Augmented Reality through three basic concepts, which are distinctive in their placement within the social realm: 1/ relations between people — 2/ the person in relation to constructed interactive spatiality — 3/ installations as an agent in public space. The project is divided into three phases. Each phase is manifested in a collection of works.

Part 1, 1998-2000, Situations for augmented relationships: "Smiles in Motion", "Mirrechophone", "I Think You-You Think Me". Part 2, 2001-2003, Constructed Interactive Spatiality: working titles: "Wishing Well", "Baby Shoal", "Mannequins and a Landscape of Flesh", "Social Space". Part 3, 2003-2005, Sensory sculpture in public space, working title: "Democratic Hybrid Sculpture Complex"

Project URL:
http:// www.boxiganga.dk

1. Augmented Reality Project – Concept:

The works submitted are part one of three parts. Three collections of artworks as themes of research in the creation of meaning in augmented interactive multi-media

The phenomenon of "interactive multimedia" has experienced a drastic increase in potential in the last few years due to technological developments. The possibility of interconnecting sensors, complex computer algorithms and the many-sided expressions of media is now so great, that the primary interest in fascination with the technology may shift rather to the creation of meaning.

In our multimedia set-ups, the computer is relegated to a place where data is recorded, processed and transmitted. We can then be concerned with multimedia in a context of Augmented Reality, with creating spatio - sensory, perceptive and reactive constructs.

An interactive multimedia set-up is a world construct, in which everything consists of second hand impressions of different forms of processed transmissions — projections, sounds and reactions as interpretations and translations in a constructed reality. One is never in direct realization, but in search of meanings with one´s own physical presence, in which one´s own senses and actions can conquer, interpret and recognize. What one can do with a computer is generate pre-programmed decisions - artificial intelligence. In order to give a more complex meaning to interactivity than simple reactions to stimuli, an interpretive program should be supplied with opinions, intentions and taste. Things should be constructed with adaptive resistance and its own will, — and this should be recognizable by participants and audience. A simple form of personality with a mixture of fixed reactions and irrational behavior. It is not a question of making artificial intelligence alive, but shifting interactivity from simple reaction to the creation of meaning.

2. Aims of Research :

Multimedia as a network of open systems. We intend to develop relations-orientated multimedia works. Works which function in the social realm, in which we as people continually recreate and reinvent our existence — in relations between people. This is "relations technology" as opposed to functional or manifested technology. Open systems in which content and relevance are directly dependant on involvement.

The anatomy of interactivity. Interactivity in multi-media technology includes a few basic elements — (A) Things one constructs and programs one encodes — (B) the substance of picture, sound and design — (C) participants and audience — (D) specific sensors, processing of data and reactions involving the different media and actions. So far multimedia has been easy to describe and reminds one of the basic description of our own body, its senses, considerations and reactions. We will be working with the following systems parts: body-tracking, voice response, sensory reactive objects, audio-visual media and — people. This complex arises when these system parts are connected and made mutually reactive.

And especially in these projects in which multimedia set-ups are a constructed reality, in which experience is created from and with the participants. Beyond the basic senses of sight, hearing and touch, more complex senses such as spatiality, time perception and experience acquire their own significance. We are looking to communication through the body. Communication through action (will, intention, touch)

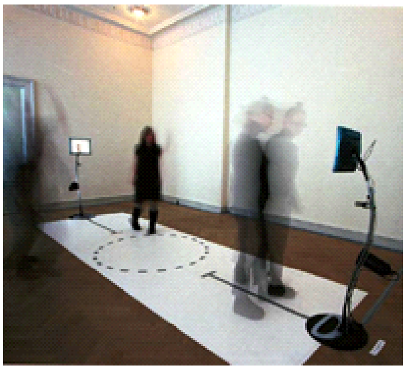
3. Project Description:

3.1 "Augmented Reality Project" — part 1

situation for augmented relationships — 1998-2000

It is through the bodies organs that we sense and act. In this way our being interprets the presence of people and things and brings a certain reality to that presence. Augmented Reality involves the body through the installations presented here, and in doing so, proposes "conversations" at the edge of our normal means of sensing and communicating.

In this project, visitors will come into contact with a series of staged and choreographed, high technology installations that can sense their presence. These "sensitive" sculptures are likened to pieces of furniture in a room. But the installations, each in its own way, don´t only sense, they also react. Thus they promote relationships through experiences that may take place at the edge of the senses. In this way, the visitor also becomes involved in an augmenting of what is able to be sensed and is likewise brought to an augmented state of interpreting that experience. In fact, the basic function of the installations often requires that two visitors enter into a relationship and investigate an interpretation of the contents of that relationship. These installations then are situations for augmented relationships.



3.2 "I think You — You think Me". — 2000

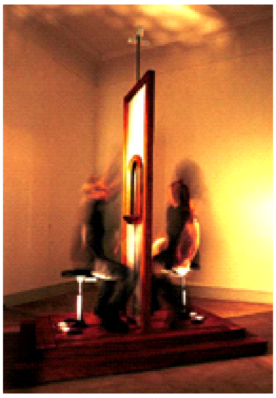
I think You — You think Me permits visitors to create relationships between real and virtual personalities. Two virtual beings, Robert and Roberta, are having a conversation. They are virtual in the sense that they are only present in the room through their faces which appear on two computer screens while their voices emanate from loudspeakers. One might say that the "real" life of these virtual beings then exists as bit-streams in the inner organs of the computers. Sensors permit Robert and Roberta to become aware of the movement and presence of real human beings in the room. When this happens, they speak directly to the visitors. However when no one is in the room, they fall asleep and snore loudly.

Through this set-up, visitors can join in and thereby extend Robert´s and Roberta´s relationship to themselves through a series of questions and demands that are addressed to them. In doing so they enter into the ongoing discussion between Robert and Roberta and become involved in their world. One might ask: "Have we thought them up or have they thought us up?"

3.3 "Smiles in Motion" — 2000

Smiles in Motion is an interactive pieces of furniture designed for augmented relationships between two people. Two chairs link two visitors that enable them to converse with each other in a very special manner.

This construction might be called a "relation apparatus" and is able to transform speech into movement. Speech and sounds produced in the audible spectrum by the two visitors are converted into vibrations, through motors placed in the seats of the chairs. As a visitor is perceiving what is spoken in the form of vibrations, he is also shown the mouth of the other visitor on a monitor fixed in a globe. The visitors "hear" each other through vibrations, synchronized with the images of the movements of their mouths. And so may converse through vibrations and smiles.



3.4 "Mirrechophone" — 2000

Mirrechophone is an interactive piece of furniture designed for augmented relationships between two people. It is a forum for the exchange of faces and words. Using complex light settings and a two-way mirror, the visual function of the installation morphs the faces of two visitors, as they look at each other, into a single face, with constantly changing expressions. The audio part takes words and sentences from each visitor, cuts them into monosyllabic words and sounds and then replays this mix back as a piece of sound poetry. What is said is re-composed into new meanings creating a single conversation through the blending together of what each visitor is saying: augmented relationships through morphing faces and speech.

poster

moving micro office

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Abstract

Moving Micro Office is a trans-disciplinary project that has been developed in order to re-discover our contemporary urban reality. It is a tool to research and at the same time interact with our built and social environment.

The Micro Office hardware is a minimal workspace made up of a steel frame construction on wheels (measuring 180cm by 90cm, the traditional Japanese Tatami size) that can easily be moved around by one person. Utilized as a device for community planning it is capable of putting the planner directly into the context he is dealing with.

Micro Office questions the prevalent notion of urban space and behavioral conventions, proposing new ways for how to put us into a spatial and social context.

Project URL:
http://movingmicrooffice.cjb.net/

Year the Work was created: 2000

1. Project Description

Background

The rapid technological progress we have been experiencing in recent years brought about a very profound redefinition of the way we relate to reality.

The shift of our life towards virtual worlds that we mainly experience through visual perception is challenging our sensorial integrity. At the same time the environments we inhabit tend to become rather elusive places. Communication is more and more enclosed within a network of wires, depriving public space of its original meaning. It is getting increasingly difficult to relate the "sensorial being" in us to the concrete reality that surrounds us.

Micro office at work

Concept and Vision

The Micro Office is a tool to break the logic of spatial alienation. It interferes with the prevalent system in order to extend our imagination, to create opportunities, and memories that change our vision of a place. Though utilizing the recent developments in communication technology, it puts the user into the sensorial world and confronts him with a one-to-one experience of environment and society.

The Micro Office is a functioning object that can and should be used, but it also works as a critical concept questioning the contemporary notion of urban space. It acts as an antithesis to the prevalent definition of the public and private sphere.


In front of a shrine

Using Micro Office as a community-planning tool, as I did, one can't avoid becoming participant in the urban transformation process. In many respects the project is closer to concepts known from the art field then it is to architecture or science. It makes it nearly impossible to "objectify" the context, but at the same time it provides us with a profound knowledge about the location.

The Micro Office questions the way planners, designers and researchers usually confront the urban context, and proposes a truly interactive approach for developing and communicating concepts in direct contact with the social reality.


Micro Office Hardware

Micro Office is exactly one Tatami, the traditional Japanese flooring material, which measures 180cm x 90cm. The structure is made of a welded L-profile steel frame, the walls from semi-transparent polycarbonate.

It has two windows, one of them a "flower window", and an entrance door that folds upwards to become a kind of canopy. I used to hang a "Sudare", a roll up Japanese bamboo blind, from the canopy to mark out my front yard and to create a smoother transition between inside and outside.


Moving my micro office

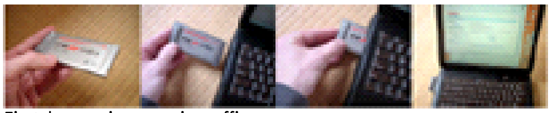
Moving Micro Office online

I used Micro Office as my office for one week in October 2000 crossing the urban reality of Mukojima, a neighborhood of Tokyo. Below an excerpt from the "moving micro office diary" that I created during that week. For the complete diary see:

http://movingmicrooffice.cjb.net

<Plug and play> ... a PC card connecting my micro office to the Internet ... and to the world

October 16th


First day moving my micro office.

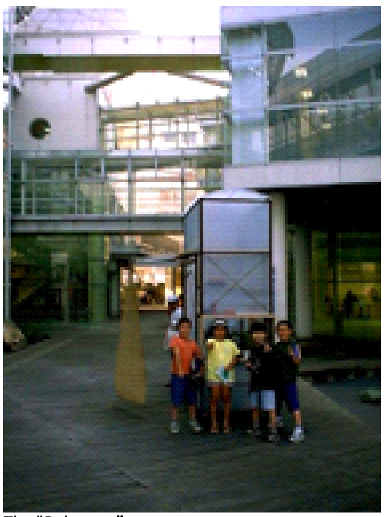
First stop: Istuko Hasegawa's "Sumida Culture Factory", the only really contemporary architecture in Mukojima. It seems as if a space ship has landed in the middle of tiny wood barracks. Hasegawa managed to create a cute urban public space in her "spaceship"...

As every good architect who minds the common well-being, I guess, Hasegawa was imagining children playing on her public space, and ... really ... there are some children playing there!


What is this?

I was happy about the children, and the children were happy about me, as I brought some alternation to their afternoon playtime ...

They told me about their collectors play cards (something like Pokemon), and I told them about the life of a German architecture Ph.D. candidate in Tokyo.


The "Pokemon" gang

They didn't believe that this was my office, until I started working on my computer ... I gave them a short introduction to connecting to the Internet via a mobile phone PC card, but finally the fascination of their collectors cards prevailed. They sat down in front of my office and exchanged their cards...

October 18th

Third day moving my micro office.

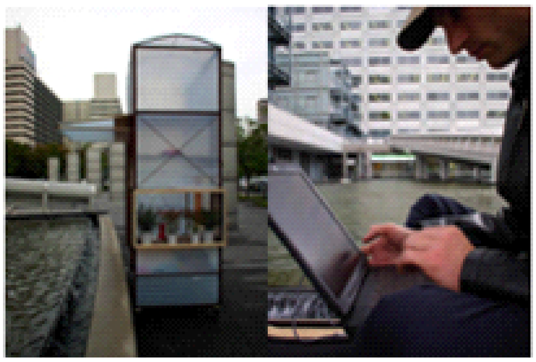
My plan for today was to move to Sumida River. On my way there I come across the Obayashi high rise office complex. The slight difference in dimension made me again realize what a small cogwheel in the big machine we are...

Micro and macro office

Some designer really worked hard on the Obayashi complex, though nobody seems to appreciate the effort. The well-equipped big open public spaces are mainly patronized by strong wind. I found a wonderful location to do some work. A kind of private waterfront for my micro office.

Squatting a square

Except the wind, and a friendly security guard (visible on the image above), nobody disturbed my waterfront working retreat. Actually the guard showed a slight sense of humor as he left me working after a short inspection of my office, just when he found me there again half an hour later he got a bit nervous, and suggested to look for a "more comfortable" location.



Private waterfront

As I was about to get hungry anyhow I set sail for (this is to be taken literally as it was a very windy day) the next "conbini" (Japanese for Convenient store), a family mart around the corner.

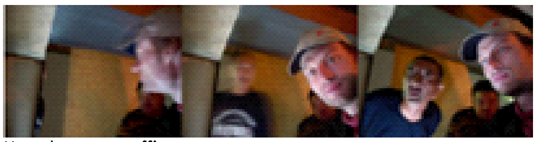
October 20th

Fifth day moving my micro office.

Today's weather is really bad, but as the wind is not that strong I decide for Sumida River to be the place for my office.

Under the bridge

We find a really nice place under the bridge, or to be more precise, under the Tokyo Expressway. It is directly at the Sumida River and has the big advantage of being dry, even in rainy weather. For this and for other reasons the homeless build their houses there. As most of you know Japanese homeless built quite neat houses, mostly using a cheap blue sheet, and that's why they are usually referred to as the "blue sheet" people.



Homeless at my office

The homeless at Sumida river have quite well working communities, and if someone like me comes there, news spreads fast. Soon I had a bunch of guests with me who didn't know much about Internet and digicams. I tried my best to explain what I'm doing, and they showed quite some interest for the latest technological inventions. They were really kind to me and offered me Sake and biscuits.


With homeless homes

October 21st

Sixth day moving my micro office.

Today me and my office are going to Kyojima, a neighborhood neighboring Mukojima. Some parts of Kyojima have somehow managed to survive the bombardments of the Second World War, and the redevelopment rush of the bubble era during the eighties. There are still clusters of "Nagaya" (a kind of row house for the poor) that date back to before the war. I guess that for the Tokyo government this quarter is an embarrassing place that it would like to get rid of a.s.a.p. I'd rather see it as a fascinating model for the future of high-density urban residential areas.


Amongst friends

The old wood facades are now covered with blue tinplates to protect them from fires, and my acrylic blue micro office seems to be a member of the family...

We find a wonderful location on a vacant lot directly beside the wood barracks. Today micro office is a hybrid building as it serves a variety of functions ... for example: being a temporary kindergarten.

Considering proportion and dimension, I thought a "micro kindergarten" might actually be more appropriate then a micro office...

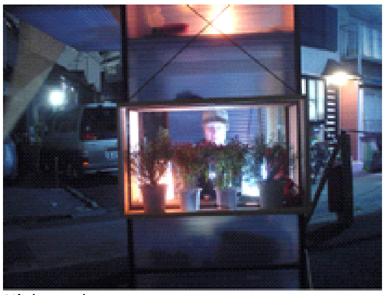

Micro karaoke?

... No, it actually didn't become a Karaoke box, even though the image above might suggest this usage..., but for the next micro project this might be a rather profitable idea...

Also today I had some visitors. As soon as they saw my digicam they thought my micro office could as well work as a "Purikura" machine (a very popular machine that instantly prints small photo stickers of the people posing in front of it). I couldn't offer colorful stickers, but at least presence on the net...


Young visitors

Again I didn't really find the time to work as frequent visitors kept me entertained...


Night work

Just after it got dark and Kyojima's village qualities prevailed, I found the time to concentrate on some minor important things like this home page...

Epilog

Moving around with my micro office was a wonderful experience and on my way I talked to many people I would have never talked to in a "normal context". Tokyo's public space became my environment, my front yard. While moving around with the micro office, it was the first time that I really felt "I'm inhabiting this city!"

panel 2:

the information society landscape

new formats of expression in eu/ist – projects

poster

isem4

interactive streaming environment with mpeg-4

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Abstract

We discuss the technological challenges when streaming MPEG-4 content over heterogeneous networks. Especially with video content we find high bandwidth demand aside with high sensitivity to losses and errors. The goal of our project ISEM4 is to set up an MPEG-4 client-server system with a special focus on the DMIF FlexMux functionality. In order to increase bandwidth efficiency, we propose to implement a non-trivial scheduling algorithm in the MPEG-4 DMIF layer and give first simulation results.

Keywords: MPEG-4, Multiplexing, Quality of Service, Smoothing, Streaming Video

Introduction

Streaming multimedia content will be one of the major applications in the future internet world. Users will demand high quality content in different situations and under different networking conditions. Our paper gives an overview about our MPEG-4 project ISEM4, which aims at developing a streaming system deploying content over heterogeneous networks. We will start this paper with typical application scenarios and a discussion of the difficulties arising when streaming MPEG-4 video content over networks with restricted resources. In the second section, we present the main ideas of our project and give first simulation results.

1. Streaming MPEG-4 Content

1.1 Application Scenarios

The MPEG-4 standard [1] differs in many aspects from it's predecessors MPEG-1 and MPEG-2. The functionality we will focus on in this paper is the integration of separately coded video objects in one scene. This offers interesting features for new applications. Content from different sources belonging to a specific topic can be grouped together and can be viewed with only one decoder. An example of this would be a teleteaching scene, combining the teacher, the lecture slides and possibly additional stored video clips. Another example we are implementing currently in our application is a news-server, containing the speaker and additional information in separate video files. Using an MPEG-4 encoder, all these sources can be combined and appear as one single video clip. This scene can also be stored in a single video file for later use.

Furthermore, if desired the user can be enabled to interact with certain objects inside the scene. So in spite of the fact that the application appears to be a single video, still the objects sources can be accessed and modified separately. Coming back to our teleteaching applications, the student can for example be enabled to scroll through the video while the teacher keeps on talking. Working with an MPEG-4 video scene therefore is very different to simple video on demand. From the teleteaching example, we also see that it is very likely that MPEG-4 content will have to be distributed over heterogeneous networks. Some students will work on a campus PC, connected over fast Ethernet, others will sit at home, connected via modem, ISDN or xDSL lines. In the near future, with mobile network protocols like UMTS, it may even become possible to listen to such a lecture from nearly everywhere. While this kind of mobility is very desirable for the user, it poses technological challenges we will discuss now.

1.2 Quality of Service for VBR-Video Objects

When streaming video scenes over the network, the major question very often will be: Does the network provide the appropriate Quality of Service and, if not, how can the application cope with this? Quality of Service is such an important issue because compressed video is very sensitive to losses and errors. Due to the elimination of redundancy, errors can propagate both spatially and temporally, as investigated for example in [3]. So, loosing only one packet can lead to unacceptable quality degradation for minutes.

Typical video content has high and bursty bandwidth demand. So even if resource reservation is possible in the network itself, it is very difficult to specify the bandwidth needed. To be on the save side, the peak rate could be reserved, but for bursty videos this will imply immense waste of bandwidth. Therefore, extensive research has already been done to find mechanisms that smooth the rate variability of the video by prefetching it into a receiver buffer, for an overview see [4].

The goal of our project is to extend these mechanisms to a scene made up of several video objects with heterogeneous Quality of Service demand. These algorithms will then be applied to the MPEG-4 prototype application in the MPEG-4 DMIF layer [2], to optimize transmission over LAN and WLAN networks as shown in Fig. 1. Related work can be found in [5] and [6].

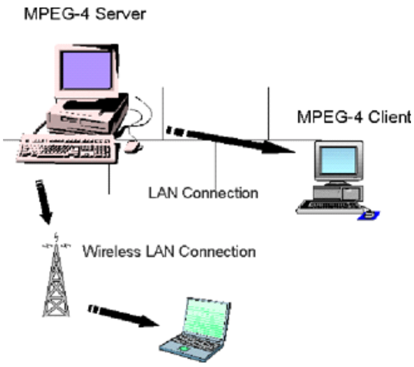

Figure 1 ISEM4 Network Scenario

2. The ISEM 4 Prototype

Fig. 2 shows our MPEG-4 news-server application. The viewer can interactively select a number of video files to be delivered to him over a network channel together with the speaker video. The speaker scene has been recorded in the virtual studio at IMK. All video files are encoded in H.263, to be able to transmit at low bandwidth.

Figure 2 News Server Application

To reduce bandwidth requirements of the two VBR-videos, we have considered smoothing-mechanisms for the scene. We have simulated the multiplexing of two VBR video sources over one joint channel under the following assumptions: one video (B) is assumed to be known in advance and can thus be prefetched. The other one (A) is created online, therefore, prefetching is not possible. Now both videos share a joint channel with constant bandwidth. Our multiplexing algorithm then works as follows:

First, fill up the receiver buffer of video B, then, if the bandwidth demand of A and B together exceeds the available bandwidth, check, if there is still enough data in the receiver buffer of B. If so, reduce the sending rate of video B in favor of the live video A. If video B's buffer is empty, discard parts of the live video. If the available bandwidth exceeds the demand of A and B, perform prefetching of B.

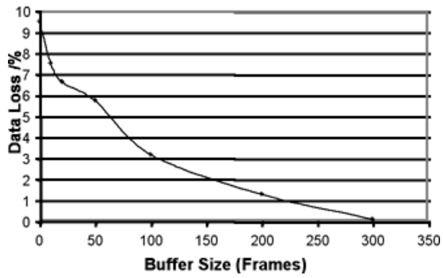

Figure 3 Data loss in the online video

Fig. 3 shows some simulation results. As can be seen in the diagram, increasing the receiver buffer of the stored video can reduce the amount of data loss in the live video, caused by discarded packets.

3. Summary

We have described the difficulties when streaming MPEG-4 content over heterogeneous networks and have introduced our project ISEM4. The goal of ISEM4 is to develop algorithms for the MPEG-4 DMIF layer to optimize the multiplexing of VBR-video objects.

A first approach that has been evaluated in simulation is to use the prefetch buffer of one single video object in a video scene to smooth the bandwidth requirements of the whole scene dynamically.

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poster

agma

automatic generation of meta data for audio-visual content in the context of mpeg-7

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Abstract

This paper describes our MPEG-7 project AGMA. AGMA stands for Automatic Generation of Metadata for Audio-visual content in the context of MPEG-7. The goal of the 3-year project funded by the German Federal Ministry of Education and Research is to develop new methods for automatic content analysis and to integrate these methods in a MPEG-7 compliant retrieval system. AGMA is divided into four components that deal with speech recognition, music recognition, face recognition and system design. The content analysis methods are developed and optimized on a multimedia database of material recorded in the German parliament. The content analysis is based on statistical methods including Hidden-Markov-Models (HMM) and Neural Networks (NN), which extract features that characterize the data and can be encoded in the MPEG-7 framework. MPEG-7 is the new standard for multimedia description interfaces. One of its main components is the representation of audio-visual metadata in XML. The paper presents background information on media archiving, the MPEG-7 standard, speech and image recognition, describes the German parliamentary database and relates preliminary recognition results.

Keywords: MPEG-7, Spoken Document Retrieval, Face Recognition, XML Schema, Content Analysis, multi-modal

Project URLs:
http://www.3sat.de/nano/cstuecke/19078/index.html

Introduction

The enormous increase in the number of multimedia sources and the availability of documents requires automatic methods to segment and analyse staggering amounts of audio-visual data. Technologies like speech and image recognition make this goal attainable. Projects like Informedia [1] and the DARPA Spoken Document Retrieval tasks [2] show that it is still a challenge to transcribe broadcast data totally automatically. Methods for face recognition and object segmentation are still under development and huge improvements are required before this technology can be used in commercial applications in the field of media archiving. The media industry is demonstrating an acute interest in reusing broadcast content that is in storage in databanks. Automatic analysis methods would make it possible to archive, retrieve and filter audio-visual segments (for example, a special interview), objects (a special person) and events (a special goal in a football match). In addition to improvements in the underlying algorithms needed for automatic content analysis, it is important to find a common description interface to describe multimedia data. This is the focus of the new MPEG-7 standard, which supports interoperability between different archiving and retrieval systems. Although MPEG-7 specifies a long list of multimedia descriptors and description schemes, the project AGMA uses only a select few of them. The fact that we can implement our system with a subset of the total functionality reflects the modular nature of the MPEG-7 standard.

The paper is divided in 5 sections. First, we describe the multimedia database of the German parliament used in the project. Second, we summarise some principles of the MPEG-7 standard that are important for our project. Then we introduce our speech recognition system, which is used to transcribe speech of the German parliament. The fourth section contains some preliminary work in the area of object segmentation and face recognition. In the final section we present our MPEG-7 system architecture followed by an outlook detailing the direction the ongoing work.

1 The Database of the German Parliament

For the AGMA project we have collected speech and video data from the German parliament. Although other domains may have higher entertainment potential, German parliamentary sessions offer three important advantages. First, the German parliament is a naturally delimited domain. Second, the high volume of speech and video with the corresponding transcriptions and annotations necessary for system training is available. Third, the data is publicly available, and its use does not give rise to intellectual property issues.

Previous projects in the area of speech recognition and spoken document retrieval have shown that designing a retrieval system for unlimited domains is not a tractable undertaking. A system conceptualized to recognise the content of sport events like a soccer game as well as other events like a TV talk show will show a low performance because the content is to diffuse for the system to learn the necessary generalizatons. Domain limitation is an important aspect to build a system that can be used for real world applications.

The second advantage of the German Bundestag database is the generous amount of data which is available. Every year there are about 100 debates containing in average 6 hours of speech and video. Even though the last 3 years are only partially available, we are able to exploit roughly 1000 hours of speech and video material. The speech and the video are provided in RealNetworks format. An additional advantage is the existence of annotations for the parliament speeches. The debates are tagged and annotated by humans and the speech is transcribed using stenography. For each debate there is a html-page and a electronic text file which can be downloaded from the Internet. The existing annotations help to train and evaluate a statistical recognition and classification system.

2 The MPEG-7 Standard

This section presents a brief introduction to the MPEG-7 standard and explains its import for the future of multimedia. More information can be found at the MPEG and MPEG-7 homepage [3] [4]. The major goal of MPEG-7 is to provide a framework for the description of multimedia content. Previous MPEG standards have focussed on audio and video coding to reduce storage requirements (e.g. MP3) and transmission issues (e.g. MPEG-2 for DVB). The huge amount of available media content requires metadata to access, reuse and to personalize this content. Like other MPEG standards, MPEG-7 aims to provide a basis for interoperability among different applications and vendors. The MPEG-7 initiative started in 1998 with the call for proposals. Within 3 years the MPEG group will have produced the ISO standard 15938 which is called MPEG-7 [5]. The components of the standards are:

System: This component specifies the architecture of the standard. It contains tools for transport, storage and synchronization between content and descriptors. It also contains tools for protecting intellectual property.

Description Definition Language: This component describes the language for defining descriptors and descriptor schemes. It is mainly based on XML schema defined by W3C [6].

Visual: This component contains descriptors related to video annotations, such as color histogram, texture information, shape information.

Audio: This component contains descriptors related to audio, like waveform and spectral envelope, melody description and spoken content description.

Multimedia Description Schemes: This component contains information about high level metadata, such information about media format, date of creation, IPR, financial, structure of the content, etc.

Reference Software: This component contains the reference software, which is mainly the eXperimental Model. Here, all descriptors are integrated in a full system used to test the MPEG-7 components.

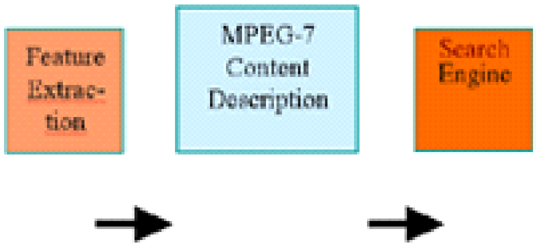

Figure 1: Focus of MPEG-7

Conformance: This component contains guidelines and procedures for testing conformance of MPEG-7 implementations.

MPEG-7 is not primarily focussed on automatic methods to annotate and recognise audio-visual input. Rather, it is meant to provide a common description of the syntax and semantics of audio-visual scenes. This principle is shown in figure 1.

The scope of MPEG-7 covers the definition of a standard for the description. Feature extraction, which is either an automatic procedure, or the work of human annotators, and search and retrieval are not part of the standard. These processes can be implemented and realized in different way by different research groups and vendors.

An important role of MPEG-7 is related to XML schema, which is used for describing multimedia content. Although schema does not cover all functionality required by MPEG-7 (i.e. matrix and vector definitions), it is a promising standard of W3C, which is used in many database systems and Internet applications. The decision to use XML will help to integrate MPEG-7 into existing database applications.

3 Speech Recognition and SpokenContentDS

For automatic segmentation and transcription of speech data we use the speech recognition system from Mississipi State University, called the ISIP system [7]. It is a state-of-the-art speech recognition system based on Hidden-Markov–Models (HMM) and is distributed under an Open Source license agreement. The whole system is implemented in C++ and contains tools for HMM training and large vocabulary decoding. The acoustic models are trained on 33.000 German sentences from the Phondat and Siemens100 databases yielding in 48 monophone models. Each model consists of 3 states with 8 mixture components. The lexicon we use for recognition contains 50.000 word entries. Higher level constraint on the recognizer is provided by a bigram language model trained with the SRI language modeling toolkit (http://www.speech.sri.com/projects/srilm/). Currently we use the ISIP system to transcribe the existing German parliament speeches to produce the training material needed to adapt the acoustic models to the domain. The main issue is to process the imperfect transcription of the stenographs. We generate a word grammar which allows the insertion and deletion of words given in the stenography. In a second processing step, we apply confidence scoring to identify segments of speech which have been transcribed with a high degree of reliability and which can be used for retraining the acoustic models. In a first evaluation we achieved a recognition rate of 65% for the German parliament domain tested on 400 sentences[8].

MPEG-7 provides the SpokenContentDS to describe the content of speech material using an existing speech recognition engine, like Viavoice, HTK or ISIP. The SpokenContentDS contains a description of a word and a phoneme lattice to allow retrieval on a lattice. This descriptor scheme was proposed and developed by [9] and is now part of

[10]. A lattice is a graph containing recognition alternatives weighted by probabilities. Figure 2 shows a typical lattice with similar words:

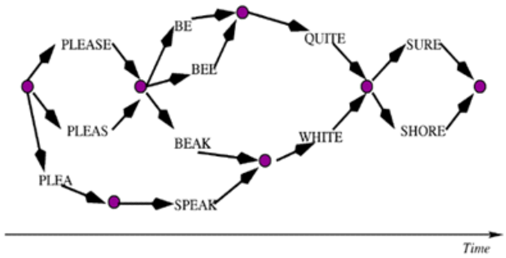

Figure 2: An example of a lattice for the SpokenContentDS (from [9])

Previous investigations on information retrieval have shown that the use of a lattice improves the performance of the system. Further, the phoneme lattice allows identification of words that are unknown to the recognition system, but that occur in retrieval queries. Proper names and new technical terms are particularly likely to be missing from the recognizer's vocabulary.

The SpokenContentDS is fully integrated in the MPEG-7 XM-system. Currently we are working on converting the ISIP recognition output to the format of the SpokenContentDS and combining this with the Transcriber toolkit [11] to annotate speech material. This system uses also XML and DTD to describe the segmentation and transcription of a spoken document.

4 Video Proccessing and FaceRecognitionDS

Although this work is in preliminary stage, we present our approach for video segmentation and face recognition. The video analysis is composed from three successive processing steps: temporal segmentation, face detection and tracking (figure 3), and face recognition. The temporal segmentation uses the difference image and the difference of the histograms of two consecutive frames to find the scene boundaries (cuts and dissolves) in the video sequence. A frontal face detector is used to find the faces in the scenes. The gaps between the detected frontal views of the face, where the person looks to the left or right, are filled using a simple histogram based tracking algorithm. The recognition of the detected faces is based on pseudo 2D Hidden Markov Models. One model trained on face images of each member of the German Bundestag is used to recognize the speaker at the parliament.

Figure 3: Face tracking result for a single speaker

5 AGMA System Design

The system design in AGMA is closely related to the design of the MPEG-7 XM (eXperimental Model). Because there are more than 100 different DS in MPEG-7 we have focused on those that are relevant to our goal of transcribing and annotating speeches of the German parliament. For example, the MelodyDS is not required for the German parliament domain. The most important DSs are the SpokenContentDS and the FaceRecognitionDSs. Both DSs are high-level descriptor schemes that contain semantic information already high level. Information on this level is important to do meaningful retrieval and have an effective application.

The components of the systems are shown in figure 4.

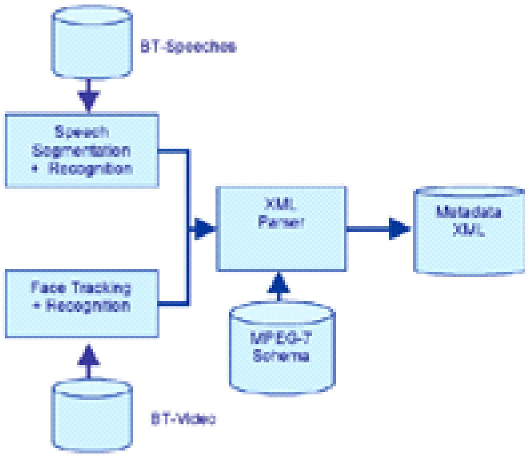

Figure 4: content extraction architecture in AGMA

The feature extraction process is divided in two stages. The speech recognition system generates a segmentation and transcription of the German parliament speeches. The output of the recognizer is a word and a phoneme lattice. In a simple version only the first best hypothesis is generated. The recognition engine is the ISIP speech recognition toolkit described in section 3. The output of the recognition process is passed to the XML parser. Here we use the Xerces parser from Apache, which is also used in the MPEG-7 XM system. The parser creates a DOM tree and is able to check the MPEG-7 schema. This step is an important stage in the process because here the recognition output format is validated. The validation guarantees conformance with the MPEG-7 standard and the interoperability with future applications.

The similar approach is carried out for the face recognition process. Before the speakers are recognized, a face finder locates the position of the face. Then the recognition process is initiated and the results are also passed to the XML parser. The results of the speech recognizer and the face recognition system are written to a XML file that contains the metadata of the audio-visual input file. This metadata can be used for retrieval and information filtering applications. Although most work should be done by automatic methods like speech and face recognition a human annotation and verificatoin is necessary. We use for the speech domain the Transcriber Toolkit to check the metadata and to improve the transcriptions. In the step, confidence values are essential to identifying regions which are not reliably transcribed using automatic methods. Exploration of the potential of semi-automatic methods is an critical research direction in the area of metadata generation.

Finally, the combination of visual and spoken annotation are important to improve recognition and transcription rate. The synergies that can be exploited under a multi-modal approach will be a key research issue in the project.

7 Conclusion and future work

In this paper we have presented our MPEG-7 reference system designed for the German parliamentary domain. The combination of speech and face recognition yields in a powerful system for automatic annotation of multimedia data from a specific domain. Our AGMA project is one the first projects covering all parts of the MPEG-7 standards except for binary presentation and streaming of metadata.

Our future work will focus on a combination of video and speech recognition in a multi-modal system. We will also concentrate on object and face segmentation in order to be able to extract and reuse the images of different politicians. We have committed ourselves to improving the overall performance of our system to the level necessary to fulfill the demands of a real-world application.

8 Acknowledgement

We thank the ISIP team for providing the speech recognition system and Phil Garner for his work on the SpokenContentDS. This research is supported by the German Federal Ministry of Education and Research (BMBF) and has the official project number: VFG0011B.

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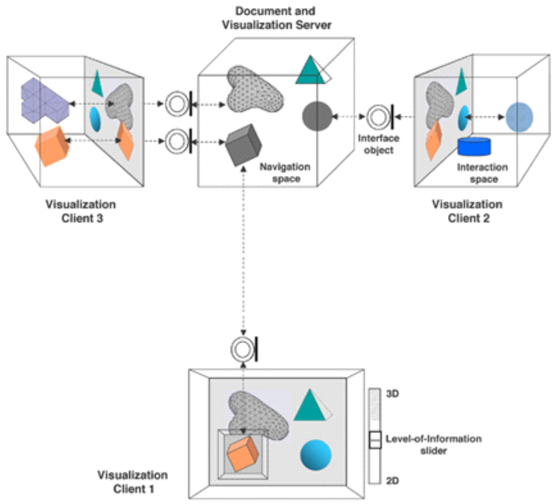

a software architecture for adaptive visualization of distributed 3d documents in open information spaces

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Abstract

With the emergence of open information spaces, e.g. digital libraries, advanced techniques for interactive visualization of complex and protected 3D documents are needed. This poster presents a new visualization concept and software architecture which deal with the problems of complexity and security of digital 3D documents in open information spaces. A dynamic combination of remote and local 3D rendering is used to allow scaling of the information quantity on client side.

Project Urls:
http://www.imk.fhg.de and
http://www.cg.cs.tu-bs.de

1. Introduction

Distributed work involving 3D scenes as part of multimedia documents within networked information systems needs technical support for retrieval, interactive visualization and communication. Homogeneous conditions for work with digital objects and interfaces to other information spaces are characteristics of an open information space which comprises several information servers, document databases, multiple clients and telecommunication networks between them. Figure 1 shows an open information space built up of two information servers (S) with document databases (DB), a number of users (C), who can also use additional local databases, and an interface between the information servers.

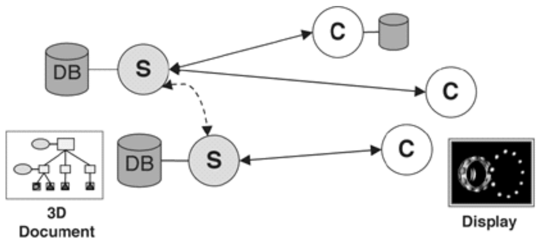

Figure 1 Visualization in open information spaces.

Documents of a digital library used by a group of students and a tutor working on a research project which involves 3D models (e.g. an architectural construction project) is a practical example. A digital library allows users to explore already existing 3D documents, generate and add new documents as a result of project work and discuss results. A digital library system should also provide the possibility for visual cut-and-paste, indexing, extending 3D documents and protection of originals. In order to exploit the full potential of the open information space, both work at the central facility on a LAN using specialized equipment and work at home using standard PCs and low-bandwidth connection should be equally possible. This poster introduces a visualization architecture which deals with these issues of complexity and security by using a combined approach of remote and local 3D rendering and an object-oriented document model. A document-request-broker approach is presented which allows access to objects of distributed 3D documents via proxy objects with a varying level-of-information (LoI) called object representations. Common graphical representations for 3D objects are shown in Figure 2.

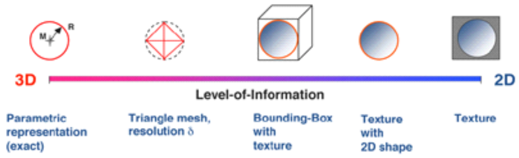

Figure 2 Representation of 3D objects with varying level-of-information.

1 The 3D Scalable Scenes Architecture

Considering 3D scenes as ordinary documents emphasizes that 3D scenes can be handled in the same way and provide similar features, e.g. cut-and-paste, support of retrieval, indexing or extensibility, and are subject to the same constraints, e.g. security or complexity, as generalized digital documents in distributed information spaces (see also [1]). 3D documents include structure information, which can be mapped onto an internal document model commonly known as the scene graph, and contain geometric objects as content, which are represented as shape nodes in the scene graph.

The Scalable Scenes concept is designed to support work on 3D documents in heterogeneous environments. It combines remote and local 3D visualization allowing the realization of a system that enables interactive frame rates on client side for local objects and security and complexity management for remote objects. Remotely rendered images are integrated into a hybrid 2D/3D client scene by texture mapping to allow navigation in a remote 3D document. Other examples of a combined approach are presented by Engel et al. in [3] and Mann et al. in [4]. Nevertheless evaluation of the literature shows that the advantages of combined systems are not investigated enough up to now.

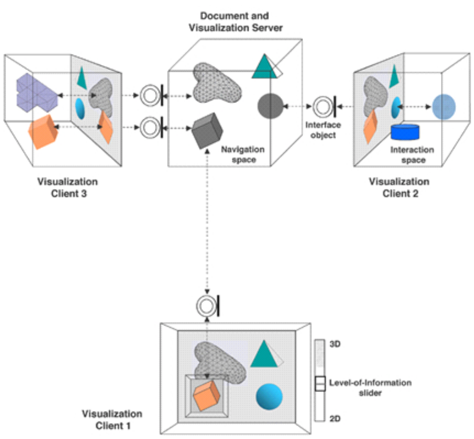

Figure 3 Combined concept of SCA3D

Synchronization of the visualization pipeline on server side with the client's visualization pipeline allows the user to navigate in remote 3D documents and to interact with objects of the same document located as copies on his computer. The concept distinguishes a remote navigation space on server side and a local interaction space on client side as shown in Figure 3. A level-of-information slider provided by the client application controls which object representations can be transmitted to a client on a selection event. The positions of the LoI-slider range between 2D image objects and 3D original objects. Certain positions can be locked to prevent a user from transmitting protected objects. Locking is indicated by a hatched area of the slider of client 1 in Figure 3 which shows the concept of Scalable Scenes in an overview. Three states of an object are distinguished. An inactive server-side object is only present in the navigation space and can therefore be visualized remotely. An object which is selected by a user is in the state of an active object. An active object is present in the navigation space and represented on client side by a suitable object representation which is connected to the server-side object via an interface object. The interface object provides a method interface to the user which is accessible over the local object representation. Finally, an object can be in the state of an inactive client-side object indicating that this object was transmitted as original from server to client.

The SCA3D architecture is built to support multi-client collaboration. The collaboration model of SCA3D uses unique client Ids to maintain individual object references for every client. A multi-client image server is used to distribute image streams over socket connection to any number of clients. The software architecture comprises four layers: a WWW layer, a visualization layer using the OpenInventor API, a document control layer using a CORBA implementation, and finally, an image layer used for image coding, transmission and decoding. The document control layer and the image layer are discussed in more detail in the following sections.

1.1 A Document-Request-Broker Approach

Access to document objects in the distributed system is managed using a technique which is similar to an object-oriented middleware concept based on remote procedure-calls (RPC) (see [5]). Generally, the standard architecture CORBA is used to develop distributed applications where methods of remote objects are accessed via local proxy objects. On server side method implementations provided by so-called skeleton objects are used to apply the RPC. A similar approach, which we term document-request-broker (DRB), is integrated into the Scalable Scenes concept. The document request broker uses interface objects on server side and local object representations on client side to support visual access to remote 3D documents. The object-oriented document model of a scene graph supports this approach very well. The characteristics of an object-oriented document model are e.g. described in the W3C DOM standard [2]. The DRB-concept is shown in Figure 4.

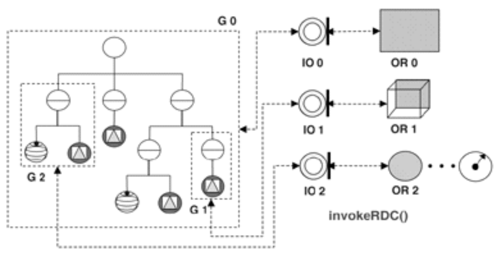

Figure 4 Access to scene graph of a remote document via proxy objects

The document itself is equivalent to the group G0 of the document-request-broker. It is represented on client side by the object representation OR0, which is the remotely rendered image of the 3D scene. The original document and the client's object representation are connected by an interface object IO0.

The client can now apply actions on the document by invoking so-called remote-document-calls (RDC), e.g. pickObject() or getCopyrightInformation(). The method invocations are then applied by the document-request-broker to the original document using the interface object's methods. In next steps further objects can be activated and interface objects together with objects representations for subgroups of the document are generated and connected. All object representations mentioned above can be used to work with server-side document objects and therefore the information quantity can be scaled dynamically.

1.2 Organization of the Image Streaming Layer

Images are distributed in the software architecture to support object representations which use remotely rendered images. The basic configuration of the client scene requires that an image representation of the whole 3D document is generated on server side with a certain server frame rate (SFR), transmitted to the client and mapped onto the clients projection plane with a certain texture mapping rate (TMR). To adjust the rate of an image stream to a client's condition a mechanism for rate control is implemented in the image layer. The rate control technique applied is also used in image streaming environments to prevent network congestion (see [6]). The SCA3D image layer uses server-side image buffering with a feedback from receiver and sender to control the filling rate of an image ring buffer. The rate with which the ring buffer is filled depends on the ratio of the fixed server frame rate and the individual texture mapping rate of each client. An image servant thread on server side reads the image data out of the buffer and writes them to a connected image client thread over a socket connection provided by an image multi server before. On client side the images are mapped onto the projection plane with the adjusted texture mapping rate. The setup of the image layer is shown in Figure 5.

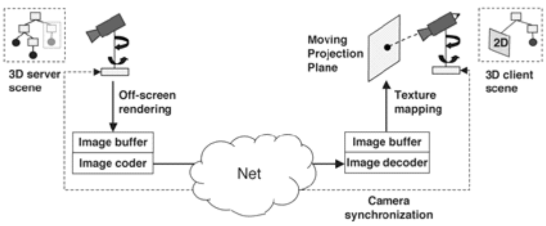

Figure 5 Generation, distribution and mapping of remotely rendered images.

To find the appropriate ratio of server frame rate and texture mapping rate for each client, a performance measurement step must be performed. For this purpose the local frame rate (LFR) and remote frame rate (RFR) are measured and their dependency is evaluated. To produce the dependency curve the remote image frame rate is stepwise increased from a minimum value to a maximum value by changing server frame rate and texture mapping rate accordingly.

2 Adaptive Behavior by Control of Frame Rates and Local Geometry Load

The software architecture SCA3D implements an adaptive behavior with regard to local and remote frame rates. When a client connects to a server, the optimal ratio between local and remote frame rates will be adjusted in order to minimize the delays for local and remote actions using a performance evaluation process which is performed at fixed intervals. The remote frame rate is influenced by three factors: the delay caused by image generation, by data transmission over the network and by texture mapping on client side (see Equation 1). The reciprocal value of the overall delay is used here as approximation of the RFR value. The local frame rate is estimated as reciprocal value of the local delay of an action (see Equation 2). It depends mainly on the amount of geometry information to be rendered, on the adjusted texture mapping rate and on the resolution of texture images.

$$\widetilde{RFR} = \frac{1}{T_{gen} + T_{net} + T_{map}} \qquad (1)$$

$$\widetilde{LFR} = \frac{1}{T_{local}} \qquad (2)$$

In order to support work on a distributed 3D document it is necessary to find the optimal ratio between local and remote frame rates. An optimal ratio of local and remote frame rates enables fluent local work on 3D objects and a remote visual feedback with a small delay reflecting the state of the server-side document.

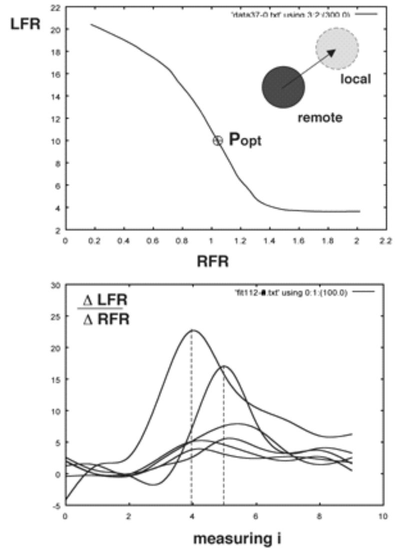

Figure 6 LFR vs. RFR curve (above), slope of LFR vs. RFR curves (bottom)

In the right above corner of Figure 6 (above) this is demonstrated by showing a 3D object that is moved locally together with the remote visual feedback reflecting the state of the original document. The difference of local and remote delay results in an impression as if the remote object is connected to the local object representation with an elastic band. Figure 6 (above) shows the experimental results of a performance test for one client as an LFR-vs.-RFR-curve with the optimal ratio Popt. This point is estimated by evaluating the slope of the curve. The characteristic curve of a client application, which is busy with texture mapping and with local rendering, shows a point of maximum slope indicating the optimal ratio of local and remote frame rates. This point is used to adjust the local texture mapping rate and the server-side push rate of the image ring buffer. Figure 5 (bottom) shows the changing slopes as result of performance evaluation of the same client for a varying geometry load. To minimize the overall delay the optimal ratio of local and remote frame rates of every client has to be adjusted individually using the rate control mechanism described above. The server frame rate, which is proportional to the maximum texture mapping rate demanded in the environment, and the texture mapping rate of a client are used to control the push rate of the image buffer. The delay factor for filling the image buffer is estimated as reciprocal value of the ratio $w_i = SFR/TMR_i$ between server frame rate and individual texture mapping rate. By multiplying the server frame rate with the delay factor image streams at optimal frame rate can be delivered to every client. In order to compare clients a performance metric is needed which reflects the differences in CPU-power and bandwidth connection. The metric is used to control the level-of-information slider and to provide a client with objects representations best fitting the individual local conditions.

In Figure 7 comparison of two clients is shown with help of the LFR-vs.-RFR-diagram. The performance of client 1 is better than that of client 2 which is expressed by the difference of the length L of the vector from the origin to Popt. The evaluation of the vector length of both clients as L = sqrt (LFR_ + RFR_) shows that the performance of client 1 is approximately five times the performance of client 2. Both clients were connected to the server over a LAN (10 MBit/s). Client 1 was a personal computer with a powerful processor (L1 = 5.2) whereas client 2 was an older workstation with less CPU-power (L2 = 1.1).

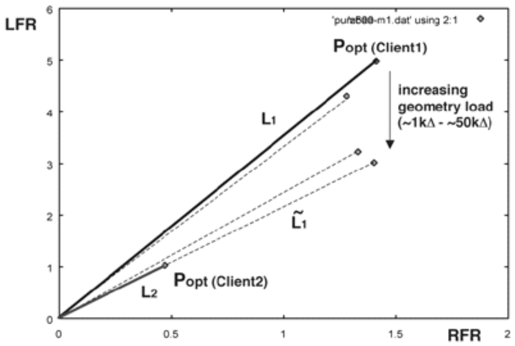

Figure 7 Performance comparison of two clients.

To show how this metric reflects the performance changes under varying conditions of a client, the geometry load was increased for client 1 and the result are presented in Figure 7. The remote frame rate remained nearly the same under the new conditions whereas the local frame rate was decreased indirectly proportional to the number of triangles in the client scene. The performance value changed from L1 = 5.2 to L1 = 3.4 as a response to a change of the triangle number from 1000 triangles to 50000 triangles. The distance DL between the clients changed from DL = 4.1 to DL = 2.3.

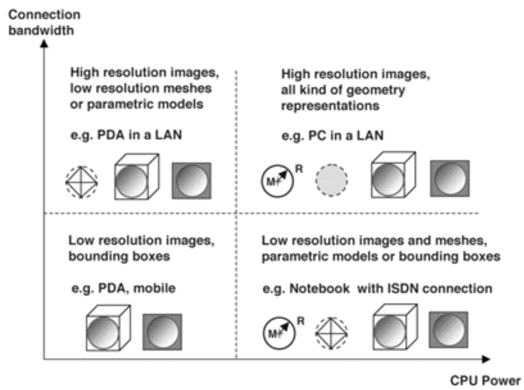

Figure 8 Classification of object represen-tations with regard to client performance

The performance metric together with the rate control mechanism are integrated into the architecture SCA3D to support adaptive distributed visualization of complex, protected documents for single users and cooperation within groups of users. The concept provides optimized conditions to cooperating users who work under different conditions with regard to local CPU-power and connection bandwidth. Clients represented by the classification scheme shown in Figure 8 can now work together on a 3D document because the system adjusts the level-of-information on client side.

3 Conclusions

The software architecture SCA3D is a solution for interactive visualization of distributed 3D documents in open information spaces with integrated techniques for complexity management. The adaptive behavior of the architecture was described by introducing a technique for rate control known from image streaming systems and a performance metric which allows a comparison of clients working together on a 3D document.

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safira

supporting affective interactions in real-time applications

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Abstract

This paper provides an overview of the SAFIRA project, an IST-KA4 project in the area of Affective Interactions. We explain the rationale for providing computers with the ability to understand, model, and express human-like emotions. We present the toolkit for affective computing that we are building, and describe 3 demonstrators that illustrate different approaches to affective interaction that are using our toolkit.

Keywords: Affect in Human/Machine Interactions.

Project URL:
http://gaiva.inesc.pt/safira/

Introduction

Although emotions have been, for a long time, considered undesirable for rational behaviour, there is now evidence in neuroscience and psychology that place emotions as an important factor in problem solving capabilities and intelligence in general [1] [2]. As a result, organisations now use emotional intelligence [3] tests as an evaluation procedure, and a strong new field is emerging in computer science: affective computing, i.e. "computing that relates to, arises from or deliberately influences emotions" [4].

As humans interact directly with computers, it is critical for this interaction to be empowered with affective components that enrich it and make it more adequate for each individual user, while also providing "machine intelligence" with otherwise impossible capabilities. In the words of Minsky: "the question is not whether intelligent machines can have any emotions, but whether machines can be intelligent without emotions." [5].

Based on these recent findings, SAFIRA addresses the resulting need to enrich the interaction between humans and computers with an affective dimension. We propose that such enrichment can be achieved through the provision of a framework and a toolkit that capitalize on recent research done on the area of affective computing and address the problem of building believable characters.

The main objective of the SAFIRA project is to bring to the software community an enabling technology to support affective interactions. To achieve that, we are investigating a framework to enrich interactions and applications with an affective dimension and implementing a toolkit for affective computing. This toolkit combines a set of components addressing affective knowledge acquisition, representation, reasoning, planning, communication and expression.

We are also creating a set of basic demonstrators of the potential of such systems: 2D and 3D virtual environments shared by synthetic characters and users, and "anthropomorphised" personality-rich personal service assistant based applications. Those demonstrators explore the concept of a virtual environment improved by an emotional channel seamlessly integrated with the audio-visual representation of the environment. Multi-sensory interaction between participants' projected cyber-selves, other participant avatars and the autonomous agents inhabiting the environment will be the means to evaluate the models developed during the project.

In this paper we will describe some of the design decisions concerning the construction of the SAFIRA toolkit and we will provide a brief description of the demonstrators that we are building using that tookit.

The SAFIRA TOOLKIT

One of the SAFIRA project objectives is to provide domain-independent components that can be put together to build agents/machines capable of exhibiting both emotionally controlled and emotionally expressive behaviour grounded in the internal architecture. To attain this objective we have classified such components as follows:

1. Affective Acquisition, which deals with the mechanisms required in order to obtain information about the user, in particular, concerning affective elements.
2. Emotion Processing, which maintains and handles the mechanisms for embedding emotion and cognition in a software agent.
3. Affective Expression, encapsulates the mechanisms, which are required in order to generate real-time emotional expression.
4. Inter-component Messaging, which provides a rich communication language to share information and service access at a flexible level, thus permitting both sub-components and components to be integrated in a loosely coupled manner.

These components are derived from the background research conducted in highly multi-disciplinary approaches which involved psychology, agent technology, knowledge representation and manipulation, visualisation and moreover, the integration of all these.

The challenges of building affective synthetic agents are not only in the specifications of engines and architectures that can understand, manipulate and generate affective behaviour and expression, but also the integration of both in a common standard API that will allow for the various components to seamlessly interact and exchange common knowledge spaces and data.

To attain that, we have specified an API to bridge the gap between the available underlying emotion engines and the various agent tools. The defined API provides a map between these tools by automating the movement of information from XML Schema structure definitions into the appropriate relational parameters required to generate the appropriate behaviour.

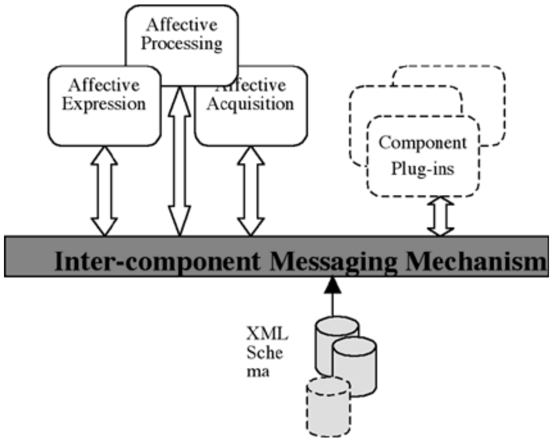

Figure 1 Toolkit architecture

Given this architecture, the toolkit will allow application developers to use API as a glue-like mechanism to tie the various visual and underlying affective behaviour generation tools together, seamlessly, regardless of the platform that they run on and the language they are developed with. To test this, we are developing 3 demonstrators, which will be described next.

The SAFIRA Demonstrators

In order to test all the relevant properties in the toolkit, such as integration, communication between modules, affective processing, etc. we are developing three demonstrators. There are three goals for these demonstrators: to provide a platform for showing the range of possible contexts in affective interaction that can be covered by the toolkit, to provide a testbed for evaluating the correctness and usefulness of the components developed, and to further in different ways our understanding of affect in interaction. Below is a description of these demonstrators.

James the Butler

The James the Butler demonstrator builds on the well-recognised metaphor of a natural, human-like computer character interacting with its user. James the Butler tries to design a believable character: one with which users may interact over a longer time span, to which users may build a relationship, and which will react in a comprehensible and relevant manner in dialogue with the user. James the Butler will have affective facial (integrated with the body behaviour rather than the facial affective output module in the toolkit), body and speech behaviours (though bound to the limitations of these modules in the toolkit), and will attempt to model users' emotions and react accordingly. It will use a combination of synthetic emotions and personality traits. The role affect plays in the system will be to support functional goals for e-commerce, and this provides a constrained field in which to understand affect in interaction.

Figure 2 James the Butler

The believable character is a common metaphor for interaction and AI research in the field, and one that the SAFIRA toolkit must be able to support. Although the field is well-defined, there are still numerous unresolved research challenges, making this an interesting and important field for research for SAFIRA.

FantasyA

James the Butler is an application for e-commerce which builds on computer science research which is relatively mainstream. In recent years, however, researchers in the areas of AI, graphics, and HCI have become aware of the importance and interest of applying advanced computing research to computer games and entertainment. The second demonstrator, FantasyA, explores the possibilities for bringing affective computing to this newly fashionable area. FantasyA is a role-playing game with 3D characters, where affect is the key to advancing in the game. Only when the user is able to make his/her avatar portray the "right" kinds of affective expressions will s/he be allowed to move to the next "island" in the game.

FantasyA presents several additional challenges, which the toolkit addresses. The first is how to enable the user to alter the affective expression of his/her avatar in a natural way; to answer this, we are experimenting with a plush toy as an input device for affect, something that has not been done before in the field of affective interactions. Also, the characters in the game will need more complex affective reasoning components. Finally, FantasyA provides an additional testbed for bodily expression.

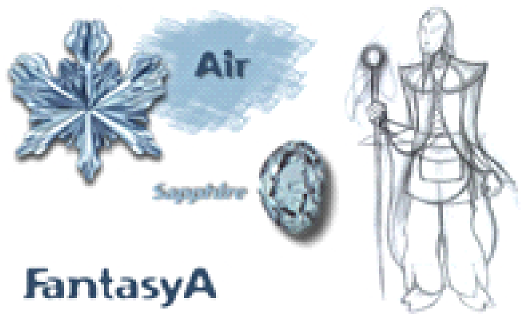

Figure 3 FantasyA

FantasyA also builds on the complexity and richness of emotion that we support. The notion of emotion in FantasyA is more complex than in James the Butler, because emotional modelling is connected to a larger narrative context in which the emotions are given meaning and can be understood, thereby relating FantasyA to the Narrative Intelligence research field. In FantasyA, we also have the added complication of several characters interacting, which moves us away from the single, user-facing agents in the James the Butler scenario. The kind of affective interaction supported in FantasyA is more open-ended than in James the Butler, because users can explore the game in a less guided way and interact with richer characters.

Influencing Machine

The two demonstrators described so far use affective interaction for believable characters, one in the established realm of computer science, the other in the newly emerging area applying computer science to games. But if SAFIRA is to address the issues of affective computing more broadly, it cannot limit itself strictly to computer science alone. The goal of affective computing is to allow a humanization of the interface, to make interfaces address a wider range of human experience than those traditionally addressed by computer science. In order to accomplish this, affective computing must address a broader, culturally appropriate notion of emotion, not only as understood by the cognitive science models of emotion which motivate much computer science research in the area, but also in such areas as depth psychology, the humanities, and art. In these areas, emotions are not binary or well-defined; they are soft, fuzzy, ambiguous, and open to interpretation. The goal of the Influencing Machine demonstrator is to show that the SAFIRA toolkit can also address these broader aspects of emotion, and to explore the nature of affective interaction in these more human, more analog, and therefore less clearly defined areas.

The Influencing Machine is a museum installation which, in the manner of an art piece, engages users in an intimate relationship with an affective, intelligent system by letting the user influence its emotional and developmental state. The relationship between the affective input from the user and the affective output of the machine is intentionally made fuzzy, complex, and rich. The user can input emotionally evocative art postcards in a "mailbox". The machine interprets these postcards as if they portray certain emotions which influence both the emotional and the developmental state of the machine. Depending upon which postcards the machine is exposed to, and when they arrive, the development will go in different directions.

Many affective systems with complex agents relate to the user either by trying to extract and respond to the user's emotions, or by allowing the user to directly control an agent in the system. The Influencing Machine explores a different relationship, in which the user neither directly controls nor is modelled by a character, but indirectly influences the system's emotions and thereby its behaviours.

The Influencing Machine expresses itself through child-like drawings, inspired by how a child develops between 9 months and 3 years old, going from scribbling to primitive human figures. The drawings express emotions both through their contents, and through how they are drawn, the dynamic properties. The drawings are underscored by emotion-driven sound, developed by a sound designer. The drawings are intended to be intriguing, being given their meaning through users' interpretation and imagination. The Influencing Machine thus allows users to reflect on the notion of synthetic emotions, on what it means to interact with an affective, intelligent system, and on their own emotions and reactions.

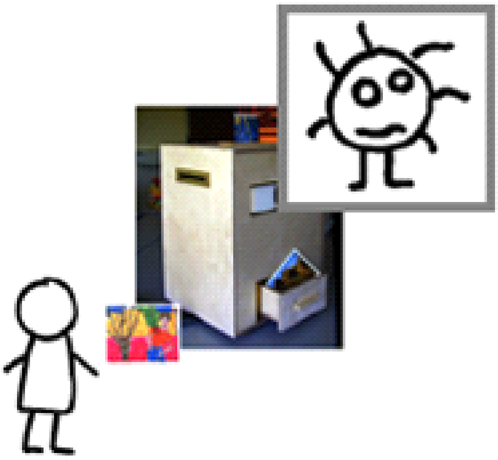

Figure 4 The Influencing Machine

From a user interaction perspective, the Influencing Machine allows SAFIRA to explore affect in an open-ended interaction over time, in which the user's reactions and interpretations are central to the experience.

Summary

These three demonstrators, still under development, provide different dimensions along which to expand our understanding of how to design for affect in interaction with end users. They also address an expanding range of contexts in which affective computing is meaningful, from within computer science, to the boundaries where computer science is expanding into the neighbouring field of computer games, to a broad context in which technology is designed with an eye to including cultural and humanist perspectives.

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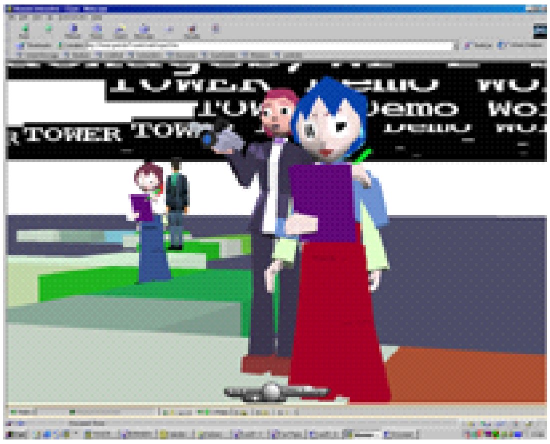
poster



awareness of cooperative activities in mixed realities

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Abstract

The TOWER environment creates, in parallel to the usage of groupware, a so-called "theatre of work" supplying awareness information. When performing an activity using a groupware application, avatars and their symbolic actions on the virtual stage represent the users and their current actions on shared objects. Avatars of users who work in a similar context appear spatially close in the theatre of work. The scenery of the stage is generated from the artefacts shared through the groupware application. The groupware application and the theatre of work are interconnected by means of the internet based TOWER event infrastructure. The theatre of work is presented as a multi user 3-D world on ambient displays in a user work setting to provide awareness of cooperative activities in mixed realities.

Project URL:
http://tower.gmd.de/

1. Introduction

In a co-located team, members typically learn from a wide range of cues about the activities of the other members, about the progress in the common task and about subtle changes in group-structures and the organization of the shared task environment. Team members act based on their individual awareness of the current environmental and social situation. Most of this awareness is achieved without specific effort. A distributed (virtual) team – even if its cooperation is based on a state-of-the-art groupware system – today is far from a similar level of awareness and opportunity for spontaneous, informal communication. This reduces the effectiveness of the joint effort, and makes cooperation a less satisfying experience for the team members.

Organisations are more and more restructured around virtual teams. Thus "they loose opportunities for innovation through the causal sharing of knowledge and learning induced by physical proximity" [17] or as Prusak [13] describes this phenomenon vividly: "If the water cooler was a font of useful knowledge in the traditional firm, what constitutes a virtual one?"

The TOWER system aims to bring the wealth of clues and information that create awareness and cohesion in co-located teams to the world of virtual teams and to present them in a 3-D virtual Theatre of Work. The 3D-environment provides virtual closeness related to the closeness of work items, tasks and contexts. It provides awareness about events in cooperative activities.

A number of approaches [14], [8] exist to support awareness information in groupware applications. Common to these approaches is that they concentrate on the provision of awareness information at the users desktop. In contrast, TOWER provides a virtual shared 3D environment, i.e. the theatre of work where awareness information is symbolised. Avatars and their symbolic actions represent users and their current actions on shared objects while using a groupware application. The avatars perform symbolic actions that illustrate events in an information space, episodes of interaction or non-verbal behaviour.

In the following we will give some theoretical background and requirements for a virtual awareness environment based on theories for human activity performance and relationship to environments. Then the generation and the components of such a virtual world are described. Finally a view on the potentials of the TOWER approach is given.

2. Effects of shared settings on group work

From activity theory [6, 7] we know that human activities are guided by inner-individual motives which may be stimulated by external objects. Like seeing a restaurant stimulates a motive for eating and activates an eating activity. In order to satisfy a motive, i.e. the need behind a motive, actions have to be performed. Actions are guided by goals. The execution of an action requires a plan of operations to be performed. The plan as well as the operations have to be adjusted to the environmental conditions. Before and after executing an operation, an actor has to verify the environmental conditions and to adapt her plan.

Real world settings are often designed to support particular kinds of activities, like restaurants, warehouses, schools etc. Barker's Behaviour Setting Theory [1] gives details of structural similarities between the physical properties of environments and the behaviour of its inhabitants. Social and physical forces combined with physiological processes, physiognomic perception and mutual learning are essential factors, that determine the synomorphy between the properties of a setting and the standing patterns of behaviour of its inhabitants [3]. Similarly, electronic environments should facilitate situated actions of the individuals [16].

3. Acting using groupware applications

In most groupware applications, social forces are limited by the low level of social presence [15]. Situated action and co-orientation are limited by the fact that members of non-co-located team do not act in a shared environment. Each team member acts in her own local setting which is basically constituted from the environment given in the local office and by the electronic environment as provided on the personal desktop and by the groupware application.

However, the shared "situation" of the cooperation partners lays in the groupware application and the shared artefacts. These constitute a shared virtual environment and which should be made visible.

The 3D-TOWER world visualises the shared context as a shared setting on a virtual stage. It is generated from the shared objects and contexts used. Functional distances between artefacts appear as distances in the 3-D visualisation. The operations of the users still take place in the local environments and by means of the groupware application but they are visualised in the 3-D virtual stage. Electronic sensors may be attached to relevant instructions and record awareness information. The stage displays the shared setting, the artefacts, the actors and actions that are taking place. The visual perception of the stage can be used by human actors to adjust their behaviour to the conditions displayed. In particular motives for activities can be stimulated and action plans can be adjusted to the scenery on the virtual stage although the operations still take place in the local physical settings.

4. The TOWER environment

In the following the technical mechanisms to generate and support the virtual stage are outlined. A central part of the TOWER environment is the generation a 3-D world from the objects used in a shared working context. Sensors are provided for recording the events indicating actors, operations and objects. Electronic sensors can be associated to groupware functions. The actors are represented by avatars and located according to their point of action as indicated by current events. Based on a model for symbolic acting the avatars are animated according to the events the actors caused. The TOWER environment is tied together by the event and notification infrastructure that sensors events in the local work settings and that also supplies sensors to detect the objects in the shared context.

5. Generating the scenery

The space of the TOWER world provides a context-based distribution of activity information, where the context is defined by the spatial, organisational, task-related and personal environment of the cooperating users [5]. The space module of TOWER dynamically creates 3D spaces from the shared information and objects used in a group (Figure 1).

In real built environments, the spatial structure affects movement patterns by creating more and less strategic routes [11]. The evolution of a symbiosis between patterns of spatial structure and patterns of behaviour gives rise to the richness of the cultural experience of space at both the urban scale and within building interiors. By en-capsulating certain aspects of this kind of emergent process within a space generation rule-base the space mo-dule seeks to develop a characteristic spatial culture within TOWER. Rulesets are used to generate the scenery of the TOWER stage from the artefacts used by means of the groupware application [4].

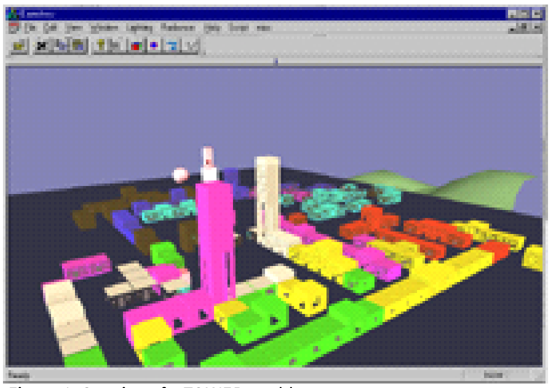

Figure 1: Creation of a TOWER world.

For example, a scenery of a TOWER stage is generated based on a BSCW shared workspace [2]. Distances between objects in the scenery map to topical distances between the objects in the shared workspace. The mapping algorithms and the rules used for world generation allow to tailor the scenery towards that desired by different kinds of organisation. For example, organisations with well-defined 'proceduralised' tasks and organisational structures may require more controlled and hierarchical spatial forms.

The space module of the TOWER environment provides the means which enables to construct a setting that carries and constitutes meaning in itself. In this sense behaviour patterns within TOWER are 'situated', the scenery visualises physical forces of the cooperation environment.

6. The actors in the scenery

In order to enable social forces and co-orientation, the actors and their actions are visualized by means of avatars animated on the virtual stage. The event notifications created when a user performs an operation are used this to animate her avatar. The movements of the avatar convey a symbolic meaning indicating the operation the user is performing. Symbolic acting provides a concept where the useful information of 'who is doing what' is displayed visually for the benefit of everyone without adding cognitive effort to the users [9].

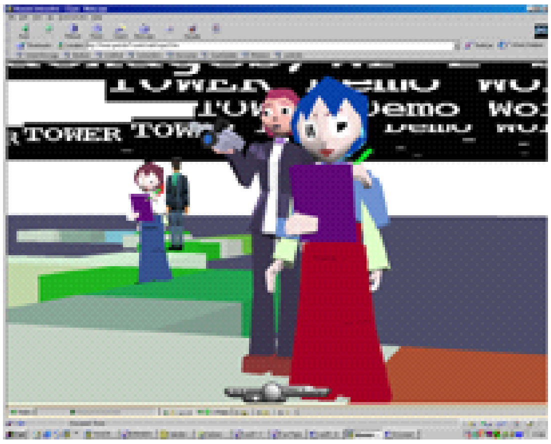

Figure 2: Symbolic acting in Tower

A user's avatar is located in the scenery at the place of her work, i.e. at the representation of the object she is currently working with. Thus depending on the object a user touches, her avatar will be moved in the 3-D world. According to the kind of operation she performs on an object her avatar will perform certain gestures in the virtual scenery.

By taking away the responsibility for controlling the avatar from the user and automating it we remove the problem of relying on neglect prone manual controls to add life to a world. With symbolic acting the context dependent actions of all users are shown at all times so the world can seem like a more active place as well as more closely reflecting the activities of a user group.

7. Interweaving virtual and real world settings

The heart of the TOWER system is the event and notification infrastructure that interconnects all components. It is the basis for world creation and for animation of the scenery.

The event and notification infrastructure is capable of recognising and sensoring user operations on shared objects or in a shared environment [12]. This infrastructure is fully integrated with the Internet.Tasks of the infrastructure are to store, aggregate, and forward the event information to applications. Restricted access to event information is realised through access rights. Reciprocity mechanisms are included to ensure transparency between producers and consumers of information.

The scripts that drive the act in the theatre of work are derived from events that are generated by the cooperating users. Both worlds, i.e. the TOWER 3-D world and the physical interaction with the groupware application in the local setting may run completely in parallel. The TOWER event and notification infrastructure interconnects both worlds and animates the scenery on the stage.

For a user, it is not necessary to be interconnected continuously with the TOWER world. Instead, when after some interrupts a user comes back to work in the particular group environment she may start the TOWER world. Then all events that have occurred since the last usage may constitute a replay of what happened in the mean time. Thus a time acceleration of the animation in the theatre of work may take place. This will enable a user to catch up what has happened in the meantime. Further means to reconstruct the history of the activities performed in the collaboration process by means of evaluating the past events are a matter of further study.

The TOWER scenery can not only provide awareness about events in the electronics work context but can also be interconnected with the physical environments. Relevant events in the electronic scenery can also be indicated to users in their local physical settings. To this end ambient interfaces can be established in the ambience of the local office. They are used as sensors to capture events in the physical environment or as indicators to indicate events from the electronic setting. Our research on ambient displays has been influenced by the work at the MIT Media Lab [18]. Similar approaches can be found in [10]. However, in TOWER ambient interfaces provide an interconnection with the physical and the virtual space in the 3-D-world. Ambient displays, which are integrated in the environment of the user, will help to avoid information overload by providing awareness information in the user's periphery.

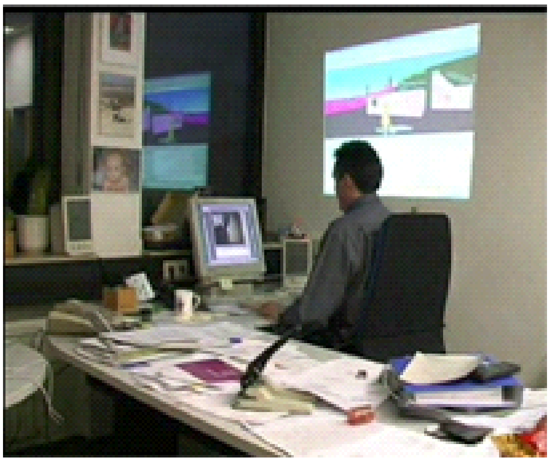

Figure 3: TOWER in a user work setting

In a TOWER office setting the TOWER world is displayed either trough projections in the office environment or by large touch sensitive screens. Figure 3 shows a office scenario in which the TOWER world is displayed at the wall. The user has just recognised the presence of remote colleague in the TOWER world indicating that this colleague is currently working on documents that are of interest to him. For opening a direct video connection to this partner he may now move the stage scenery on his screen and touch the colleague's avatar. This scenario shows the potential of the TOWER world to serve as a contextual chance encounter for distributed teams.

8. Conclusion

With TOWER, new workplaces will be opened which enable people to benefit from currently available animated 3-D world technologies for the development of new working situations for distributed teams. Distributed teams or groups will be the working conditions of the future. With the Theatre of Work we provide a pervasive environment that is complementary to existing groupware systems and that augments these systems to achieve an environment that increase the awareness and cohesion in distributed teams.

A user bodily performance takes still place in her local physical environment but it is mapped to the virtual stage. The virtual 3-D stage may facilitate cooperation, provide action affordances, and ease the development of congruent behaviour almost like a behaviour setting. Orientation in the cooperation process will be facilitated by the virtual stage.

The effects of the usage of TOWER on virtual teams, on team cohesions and synergy effects in team work as well as its impacts on telework and telecooperation will be studied in future practical evaluations of the system.

9. Acknowledgement

The present paper and the TOWER project is based on ideas, concepts and software produced at UCL, BT, blaxxun and GMD.

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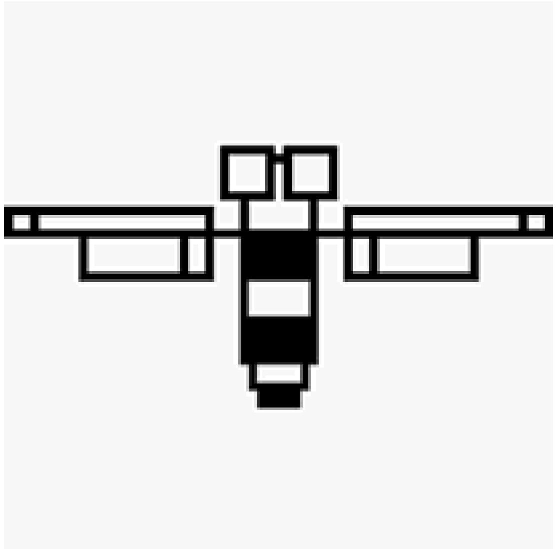
panel 3:

networked living

connected citizens

Poster



buzzbee.tv

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Abstract

Conventions and laws introduced over the last decade make it nearly impossible for a genuine refugee to reach Europe legally. Once arrived they face an application process for asylum which is of a quite complex nature and it is never easy to be accepted as an asylum-seeker.

buzzbee.tv is proposing a service which concentrates on this current situation, in which many asylum-seekers are often forced into an illegal existance.

buzzbee.tvs structure tries to allow the immigrants to move step by step into the daily life of the local community where they hope to find a new home. The interactive mediaformat provides a service that mainly relies on shared knowledge and experiences of the users themselves. While building up a mental backing with the people who understands the individual background better than anybody else, local citizens are getting more and more involved. The intention of buzzbee.tv is not only to appeal to the solidarity with asylum-seekers but to provide a platform where interests of local citizens and asylum-seekers are dealt with a maximum grade of openness.

Keywords: Interactive TV, Online Service, Diverse User Profiles

Project URL:
http://www.monofloskel.de/buzzbee.tv

Year the Work was created: April 2001

1. Theme

All over the world people start to become more and more mobile. Even worse: people on the globe have broader access to information than ever before. As a consequence more people than ever want their dreams come true. Many of them think that their best chances are found in the western world - and try to get there.

But there are also those, who are forced to migrate facing persecution because of reasons of race, religion, nationality, membership of a particular social group or political opinion.

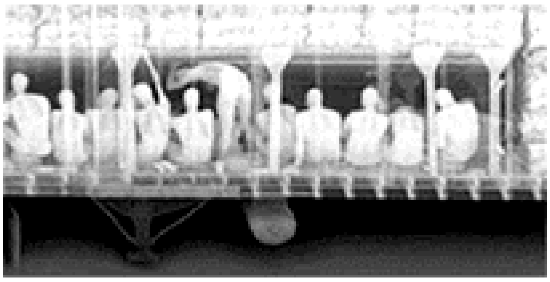
Over the last decade politicians all over the western world have been pretty concerned about these migration tendencies - and decided to stop migration in large scale. Now there are tighter laws, which clearly try to separate between people who have had to leave their countries because of the reasons mentioned above and people who want to sneak into the country just for reasons like ... self-realization?

But recently the topic of migration appeared in a new light. In some countries of the European Union the population is decreasing. If this trend is going to continue there won't be only the pensions for the elder in danger: despite of unemployment rates the economies are hungry for skilled employees. Because of these reasons some politicians start to rethink their migration-policy.

While politicians are not sure how they shall take position asylum-seekers keep on trying to reach the countries where they hope to find at least a safe place.

In the European Union there are additional laws regulating which country has to deal with asylum-seekers: it sharpens to a point if they reach the border of the European Union and they are travelling through a country which does not threaten them, - a so called safe third state - the asylum seekers have to stay in this country and this state has to deal with them.

Fortunately the European Union is surrounded by these safe-third-states only. The only chances left for the unfortunate asylum seekers is to reach any state of the European Union by air or waterways. There is a specialized business going on to use the remaining possibilities to bring the people into the countries of desire. Not all of the asylum seekers are specialized in the same way.



Frequently they reach their destinations only dead.

In the case they stranded successfully, they have to prove the persecution they are due to face in their home-countries. If they cannot bring the evidence, they are sent back to where they came from.

Being aware of the danger to be sent back, many asylum-seekers flee straight from their illegal arrival into an illegal existence, where they are often at the mercy of dubious gangs and people who take advantage of their situation.

2 Concept

The Intention of buzzbee.tv is to give the immigrants as much support as possible in this difficult situation: to guide them over some hurdles and to a legal existence, without wanting to deny or play down the facts asylum-seekers have to face in reality.

This support is putted together first of all with a mental backing by providing contact to people, who come from the same country and who might have the same fate.

The possibility to have someone you can communicate with in the way you are used to, is meant to be very important for building up the confidence you need to go through a process of legalizing your existence. Further support follows by offering in buzzbee.tv embedded services trying to help finding accommodation, getting things right for the application for asylum, getting a job and fundamental medical supply. There is even a service which has the intention to encourage personal contact between asylum-seekers and native citizens on a deep emotional basis.

More information about these services and how they work later on

It is often a long way to get a legal status, but after all it is a formal procedure. To see yourself and to be seen as a part of a society requires integration.

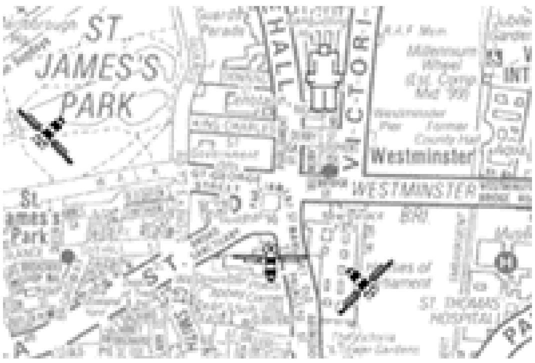
buzzbee.tv tries to do some bits for limiting prejudices and pushing integration forward by bringing asylum-seekers and citizens together - and tries to do that in a more subliminal way.

To open the service for a more sublime communication, there is a strategic differentiation of the access to certain services in which different communities will join each other. Employers and potential lovers use different portals than the asylum-seekers for accessing the services of buzzbee.tv (the portals have different names as well). In the case of the service used by employers there is even a different interface used. The main intention is to push the topic, that there are asylum-seekers involved first into the background and to give the space for an interest-led (employers) or joyful (lovers) communication.

To design for asylum seekers means first to take care of the heterogeneity of these people. They come from very different cultures, have different religions, speak different languages and not all of them understand the local language. It is even possible that there are some tensions among themselves. The circumstance that unites them, is the fact that they want to stay in a country, which is very suspicious of them - and they themselves are suspicious of the country as well. The line which separates their existence between legal and illegal is very thin. Therefore the design of a service has to be open to this ambivalence – and also has to offer as much protection as possible for its users.

Another difficulty is to make sure that the created services are working on their own. Or in other words: use only enough administration necessary for running the services - keeping the service efficient - keeping it autonomous.

The other problem is to avoid that traitors have easily access to confidential information and cause damaging mistrust. I decided to use parts of a system, proved over decades by several organizations: The personal contact and a decentralized information structure.



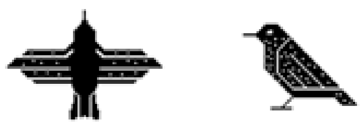
3. Substitutes

buzzbee.tv has many similarities with a game. Every user is represented as a figure in an environment, which is actually a map of the real environment the people are living in. All the figures representing asylum-seekers have in common, that they are highly abstracted flying animals. I have chosen winged animals, because the ability to fly over the simulation of the real space these people are actually living in, stands in opposition to high restrictions of moving they have to face in reality. To offer a pushed up possibility for movement in the virtual space is intended to reduce the strong feelings followed by the restrictions. With this figure you can explore the space and interact with other users as well as with the provided services.

As a new user, you start as a bee. I have chosen a bee as a substitute, because it is an animal, which has very positive attributes in every culture.

The whole service relies on a system of recommendation-points. By communicating with other users and using the provided services you can get these points. A certain variation of these points from different users is necessary to upgrade to a queenbee. The queenbee stands for a person who can be trusted. The variety of possible actions is extended: for instance one of the jobs the queenbee can do, is to prove the authenticity of new users. You would get a point for this job - of course.

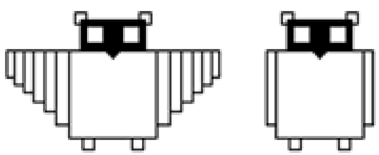
If you continue collecting points as a queenbee you can upgrade to a starling.



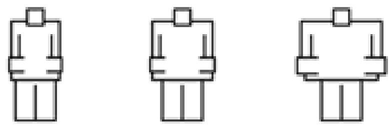
The starling is a bird, which is able to imitate other animals voices or sounds of the environment. So the substitute starling stands for a basic knowledge of the native language. With this important skill, the user has access to a new service: the honeybee-service. More about this service - later on.

The eagleowl represents people who actually run the service (welfare organization). It also represents the automatic system. So the system behind generated notices, mails and other messages, is represented through this bird as well.

Usually the user has only at the beginning - at the first logon - contact with the eagleowl.



In the case of later contact (i.e. public relations), the eagleowl is also able to provide recommendation-points. These points can be used as jokers.



The substitutes for the employers can not fly of course.

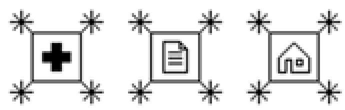
Their substitute is only visible for the asylum-seekers. Employers use a different portal and have a different representation of the data. This service is specialized for the community of employers who offer jobs especially for illegal persons. Using the service is much safer for them than picking up the workers directly from the streets (like they usually do it).

On the other hand the asylum seekers can see at the recommendation-points the different employers have collected (they are also embedded in the point-system) if they can trust this person (i.e. paying the wages). Depending on the collected points, the substitute is more fat or slimmer. Fiddling with the hands in the pockets means that the employer has a job offer.

4. Services

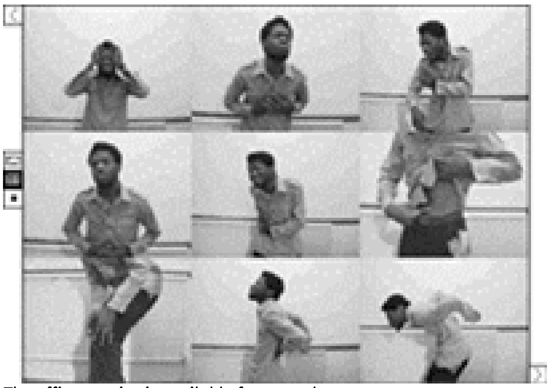
The health-service is available from the start as a bee throughout all levels.

If illegal asylum seekers are ill, they are not able to ask for medical treatment without risking being detected as being illegal. Therefore it is important to provide them with necessary information in the case of serious illness.

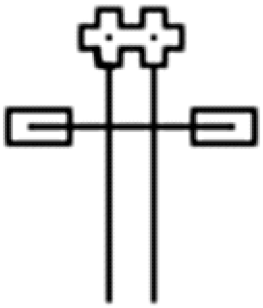


It is thought that there are doctors or medicine-students, who are interested to support this kind of service. Because of expected communication-problems a picture library supports the service.

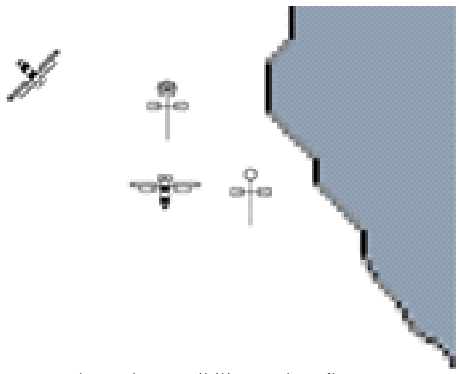
By choosing different pictures pointing out the medical problem, it would be possible to specify the kind and seriousness of the illness.


The office-service is available for queenbees.

Applications for asylum are quite tricky. This service tries to support the applicants providing information about what kind of documents are needed and about criteria of acceptance.


The honeybee-service is available for starlings.

The service has a second portal for native citizens. It is a little world in the world of buzzbee.tv, where everybody is represented through a bee. There might be a identification problem in the first moment for asylum-seekers who have already passed the stadium of the bee at this stage. But here they have got the possibility to add attributes like colour and the movement of the wings to their representative.


As a user, you have the possibility to plant flowers.

These flowers are representing media files. Depending on the length of the media the shape and the number of petals is varying. You start with three seeds for planting these flowers. In consuming the content from a flower, you are creating a seed for the author of the particular flower. If you cannot attract anybody, you run out of seeds.

The honeybee-service intends to make it possible for asylum seekers to meet native people. It wants to create a playful environment, which shall make it possible for asylum seekers and native citizens to come closer. Maybe close enough to give your relationship a formal status.

If the application for asylum is not accepted there might be another way for getting the citizenship.


Love can be a strong power.

5. Pictures in order of appearance

Cover, The Economist April 2001

Refugees smuggled aboard lorry, Guardian Unlimited 2001

Still, Navigation Interface buzzbee.tv

Figure Bee active/passive, buzzbee.tv

Figure Queenbee active/passive, buzzbee.tv

Figure Starling active/passive, buzzbee.tv

Figure Eagleowl active/passive, buzzbee.tv

Figures Employers passive, buzzbee.tv

Figure Health-, Office-, House-Service, buzzbee.tv

Picture-Library Health-Service, buzzbee.tv

Figure Honeybee-Service, buzzbee.tv

Still, Honeybee-Service Navigation Interface, buzzbee.tv

Detail Content Representation Honeybee-Service, buzzbee.tv

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Forderverein Koelner-Fluechtlingsrat e.V.,

www.koelner-fluechtlingsrat.de

ProAsyl, www.proasyl.de

UNHCR, www.unhcr.ch

collage machine

interest-driven browsing through streaming collage

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Abstract

People now browse the web by scanning pages and deciding which links are worth chasing. They see a limited subset of all potentially interesting pages. CollageMachine [4] stirs up the process of web browsing with cognitive strategies that promote emergence and creativity. It changes the granularity of browsing. A session is seeded with a set of web addresses or search queries. CollageMachine deconstructs web pages to form collections of media elements – images and texts – and hyperlinks. It crawls hyperlinks and recurses. Meanwhile, media elements stream continuously into a collage. The user can engage in collage design as part of browsing by selecting elements for which she feels an affinity, and removing undesired ones. These direct manipulations drive an agent, which models the user's interests in order to effect the evolution of the collage. A visualization grid allocates screen real estate to optimize display of the most interesting media elements.

Project URL:
http://mrl.nyu.edu/collagemachine

1. Browsing

In the six short years since the first Mozilla, browsing has quickly become an everyday part of information age life around the world. What does it mean? Browsing comes from a 16th century French word meaning "buds, young shoots. " [8] Literally, it means "to feed on the leaves and shoots ... or tender parts of rough plants: said of goats, deer, cattle." This is an interesting activity. On the one hand, the basic need to eat for survival is being fulfilled. It is a critical task. On the other hand a culinary sense is suggested, a whimsical sense. Which shoot looks better to eat? Next, I will browse the one which looks tastiest.

When it comes to the web, the public understands this implicitly. Hence the term, "to surf the web." Surfing has whimsical implication. A surfer seeks to catch the finest wave around. This is a very important aspect of what browsing is. Utility is connected with an ineffable sense of pleasure.

Some researchers have ignored this aspect of browsing. Card and Pirolli have published a useful series of articles about how to mathematically model web-browsing behaviors, based on the analysis of web server logs. [10,11,12] Unfortunately and perhaps unwittingly, they have limited the scope of their work. They define their work on information foraging thus, "the basic idea behind information foraging theory is that we can analyze how users and their technology are adapted to the flux of tasks and information in their environment." [11: 1] The limitations of this approach should be very clear: if you think of browsing in terms of tasks, you'll be missing more or less half of what it is. While they recognize that "most of our everyday tasks can be characterized as ill-defined problems," what they mean by this is:

Tasks might include choosing a good graduate school, developing a financial plan for retirement, developing a successful business strategy, or writing an acceptable scientific paper.. [12: 4 -- 5]

This does not sound like surfing. The values represented are all work and no play. Life is more than the solving of problems, more than utility. What about heavy.com, where androgynous samurai stand as interface gate-keepers to the funky web representations of popular hip-hop and sexual personalities? It's another world, just as important. Ethnographic research which investigates the different kinds of behaviors of users engaging in various browsing activities in diverse contexts, such as living rooms, Internet cafes, and universities, as well as workplaces, would complement empirical quantitative analysis.

During certain parts of the browsing process, users may be more interested in particular elements of documents, than in the documents, themselves. CollageMachine reduces the granularity of browsing from whole documents to media elements. Documents are not treated as integral forms. As containers of media elements, they are sources of material for the selection stage of collage-making. Direct manipulation of these media elements is afforded. Users can move seamlessly from the collage representation to the normal browsing paradigm when they desire depth of context. As containers of hyperlink references, documents are referential structures which connect media elements in order to support the process of inference.

The granularity of browsing is also extended. It is extended in terms of objects, because no longer is a single entity presented at once. Instead the media elements collect, overlap, and build up a sedimentary residue which reflects the user's collage manipulations. The granularity is also extended in time, as the collage evolves, unless the user intervenes to pause its development. While the other cited browsing and information visualization paradigms may utilize animation for transitions, their presentation is static in the absence of user interaction.

2. Collage

Collage is one of the most important artistic concepts of the information age [14]. Literally, it means glued stuff. A good connotative synonym would be combination. That is, collage is work created by combining materials (from different sources). In general, some of those materials are not created specifically for inclusion in the collage; they are derived from found objects. The recombination of these semiotic code elements, which occurs when they are cut from their original contexts and then pasted together, is the essence of collage. The pasted object functions semiotically, in context, to introduce new meaning to the work in two ways. First, as in Duchamp's single readymades [7], the new presentation environment of the collage creates a new context for the interpretation of its elements. Additionally, the juxtaposition of elements within a collage further alters their context, and thus their meaning. It forms semiotic relationships between them.

3. Indeterminacy

Indeterminacy is one means for structuring decision-making in any of the phases of collage-making. It has a long history as a cultural method, predating Dada by more than a millennium. [15] Indeterminacy refers to the utilization of chance procedures, such as random selection operations and random factors that influence the values of parameters. Certain creative decisions are expressed in an algorithmic form that relies partially on randomness. Work which utilizes indeterminacy is not itself entirely random: the design of the algorithm which includes random factors shapes the ultimate outcome.

Tristin Tzara created "Dada poems" by cutting up the day's newspaper articles and casting the fragments. [13: 51] John Cage's Imaginary Landscapes no. 4, consists of a score which instructs each of 12 performers to manipulate the dial on an FM radio for certain time intervals which were chosen through structured chance procedures. In Music of Changes, the chance procedures structured the derivation of a score for solo piano.

CollageMachine uses indeterminacy in the selection of media elements and hyperlinks, and the placement of elements in The Collage Visualization Grid. A floating point weight is associated with each object. These weights become the basis for a series of randomSelect() operations. That is, the weight associated with a given object determines the likelihood of its selection. The invocation of chance procedures to make key decisions links CollageMachine with Dada and Cage in spirit. It keeps the process open and somewhat unpredictable. CollageMachine differs in that it embodies the process of collage-making.

4. Creativity and Emergence

The application of indeterminacy to creative processes turns out to be consistent with cognitive science. A group of cognitive scientists has broken off from the main line of that field in their study of creativity. The practices of these "creative cognition" researchers contributes to our understanding of collage. Previously, cognitive science had limited itself to the study of "highly restricted domains" of well-formed problem solving. [2: 5], such as structured puzzles like the "Tower of Hanoi". The hope was that this would lead to insights which would then be generalizable into broader understanding of creativity. Limited progress has been made through that line of inquiry.

The creative cognition researchers have included the study of fuzzier scenarios in order to cover a broad range of real-world creative practices. Through rigorous experimental investigation of what subjects do under consistent conditions, they have identified stages and structures of the creative process. While these components seem to be necessary for creative thinking, their presence is not sufficient to determine a creative outcome. In other words, creativity, by nature, includes indeterminacy. The need for indeterminacy in modelling creativity provides another indication that indeterminacy belongs in software, such as CollageMachine, which engages in creative processes.

Findings within creative cognition research describe the way collage works. A general cognitive model called Geneplore breaks creativity down into two phases:

In the initial, generative phase, one constructs mental representations called preinventive structures, having various properties that promote creative discovery.

These properties are then exploited during an exploratory phase in which one seeks to interpret preinventive structures in meaningful ways. [2: 17]

Geneplore research indicates further that when preinventive structures feature preinventive properties, they are more likely to lead to creative results.

The way that exploration and interpretation of preinventive structures lead to creative material is particularly indeterminate. While certain kinds of preinventive structures and properties create a likelihood for the development of creative material, ultimately creativity is unexpected. Creative material emerges: An image displays emergence when its parts or features are combined such that additional, unexpected features result, making it possible to detect new patterns and relations in the image that were not intentionally created. [2: 50]

Within this general model of creativity, certain preinventive structures and particular preinventive properties describe Dada collage and CollageMachine. Mental blends are a type of preinventive structure that includes conceptual combinations, metaphors, and blended mental images. [2: 22] Clearly, these are all based on combining processes, the essence of collage. Verbal combinations accomplish similar results, where the constituents are words. Ambiguity and incongruity are preinventive properties to match with mental blend structures in order to increase the likelihood of emergence. If the relationships among the combined elements are clear and definite, there is no room for the imagination, so creativity is unlikely. Cognitive science has demonstrated that it is exactly the disjointedness of Dada collage which makes it so effective. Because the relationships between elements is not clear, the imagination -- the unconscious mind -- is spurred to make connections. The Dada artists did not work because of this explanation; indeed, the rejection of explanations, altogether, was an impetus for their collages. Nonetheless, 70 years later, the creative cognition scientists have validated their methods.

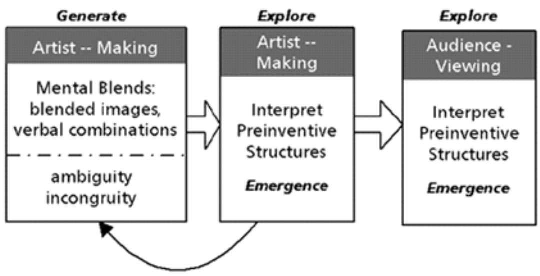

Figure 2: The Creative Cognition of Collage

The collage artist provides these structures and properties which promotes emergence. S/he gets involved in exploration and interpretation mostly on a meta level: in consideration of refinement of the provision of opportunities for emergence in the audience. Primary exploration and interpretation are the audience's role.

CollageMachine positions itself within this model of the creative cognition of collage. The program takes the generative role of the artist: it constructs ambiguous and incongruous blends of images and texts. The user does the exploring. S/he can respond to the developing collage by rearranging its elements. S/he expresses interpretive sensibility through the direct manipulation interface of the collage design tools. The program monitors this interaction in order to evolve its model of the user's interests. Meanwhile, the same model drives the ongoing process of blend generation. By situating this feedback loop in the midst of the cycle of collage generation and interpretation, emergence is promoted. The structure of creative cognition is harnessed in order to assist creative experience.

5. CollageMachine Sessions

A CollageMachine session begins with seeding. This is the specification of the web addresses or addresses from which the collage generation begins. Seeding is implemented through HTML and JavaScript. It invokes the signed Java applet which generates the actual streaming collage. The collage is generated dynamically. As web pages are deconstructed, the agent model is developed. The user influences the model by activating one of the collage design tools, and directly manipulating collage elements. Through direct manipulation the user simultaneously effects collage design and expresses interests.

6. Seeding A Collage

The user is offered three methods for specifying the seed addresses. One method, "popular blends," consists of canned sets, like a typical portal. Examples, are "news collage," which draws from The New York Times, The BBC, CNN, and ABC, and "art museums," which draws from The Louvre, The Van Gogh Museum, The British Museum, The National Gallery, and MOMA. "Searches" allows the formulation of up to five queries, which are then passed to a search engine. Most search engines produce extensive junk (in the form of unrelated shopping and advertisements). In response to formal usability tests, Google was selected as the search engine, because the results are more effective. The third seeding method allows the user to type URLs directly. Usability testing showed that it is important to specify this as "web addresses," not "URLs," because some users are not familiar with the latter term.

In any of these scenarios, the result is the same. A set of URLs is generated. (Popular search engines use the CGI "get" method: the forms which call them simply collect arguments and append them to a URL.) The URLs are passed to CollageMachine as start-up parameters.

7. Collage Design Tools

In order to steer the session and take control of the web browsing experience's visual appearance, the user activates a tool and interacts with the collage. The selected tool determines the effect of direct manipulation. Like Photoshop tools, each enables a different design effect. Each tool simultaneously expresses interests.

	Positive Grab. Move an element you like. Similar appear more. Enables dragging, as well as lifting.
	Negative Grab. Move an element you dislike. Similar appear less. This tool enables dragging without lifting. The manipulated element may be dragged under elements that the program considers more important.
	Cut. Delete an element you dislike. Again, similar appear less.
	Web Page. Browse the page associated with an element in regular browser. Similar appear more.

8. Dynamic Design – Collage Grid Visualization

Grid operation is based on the current state of weights of on-screen elements. At the start of each cycle, the elements are sorted according by weight. The stacking order is adjusted so that the most interesting elements are on top. A size for the next element is chosen from the range of accepted sizes. The size is proportional to the significance of the new element, in comparison with those already on screen. If the element is an image, the size is adjusted to mirror the aspect ratio of the original. It is also limited to the size of the original, avoiding pixelation.

Figure 3: Later state of the same news collage session.

Next, each possible rectangle of the chosen size is considered as a candidate for placement. The weights associated with these candidate grid regions are computed. These candidate weights are fed to a randomSelect() operation. Thus, the location of the new element is chosen. If the grid is considered to be full, the element with the lowest weight is deleted. Heuristics ensure that the element the cursor is presently over is never covered. They also assign special weights to the most recently added and manipulated elements, so that they don't get covered up quickly.

9. Acknowledgments

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poster

what do we get out of what we put into the blueberry i-box

tracking virtual identity

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Abstract

New technologies are shifting the nature of how identity is understood. A wide range of information is being put into computers on a daily basis. This project endeavours to illuminate some of the embodied effects coming out of this human relationship to technology. Radio Frequency Identification (RFID) will be used to track virtual identities and store their associated data. The model of recessive inheritance and the concept of the 'meme' will be applied to the data to expose hidden (recessive) effects emerging out of our interaction with computers. Issues of surveillance, gender, work and play, all specifically relating to new technology, are also addressed in this project.

Keywords: Radio Frequency Identification, Microchip, Meme, Surveillance, Gender, Art

Year the Work was created: 2001 on-going

Introduction

It is in the transitions, the multiple and rapid shifts between physical and virtual identities, that barely perceptible shifts in embodied and virtual behaviour emerge. I am looking for cracks in this shifting where a potentially latent virtuality leaks into the real. The cast01 conference will mark the launch and announcement of a new art work in progress that uses Radio Frequency Identification (RFID) and communications technology to survey identity when the boundaries between the physical and the virtual blur. Using implantable microchips I will extend and redirect this electronic link between physical and virtual identities. Rather than tracking the movements of my physical body in the world, the chips will track my travels in virtual spaces.

Information and communication technologies are ubiquitous in many peoples' daily lives. We program our video recorders, use automated bank machines, shop on-line, play games, e-mail friends, experiment with identities, and manipulate and store data. Huge amounts of time, effort and information are going into computers every day. I am interested in what comes out of what is being put into these digital boxes. Some of the more obvious shifts emerging from our associations with these technologies are connections between people over distance, partial separation of identity from the physical body, and increasing access to information. What subtle or hidden effects do these shifts have on embodied identity and behaviour?

2. Aims of Research

Richard Dawkins has introduced the concept of the 'meme' [1] as a unit of cultural heredity similar to the gene, the basic unit of genetic inheritance. As there are recessive genes, perhaps there are recessive memes. A significant attribute of recessive elements is that they are hidden and remain hidden until they are (as with the biological analogy) (com)paired with another recessive unit. The first objective of this project is to generate sets of data which will then be analysed (recombined) to increase the chance of juxtaposing these otherwise hidden units. (Fig. 1)

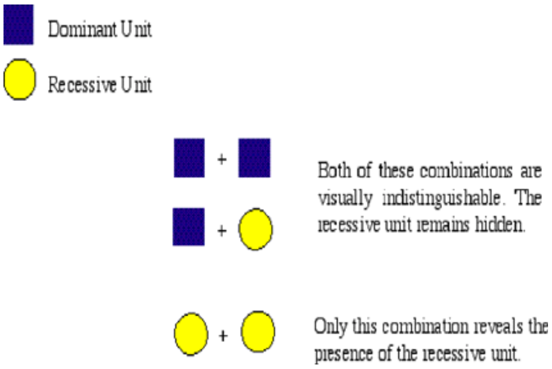

Figure 1 Model of Genetic Inheritance

Surveillance of people, in a myriad of forms, is on the rise and widespread use of tracking technology may be on the horizon. Implantable microchips are already available to selective high profile consumers [2]. Although there are benefits in the use of this technolgy, the threat of mandatory implantation in humans and the potential infringement of privacy and other legal rights is cause for concern [3]. The second objective of this project is to further question issues of identity and control. By consciously appropriating this technology I will be able to gain an understanding of its limits and failures while retaining control of what information is gathered and how it is used.

Subjection of my body to this technical invasion and cultural coding is not to be overlooked. Historically, women's connection to technology has not been one of liberation or empowerment, but rather one of control and improved efficiency [4]. In this project I am not becoming a passive subject of others, but remain empowered and pro-active in the representation and interpretation of my identity(ies). The third objective of this project is to play with this tracking technology; to observe my-selves and to formally give voice and physicality to my virtual identities.

3. Project Description

Radio Frequency Identification employs a passive electronic microchip which is able to use a low radio frequency signal (energy generated by the scanner) to transmit its ID code back to the scanner [5]. In 1997 Eduardo Kac injected a similar microchip into his ankle and registered himself in an animal identification database in an intriguing piece called "Time Capsule" [6]. The implantation of microchips in my body is similar to the spectacle of Kac's work. Where he paused, I will push further. I will repeatedly engage my body in dialog with the technology. Rather than submit to an externally controlled database, I will also create, control access to, and use the information that is gathered.

Shortly before the conference a microchip will be injected into each of my hands. (Fig. 2) Since each chip has a unique ID number, the use of two chips will not only enable a switching mechanism with which any number of identities could be represented, but also subverts the notion of these chips being unique markers of identity – which chip is the authentic marker?

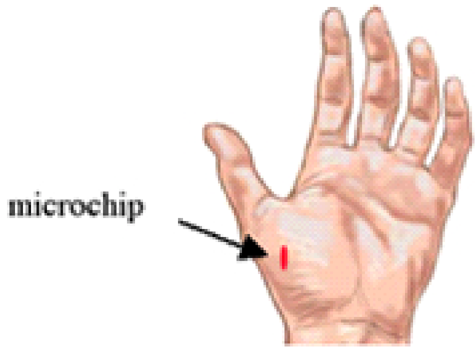

Figure 2 Proposed Injection Site

A computer mouse will be re-engineered to function both as a mouse and as a chip reader capable of scanning the implanted chips. (Fig. 3) Figure 3 Proposed mouse/scanner

Microchip scanner inside the mouse

Software will be designed to record and store, at the click of the mouse, the chip ID and information such as the URL, sound, image, and text files, the date and time, and the frequency of visiting a particular URL. (fig 4)

Date: 8/09/01 **Time:** 6:51PM	**Chip ID:** 4014556564 **Category:** play
URL: http://www.destronfearing. **Dot designation:** com	**Times visited:** 10 **Mouse clicks:** 30
Screen shot: 	**HTML text:** <HTML> <HEAD> <TITLE>Destron Fearing Electronic Identification Microchips</TITLE> <META NAME="keywords" CONTENT="Destron Fearing electronic animal identification ear tags microchip microchips animal identification eartags tag radio frequency identification transponders scanners injectable micro

Figure 4 Sample Tracking Data

The choice of my hand for injection of the microchips is for both practical and symbolic reasons. Practically, hands are still the usual biological interface with computers. The hand is the body's connection with the technical, an extension of the body used to probe. The use of fingerprints by the authorities to identify individuals is still extensively used and accepted as evidence of a particular person's presence at a given physical location. Symbolically then, the electronic ID chips embedded in my hand will heighten the connection between my virtual identity(ies) and my biological/physical identity.

After the technical components have been established, the initial phase of the project will be to track two simplistic forms of my identity, that associated with work and that with play. As I use my computer clicking of the mouse will trigger the scanner to read the chip located in the hand using the mouse. The chip ID and the other information identified within the designed software will then be automatically retrieved and stored in a database. The data collected from these two categories will be superimposed in such a way that the data serves to filter itself. By looking for continuity and discontinuity, similarity and difference, repetition and omission, it will be possible to sift through the noise thereby amplifying the interesting details hidden within the data.

Throughout this project I will be considering how best to transform the data and insights into visual art. I do not consider the database generated in this project to be the art, but rather it serves at the raw material with which I will work and play to create artwork.

4. Conclusion

With the use of identification microchips and collection of virtual tracking data this project seeks to investigate the intersections of embodied and virtual identities. Ideally this work will do three things. Firstly it will reveal the more subtle influences of surveillance and communication technologies on how we perceive and define shifting identities within a networked society. Secondly it will further engage us in discussion of the paradoxically threatening and beneficial uses of microchips. Finally it will engage gender issues specifically relating to women's relationship to new technologies in a playful, empowering and electronic way.

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poster

20 to 20 project

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Abstract

A distributed open-ended narrative played out across a social network via soft, easily portable, communication- enabled dolls. The dolls "know" each other, wireless communications provide an open channel between them. The dolls will be given to 20 colleagues living in the US, Canada, Europe, Australia, and Japan. These people will be asked to carry the dolls with them as often as practical, for one year. In the first year the project will involve the design, fabrication and distribution of these dolls, server design, and research of networked social models. In the second year (the performance year) the dolls will be in the field and the communications of the doll carriers combined with narrative material introduced through the server will combine to create a sort of improvised theater at the speed of life.

Keywords: Distributed narrative, portables, doll, GPS.

Project URL: Currently none.

Year the Work was created: In progress.

Project Partners: Studio for Narrativity and Communication, Interactive Institute, Malmø, Sweden; Palle Henckel - electronics; Jesse Gilbert - programming.

1. Description of dolls

The 20 dolls are identical – only their synthesized voices differ in pitch and character. Their exterior design uses the materials, ornamentation and general aesthetic of sports footwear (fig.1). Embedded in them are electronics that have much in common with an internet enabled GPS cell-phone, with the addition of environmental sensors. Their design aspires to a unisex, wearable aesthetic, not too precious to be tossed around like a backpack or a gym bag. The doll's face has a lively, warm expression, and it speaks in an understandable synthesized voice. It will speak only if it is being held or carried - unlike a cell phone, you can stick it in your bag and it will keep quiet - it's only activated when being handled.

1.2 The doll-minders

The 20 to 20 project seeks to integrate a virtual social network and narrative within the real space of daily life. Carrying one of these dolls gives a person constant access to an open phone channel between the twenty dolls. It asks the twenty participants, doll-minders as they will be called here, to share personal space. The project asks to share both the pocket of personal space that is typically taken by a purse, backpack, briefcase, or any other item we carry with us, and space in the social sense - one's time alone, traveling from place to place, idle moments at home and at work.

The doll-minders will be carefully chosen on the basis of location, commitment to carry out a yearlong project, comfort with carrying a doll, and frequent travel habits. Experience with some type of improvisation (musical, theatrical, rhetorical) is desirable. There will be provisions made for dolls to be transferred to standby doll-minders if the original minders cannot fulfill their commitment to the project. The character and enthusiasm of the doll-minders will be crucial for the project. As the performance year goes on the doll-minders will develop a unique relationship with both the doll they carry and the nineteen other people carrying dolls.

1.3 Communication / Configuration

The communication mode of the network reinforces the unusual relation between doll and doll-minder. Speech on the network, at least initially, will be largely instigated by a query from the dolls to their minders, i.e. "What can you tell me?" Whatever you say to the doll is repeated by the other dolls (as many of them as are active), but not in your voice - in its voice, a synthesized doll-voice. So it will not be readily apparent to doll-minders which of the other members of the network are speaking, except through questioning.

Over time the extra effort of focusing on speaker identity is likely to be replaced with the sense of an aggregate voice/personality. The doll becomes for its minder a repository of nineteen personalities speaking with the same voice. Messages spoken to dolls will go to a communications/voicemail server (fig. 2). Speech is translated to text, then sent to the voice synthesizers of the other nineteen dolls as text files. If the incoming file does not contain language, say the sound of a dog barking is being sent, it will be played through as a sound file. There is a human (!) operator logged onto the server in shifts, reading incoming text, correcting speech recognition mistakes, and participating in the narrative. There is further detail about the role of the operator in the section below.

1.4 The Performance

The default mode during the performance year is improvisation – doll-minders responding to each other's messages. But authorial intervention is possible and this is where the operator comes into the picture. The operator, assisting the (exceedingly imperfect) machine translation from speech to text, is an important and quite deliberate aspect of the project. There will be a number of regularly scheduled operators, with time slots open for guest operators. Besides monitoring all messages coming through the server, the operator can send messages to the dolls, either to the whole network or to a particular doll. By virtue of being at the server, the operator knows which doll is sending a message, and the location of each of the dolls (remember the GPS). Location information can enter the general narrative through the operator. For instance a doll minder could be alerted that another doll is in its vicinity so that they could meet each other. Location information will be used in the social and narrative models, as well.

Certainly in the beginning the network activity will be all about figuring out who else is online, what time it is there, what the weather is like, etc. But, once 'communication mind' relaxes and the minders are accustomed to the multiple personality aspect of the doll, the operator will seed the conversation with hints about the relationships between the dolls, initialize social dynamics, and introduce narrative material that can be taken up and developed by the doll-minders, or discarded.

1.5 The Audience

Because this project is an experiment in integration of a virtual network into physical/personal space and daily life it seems appropriate that there be no virtual vantage point, no screen from which the uninvolved can observe the action. The audience for this work, in the tradition of durational performance art, is those who come in contact with it in the course of everyday life.

Everyday life in a mediated society does inevitably involve media. It may happen that the audience develops its own best vantage point (e.g. media designer Celia Pearce proposes to use the GPS readings from the dolls to dynamically trace their locations on a map - available as a public display and perhaps a website.)

For archival purposes all network activity between the dolls will be saved as text and sound files, indexed according to the time it occurred and which of the dolls originated the message. After the performance year it will be possible to replay the whole year -long conversation back through a gathering of the dolls. Currently this data is incidental, the database is not the subject of the work.

1.6 Symbiosis

The doll as a formal device differs from an on-screen avatar (or a walkie-talkie) in that we talk not only through it, but to it. Any doll flickers between being an extension of us and being an other. The flickering otherness of dolls may assist the individual players in this game in formation of an aggregate personality for the group, helping leverage the conversation from an exchange of information into a narrative form. The doll society cannot exist without the doll-minders. What will the doll-minders need the doll for? For this group of twenty colleagues, pre-disposed to play, the dolls are an instrument, a formal strategy, a game. Will these dolls insinuate themselves into other niches in our lives?

2. Project Development

The 20 to 20 Project is being developed and funded substantially through the Studio of Narrativity and Communications at the Interactive Institute, Malmø, Sweden, and through their partnerships with Ericsson and Nokia. For more information about the Interactive Institute see <http://www.interactiveinstitute.se>. Additional arts and corporate funding are being sought.

Figure 1. Mock-up of doll for '20 to 20 project.'

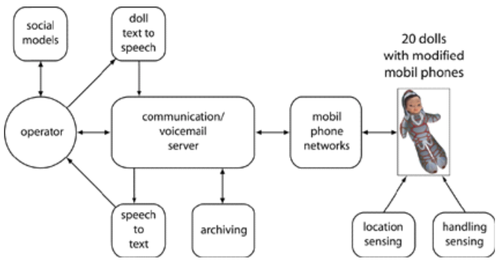

Figure 2. Communication environment for '20 to 20 project.'

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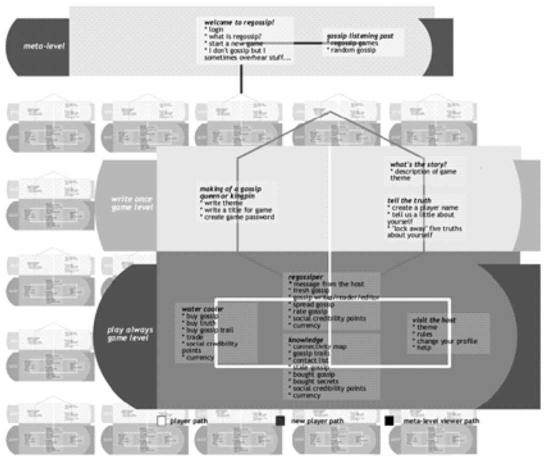

regossip: gossip and multi-user narratives

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Abstract

This paper is about a research project known as reGossip. reGossip is a network game about gossip and social status. The multi-modal network includes mobile phones, personal digital assistants, and desktop computing systems. The paper describes the interaction model, the game design and system design of reGossip, preliminary results and next steps. The primary research question is can an interaction design platform be created to author "multi-user narratives".

1. Introduction

No doubt narrative began its life on earth in the form of gossip, simple stories told by one individual to another. Gossip remains a folk-art version of literature, the back-fence way of compressing events and exploring their meaning. Like the grander forms of storytelling, gossip expresses our concerns and anxieties, it delivers moral judgements, and it contains ironies and ambiguities that we may only partly understand, just like the most serious work of the greatest authors. When we gossip we judge ourselves as well as those we talk about.

- Robert Fulford, Triumph of the Narrative

You have been invited to join a game of "reGossip" by someone you know. This person is the "host" of the game you've been asked to participate in. The host has chosen people who he or she thinks are great gossipers who will make the game interesting and fun with their gossip.

When you first logon you will have a list of five people to whom you can send gossip. The game may involve many more people, but for now you only know of these five.

- reGossip scenario for design testing

reGossip began as a discussion about the possibility of developing an interactive technology platform for creating social networks that one could play in, be entertained by, and use to tell or read stories. The discussion quickly focused on ideas of multi-user interaction models that became encapsulated in a multi-player game design we called reGossip.

The essential game description is as follows: Players exchange gossip in a game to achieve the highest degree of "connectedness" by becoming the best "gossiper" or "gossipee". Players are invited by a "host" to join a reGossip network that shares a common experience. They exchange and rate gossip while accruing social status points and currency to further their overall "network connectedness".

The game design relies explicitly on functions of a social network and as an outcome generates multi-authored narratives. The interaction design of reGossip is based on assumptions of social networks that include the idea that social standing is a motivator for social participation, and that social standing is achieved by possessing and exchanging information. In particular, social networks exchange information as narratives or gossip.

At this stage of the research, the primary question is can we design a platform for creating "multi-user narratives". Key issues related to this are the questions of can we use game design as a participation model, and what qualitatively would we accept as a narrative in a multi-user context? The ultimate outcome of reGossip, is a theoretical framework for multi-user interaction and language exchange in an interaction design context.

This paper describes the current research objectives of the reGossip project, and provides an overview of the game design, the game environment and the system design. Preliminary results from initial testing and prototyping of the platform and an outline of the next steps in the reGossip project will be reported in this paper.

2. Aims of research

reGossip draws on text-based interaction models of email, chat, messaging and SMS (Short Message System). It extends these models by designing a platform for more structured and extended interaction that is designed for play and social creativity.

The extended model captures and makes explicit the collaborative information or narrative building of a group. The social use and play of technologies like SMS is an antecedent to a more designed interaction platform like reGossip [1]. Structured text-based game-play like in MUDs (Multiple User Dungeons) occurs on an equivalently large scale.

In reGossip language is at the center of its interaction and the object of the game-play. The interaction model has the potential to research collaborative authorship, and even game play, that in fact may be at the core of the evolution of mythic storytelling [2,3].

In addition, the language exchange in reGossip is rapid and iterative which allows for the collective story to emerge in a reasonably short period. The game system captures the mutation of the stories and tracks its mutation path from individual to individual. The system offers an accurate mapping of the evolution from gossip to collective story. The game design, on the other hand, is a blueprint that potentially allows for exploring motivation in not only game-play but also in storytelling.

A primary research aim is to further explore the relationship between storytelling and game-play as found in reGossip. Preliminary testing confirmed the game design as a means to develop collective stories. The areas for further research are the direct qualitative relationship between game play and narrative. Is there a link between strategy and narrative quality? Is a prominent role in the making of collaborative narrative related to degree of connectedness to the social network, i.e. winning the game in the context of reGossip? From our initial prototyping it was generally evident that game design had an impact on the nature and quality of the gossip.

In the current phase of the research, the immediate question is can we design a platform for creating "multi-user narratives"? Key issues related to this are the questions of can we use game design as a participation model, and what qualitatively would we accept as a "multi-user narrative"?

Primary issues in pursuing this question include designing a participation model that will simulate a social network, for this we have chosen multi-user game design. The question of defining what constitutes a multi-user narrative is the key to assessing the design of the platform. The process of narrative generation that we have assumed is akin to the process of evolving from gossip to collective stories to social myths. The process is inherently social and iterative and therefore, there is an onus on the participation model or in our case the game design to move past simulation of a social environment to successfully supporting an actual social network.

3. Project description

Players exchange gossip in a game to achieve the highest degree of "connectedness" by becoming the best "gossiper" or "gossipee". Players are invited by a "host" to join a reGossip network that shares a common experience specified and designed by that "host". Players exchange and rate gossip while accruing social status points and currency to further their overall "network connectedness".

The success criterion for the game is social credibility that is achieved by success in social status, social knowledge, and network awareness. Social status can be determined by the degree of fame or infamy a player has through either gossiping or being gossiped about. Social knowledge is measured by the amount of gossip a player knows and the amount of secrets a player knows about other players. Network awareness is measured by the number of players a player knows and the level of knowledge a player has about the transactions of a network, for example, who has sent gossip to whom.

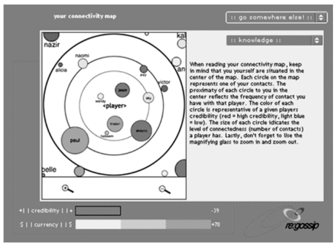

Figure 1. Screen shot of the web interface displaying the "connectivity map" for a player. The map provides an overview of the player's social relations with other players or "network connectedness".

The mechanics of the game interaction revolve around a basic set of actions that include: writing gossip, circulating gossip, rating gossip, buying network traces of gossip, buying of gossip from the system or player, and buying secrets about other players. The primary actions for players are writing, circulating and rating gossip. Players are only able to send a piece of gossip on to one other player. The recipient player has the option of deleting or sending the gossip on to another player. In either case, the player must rate the gossip as positive, neutral or negative. After rating the gossip and if the player decides to send the gossip to another player, she may alter or add to the gossip content.

The rating of the gossip is a key factor in determining the social standing of a player. Each player who is part of the circulation of a piece of gossip is affected by the rating of that gossip each time that gossip is rated. A player's credibility rating rises or falls with each evaluation of the gossip. The original writer of the gossip is affected by the rating at twice the amount each time, positively or negatively. In addition to the rating of gossip, player's credibility rises or falls depending on how much social knowledge and network awareness they have.

The game design also includes accruing and spending of currency that enable actions and the acquisition of knowledge. Currency is accrued based on the player's success at circulating gossip. The player receives currency for every eventual other player that receives gossip the player has either written or circulated. The currency allows the player to purchase secrets of other players, traces of gossip and other artifacts that will aid with furthering the player's knowledge of the network.

Designing resources as an exchange mechanism and to induce a condition of scarcity is common to game design. However, this typical game design convention is unique in the combined game play and storytelling approach of reGossip. The use of currency was successful in the preliminary user testing in regard to acquiring knowledge of other players to be used directly in the gossip generated.

A direct result of the preliminary tests is the plan for a meta-level of interaction. This is a crucial factor in creating audience for the multi-user narratives and to include mechanism for each game or game host to design unique gossiping themes and more importantly, unique communities. This is the game level for the "hosts" and it is at this level a "host" can create an instance of the reGossip game. In addition, the meta-level allows for a passive participation with the system. The users will be able to view abstracted views of multiple reGossip games. The multiple emergent and dynamic narratives will be available to be "read" as the games continue at the game level.

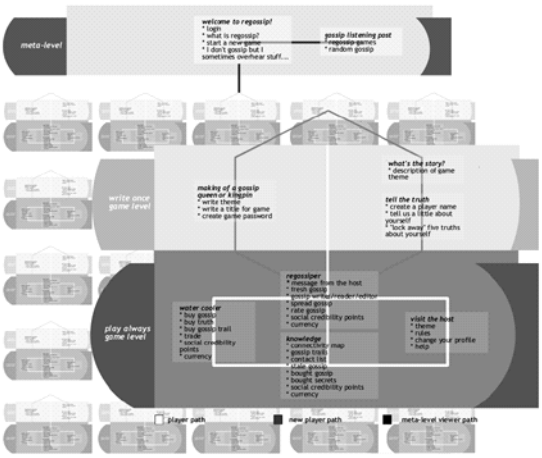

Figure 2. Flow diagram for the reGossip user-interface. The diagram represents the overall reGossip system, including a meta-level and game level. Note the concurrence of multiple instances of reGossip games at the game level.

4. System design

To date we have implemented and user-tested the web-based system, and reGossip has been implemented in i-mode and WAP. User-testing has been staged to eventually test in the complete multi-modal environment.

The virtues of the system design are to support the social based interaction and to support the formalizing of functions of a social network. This formalization allows these functions to be aspects of game play in the game design. The system design tracks social interaction as discrete artifacts that can be measured, filtered and traced. For example, information in the form of gossip is in reGossip a discrete message that is checked for changes, traces, ratings and can be represented in a point system. The system makes explicit social relationships within the network by visualizing the network and one's relationship to it. The system provides for an accurate and real-time point system that makes social standing explicit, especially important for game design. A secondary function of the system design is to monitor actions throughout the reGossip network and to allow for actions other than exchanging gossip to be bought and sold.

5. Prototyping results

Web-based prototypes of reGossip have been user tested to validate the basic concept of the use of multi-user game design as a method for creating multi-user narratives or collective storytelling. The refinement of the system design was critical to ensure that we could not only implement the platform but also effectively capture the process of storytelling. In addition, the details and design of the game rules is critical in providing an effective blueprint for exploring issues of motivation, quality and nature of gossip, and social structuring and for testing these ideas in an eventual theoretical framework for collective storytelling and multi-user interaction.

In addition to the web-based prototype, we user-tested the basic game design through face-to-face role-playing. The initial results discussed here affirmed the basic premises and raised the central design gap in the platform, the lacking in the design of the meta-level of the reGossip system.

6. Next steps: collective and interactive narratives

A key issue in the next step is the criteria for narrative. This will not only allow for detailed relationships to be made between game design and narrative generation, but as has been stated, the game design may be a blueprint for a theoretical framework for collective storytelling.

There is a ubiquitous definition of narrative in which we are all engaged in narrative all the time, "verbal acts consisting of someone telling someone else that something happened"[4]. If we move beyond the everyday but still on the collective level, the Russian theorist Vladimir Propp pointed out that folktales are sense-making narratives that are invariably plot driven[5]. In relation to "higher" forms of narrative the primary goal of folklore is to make highly comprehensible to as many as possible, what has happened in their context.

In a yet more formalized collective setting, organizations, narrative often appears in these forms[6,7]: i) research that is written in a story like fashion; ii) research that collects organizational stories; iii) research that conceptualizes organizational life as story making and organization theory as story reading; iv) disciplinary reflection in the form of literary critique. The use of narrative in an organizational context for example, appears to have its own evolutionary path that includes a level of reception analysis.

In relation to game design there has been a fair degree of discussion about narrative, mostly in arena of non-linear narratives. The interaction designer, Chris Crawford is a strong advocate of the inherent narrative potential in the non-linear interaction of interactive games[8]. The writer Steven Poole's analyses narrative in the form of complementary pairings of "diachronic" narrative, what has happened, and "synchronic" narrative, what is happening[9]. He argues it is interactive games inability to design engaging user-driven "synchronic" narratives that diminishes the current potential of narratives in interactive games. Collective narrative is primarily strong "diachronically", making sense of what happened. However, in design and planning processes the form of the "scenario" as a future sense-making tool is widely used, the scenario genre can be seen to be a synchronic narrative of what is happening in the future.

It is against the backdrop of this brief overview of collective narrative theories that the defining of collective narrative generated by reGossip will take place as the next step.

7. Summary

reGossip is at a first stage of research and it is too early to draw conclusions. The concept has been tested in face-to-face exercises and a web-based implementation and the preliminary results are encouraging in affirming the premise and basic concepts of the reGossip. In addition the results clarified the interaction objectives and game design, including the solution of designing an explicit meta-level function.

In summary, at this stage of the research, the primary question is can we design a platform for creating "multi-user narratives". A key issue related to this is the use game design as a participation mode. In addition, determination of the qualitative criteria of a multi-user narrative will need to be established and further explored.

While the long term research aim and outcome of reGossip, is a theoretical framework for multi-user interaction and language exchange in a game design or interaction design context, there is a range of intermediate research aims revolving around the concepts of game play and storytelling in a collective context. It is clear that reGossip is currently developing a design for determining a qualitative goal for collective storytelling through game design.

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panel 4:

netzspannung.org

digital archives and mobile units

poster

beethoven's contemporary world revived for the future:

the digital beethoven house

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Abstract

Objects, manuscripts, letters etc. from former centuries are valuable treasures which are to be preserved. And even more: Cultural heritage is not only a question of preservation but of reviving it, putting new life into it.

Our project "The Digital Beethoven House" takes care of both. 26.000 original documents are digitzed, e.g. sketches of sheets of music, music handwritings, first prints, letters, colored engravings, photographs, and pictures.

These digital objects are the basis of a powerful online presence with possibilities to explore Beethoven´s world via the Internet. Communication with other Beethoven fans will be possible. The Beethoven museum´s facilities in Bonn will be supported and accessible for the broad public. One highlight will be a virtual installation in Bonn that will offer the adventure to experience one of Beethoven´s compositions.

This poster will present some of the project´s highlights in more detail.

Keywords: Digital library, multimedia database, virtual installation, digitization, online presence, content management system

Project URL:
http://www.imk.fraunhofer.de/Beethoven

Year the Work was created: The project started in September 2000 and is scheduled to be finished in 2004.

Project Partners: The project "The Digital Beethoven House" will be performed in cooperation with the Beethoven House association in Bonn. It is funded by the City of Bonn, the German Government and the German Research Community (DFG)

1. Introduction

The Beethoven House association owns the most important and the biggest collection of Beethoven who was born in Bonn in 1770. This famous son of Bonn is considered to become the new attraction of the city after the move of the German Government from Bonn to Berlin. The application of new technologies shall make this possible. "The Digital Beethoven House" is a digital library project and consists of three main parts. The digital Beethoven Salon will present a virtual world to the tourist visiting the Beethoven museum in Bonn. A further attraction is the on-site access to high qualities of the digitized material. The main second part is the digital archive which is a multimedia database that stores all digital objects in different qualities with its additional metadata and functions. As third part a World Wide Web presence will present all relevant information concerning Beethoven and the Beethoven House in Bonn.

1.1 Welcome to the Digital Beethoven Salon

One of the main attractions will be the Beethoven Salon. The visitors dive into a virtual world visualizing one of Beethoven´s compositions (e.g. Fidelio, 6th symphony). They will enjoy an interactive experience of classical music. In contrast to the audience of a concert a listener in the Beethoven Salon is integrated in the story of the virtual world. The digital Beethoven Salon [Figure 1] is a main attraction point especially for younger visitors.

Figure 1: 3D model of Beethoven´s last study room

Digital Archive with public access

It was a pilot project [1] to digitize a composer referred collection in color. The implementation of a color management system made sure the color reproduction of the documents. They are scanned once and used for different purposes, may that be the online access or the facsimile reproduction.

Figure 2: A Beethoven picture

A multimedia database [2] is the center of the digital archive consisting of audio files, images [Figure 2,3,4], video files, 3D objects and descriptive technical, structural and bibliographical metadata. Search functions and semantic connections will offer added values in comparison to visiting a museum. According to the format of the digital objects they will be made accessible via functions which for example allow Internet users to listen to parts of compositions, to compare different interpretations or to zoom in to discover the seal of a document. It is not a matter of just watching but of touching the objects.

1.3 Information world wide

- Beethoven online will offer [3]
- access to the digital archive
- information and latest news about the real "Beethoven House"
- documentation of the virtual Beethoven Salon
- a virtual tour through the Beethoven House
- order facilities for objects of the museum shop or special information like newsletters especially for the clients
- instructions for the members of the Beethoven House Association.

A Content Management System [4] will enable the members of the Beethoven House to maintain the content themselves.

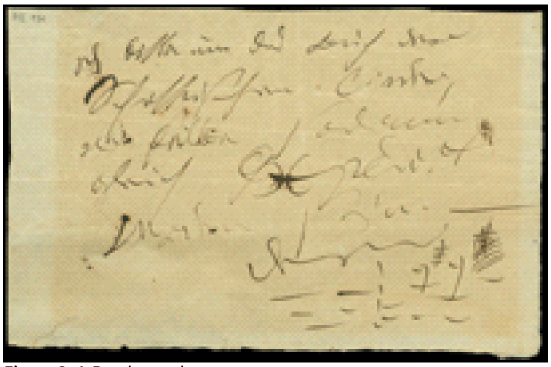

Figure 3: A Beethoven letter

1.4 Project status and further steps

We prepared the project with a feasibility study in February 2000. The kick-off of the project was in September 2000 where we began with first conceptual works. The definitive start of the project was in April 2001 after the permission of all investors. The design phase was our first milestone of the project which we finished in June 2001. The next following steps will be a detailed conceptual phase, the implementation of a testbed and the integration of the overall system. Finally "The Digital Beethoven House" will go into (pilot) operation and is scheduled to be finished in 2004.

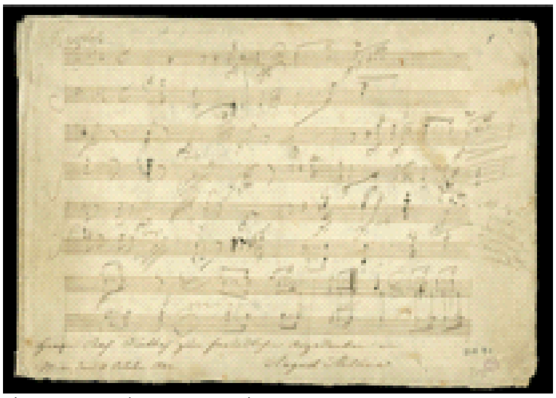

Figure 4: A Beethoven manuscript

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[1] Manfred Bogen, Christian Bonkowski, Marion Borowski and Jobst Löffler: Digitizing a Cultural Heritage - The Key Issue for Preservation and Electronic Publishing. In: Proceedings of WebNet 2000, ISBN 1-880094-40-1, pg. 44-49, November 2000, San Antonio, Texas

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[3] Manfred Bogen, Martin Göbel, Simone Lahme: Beethoven Online, in: Museums and the Web 1999, Selected papers from an international conference, New Orleans, Louisiana, March 11-14, 1999, Edited by David Bearman and Jennifer Trant, ISBN: 885626-17-7, CD-ROM

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poster

ct

(city tomography)

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Abstract

CT, City Tomography, is a project to reconstruct visible or invisible aspects of urban spaces as a three dimensional "information city" and explore it just like a computerized tomography (CT) of the human body. CT will provide information about the city by the way visitors cannot perceive from a physical urban space. It will enhance an overall image of the city through a reciprocal relation between a place and information.

Keywords: City Tomography (CT), Information City, Geographical Structure, Space Communication, XVL

Project URLs:
http://www.plannet-arch.com/ct/index.htm;
http://www.sfc.keio.ac.jp/~wakita/ct/index.htm

Year the Work was created: 2001

1. Project Description / Projektbeschreibung

1.1 Migration of the Concept of Cities

Industrial revolution had driven people and goods to cities and given birth to forms of new urban spaces. Information revolution accelerates flow of people and data into the network, and is creating a new information space. Buildings in the physical space cannot move into the information space. But the concept of cities can.

The concept of cities has been represented in the information space through experimental works as Legible City (Jeffrey Shaw:1989), City of News (Flavia Sparacino:1997) and other cyber-city projects. They have evoked various subjects about integration of people, information, communication, architecture and a physical space within a broader urban context.

A city contains normally invisible aspects such as flow of data, semantic values and human communication as well as visible entities such as buildings and urban infrastructures. In this project, a possibility of a new city is proposed in the information space so as to grow together all of visible and invisible aspects into a new form of the spatial continuum.

1.2 City of Information

CT is a web-based project to reconstruct an existing urban space as an information city. It proposes a new system of information browsing based on a geographical structure of the city and enhanced by a user's interaction and communication. A user of CT will scan the city, just as the computerized tomography (CT) of the human body, in order to perceive the invisible aspects or internal structure of urban spaces. He/she can interact with a building to explore a specific place with further information, and communicate with other users.

A busy urban district like Ginza, Tokyo is originally an information space, and in such an area, the physical reality of architecture is weakened by a flood of signs and symbols. CT is the completion of this scene with superimposition of an information browsing system. A building wall becomes an information browser to explore invisible/visible contents of the building such as history, activities, evaluations, people, goods, images and more information.

1.3 Geographical Structure

A visible structure of CT is designed on the basis of a flat geographical structure of the city rather than a hierarchical system of data archives. A 3D model of Ginza area in Tokyo (approx. 1km long street and its surrounding) is employed to allocate information related to a specific place or building in the city. Each building has its own information. A sense of distance, direction and location becomes important for a spatial perception of information. User's location in CT will be simultaneously represented on the 2D map of the city. Various information is mapped onto the translucent building walls, and the city looks like an accumulation of thin leaves of images and texts.

CT will provide information about the city by the way visitors cannot perceive from the physical urban space. It will enhance an overall image of the city through a reciprocal relation between a place and information.

1.4 Three Dimensional World

A user can access information interactively while moving in the virtual city by XVL (Extensible Virtual world description Language; one of the formats to browse three dimensional data on WWW). Each building wall will accept onMouseOver and click events by users so that they can further browse information and post their messages on the wall. At the same time, information on the wall will contain broader connection to the World Wide Web.

1.5 Space Communication

CT is not only a visual representation of the physical city but also a communication platform for multi users. The space BBS, a site specific bulletin board system, is proposed for communication between visitors of the city. It is a message posting system on building walls. A user can read a message by other users and post his/her own message or a hyper linked URL. In this BBS, a place where the message is posted becomes very important as well as date/time or subjects of communication. Spatial distribution of messages represents activeness of communication in the city.

Please note that a multi-user environment of CT has not been implemented yet in this stage, and there are no active CT communities on the web. A user can read and post messages for a trial purpose.

1.6 Technical Requirements

Technical requirements for viewing "CT" are as follows.

- OS : Windows 98, NT and 2000. Not applicable to Windows ME and Mac OS.
- CPU : 800MHz (Pentium3or equivalent) or higher.
- RAM : 256MB or higher.
- Browser : Microsoft Internet Explorer 5.0 or higher.
- Not applicable to Netscape Navigator.
- Plug-in : XVL Player2 is necessary. Please get the plug-in from a download site shown on the CT site.

1.7 Operation of CT

A user's interface of CT consists of "3D View "(upper) and "2D Map" (lower). There are two menu bars at the top and the bottom.

- Start : Click on ""enter CT" at the top menu bar, and get into the selector page. Please select any of a "Standard Version," a "Light Version," or a "Quick Review Version." Wait and do not operate until all relevant images to be downloaded onto the building walls. After a "Now Loading" message has been turned off, please choose any of the following Navi modes to cruise in the virtual city.
- Auto Navi : From the "Auto Navi" button at the bottom menu bar, you can choose your alignment in the 3D View from among center, left, right, upper and lower positions. You can also stop your movement by selecting the "stop" button in this menu bar.
- Manual Navi : From the "Manual Navi" button at the bottom menu bar, you can get into a manual-navi mode. You will choose either a "walk" style or a "examine" style. By right clicking on the 3D view, you can select shift, walk and look around action in the "walk" style. You can select pan, examine, zoom and fit action in the "examine" style.
- 2D map Navi : By clicking on the 2D Map at your favorite location, the 3D View and a red cross will automatically move to the place you have chosen. If you would like to travel on the 2D Map, this is an easy way to explore the city.
- User's Interaction : You can interact with buildings in the 3D View with a mouse pointer. (in the auto-navi and manual-navi) If the mouse pointer is positioned over a translucent wall (onMouse-over), the wall will be illuminated. If the wall is clicked, a new image will be loaded onto the wall. If you continue to click on this new image, you will find a text message is attached to the wall. By the third click on the wall, this message becomes editable and you can submit your own messages and hyper links at the form windows. By clicking on the hyper-linked message attached to the wall, a new window will be open to show the corresponding website. You can escape from the wall by the fourth click on the wall.
- Urban Design : From the "Urban Design" button at the bottom menu bar, you can choose surface design modes of the wall from among a text(billboard), image and message. (see figure1,2 and 3)
- Viewpoint : In the manual-navi mode, you can select your favorite location from among the list of the "Viewpoint" button and warp to the place.
- Reset : To restart your session, please click on the reset button.

1.8 Conclusions

CT is a proposal to build a city as a collective body of information through a method of spatial visualization, communication and browsing. Our interest lies in how we can perceive data in the information space in relation with a cognitive structure of the three dimensional space. Users will recognize information more intuitively by the space browsing but it would raise another difficulty of time and distance. Our next goal is 1) to make multi-user functions active, and 2) to develop a hyper-space browsing system for a movement and time consumption in the information space. Our final goal is to make this project emerge out into more comprehensive physical urban space from the information space.

1.9 References

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[6] (F. Matsumoto, S. Matsukawa, 1999)

[7] INFOTUBE: http://www.pannet-rch.com/information/tube.htm

[8] (F. Matsumoto, S. Matsukawa and A. Wakita, 1999)

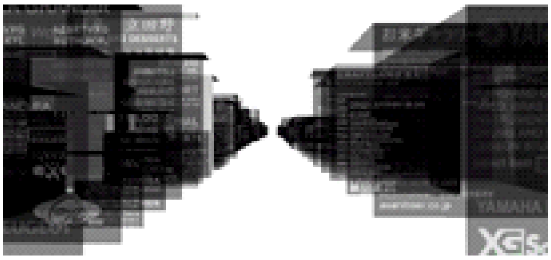

Figure 1 Information city in a text mode

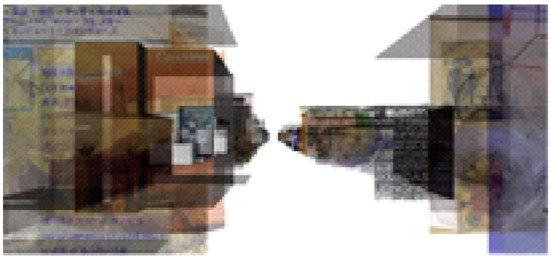

Figure 2 Information city in an image mode.

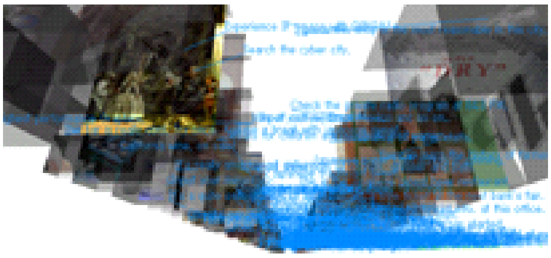

Figure 3 Information city in a message mode.

Figure 4 Clickable walls.

Figure 5 Space communication (BBS).

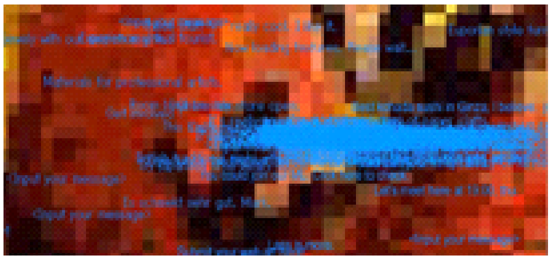

Figure 6 Running through images.

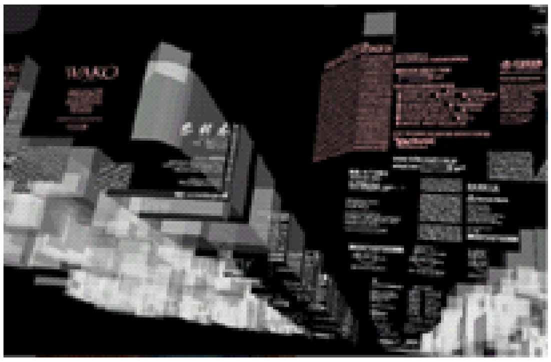

Figure 7 Space communication in the information city.

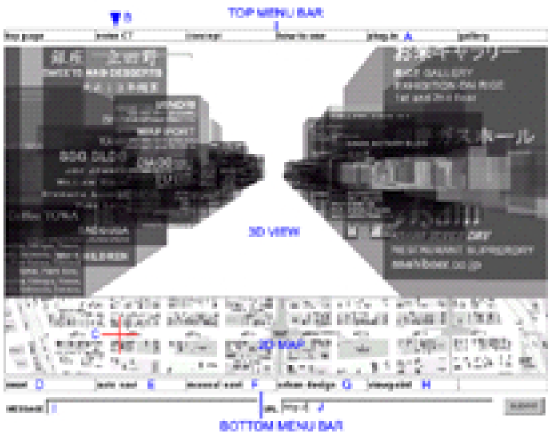

Figure 8: Overall view of the information city

poster

the gambit

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Abstract

The Gambit is an interactive animation in the form of a site-specific performance/installation to take place in the lobby of the Westin-Bonaventure Hotel, Los Angeles (John Portman, 1977). The medium of the project is a digital compass attached to a PDA with a 2.25" by 3.33" color screen and headphones. The apparatus lets you "see through walls" to spaces outside the hotel that are around you but not directly visible to you. This"seeing through the walls" has a shape, and tells a story. The story is told through an animation made up of a pattern of still photos, words and sounds. The pattern is ordered by a spiral inscribed on the map of the city. The story is of a hotel flower arranger and a world in which flower arrangements have archival and narrative abilities.

Project URL:
http://datsun.net/kati/gambit/index.html

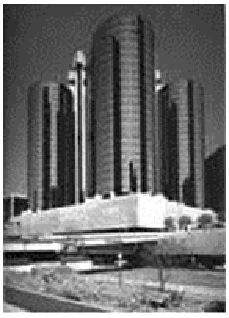
Year the Work was created: 2001

Project Partners: Ewan Branda (Programmer), Zhenya Gershman (Actor)

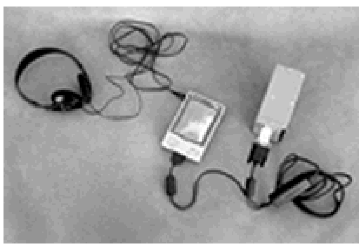
1. Introduction:

The Gambit is an interactive animation in the form of a site-specific performance/installation to take place in the lobby of the Westin-Bonaventure Hotel (John Portman, 1977).

The medium of the project is a digital compass attached to a PDA ("personal digital assistant" or "Palm-Pilot") with a 2.25" by 3.33" color screen and headphones. The animation is made up of still photos, words and sounds. It tells the story of a hotel flower arranger, and of a parallel world where flower arrangements have archival and narrative abilities.



The site, the lobby of the Westin-Bonaventure, is well known and well used, primarily by business travelers. It has architectural interest in that it's a windowless, bi-axially symmetrical space decorated with fountains and "Chia" sculptures (Frederic Jameson wrote of the hotel as being a full-blown post-modern building). But most significantly, the lobby functions in the city as an "everyday" space, and a set for movies, closely resembling a typical shopping mall.



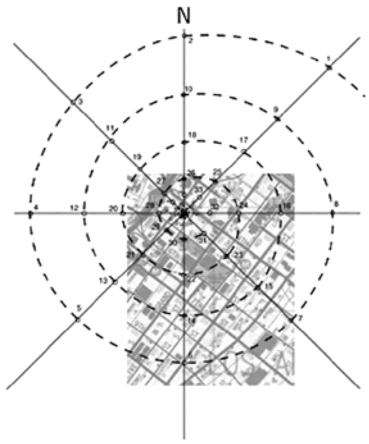
Casio E-105, headphones and digital compass.

2. Project Description/Projektbeschreibung

2.1 In the lobby

The viewer of the piece stands in the lobby of the hotel with the PDA in her hand, the attached compass strapped to her waist, and headphones on her ears. As she begins to walk around (with no instructions of where in the lobby to go) she sees changing still-images on the screen and hears spoken words and sound through the headphones. Through the computer (the PDA), the changing compass coordinates induce changes in the sound and images.

What the viewer doesn't know is that there is a spiral pattern inscribed in the memory of the computer that mirrors a spiral pattern inscribed on a map of the area surrounding the hotel.



Spiral pattern overlaid on map of city, with hotel lobby as the center; radius of 4k.

As the viewer moves around the lobby, and turns on her own axis, the computer (via the compass) makes a correspondence between her motions and the spiral on the map. Images and text are being accessed in accordance with her movements inside the lobby. Through her exploration of how the device responds depending on her speed and direction of travel, a narrative emerges.

2.2 Nodes and cinematic framing

When the device is first switched on, the screen shows the view from the circular, glazed revolving restaurant 35 stories above the windowless lobby, as if the viewer had a periscope to see through the floors of the hotel and out over the city. In the narrative this constitutes an establishing shot. As the viewer walks around, the panorama of the city changes, according to which way she is facing. The "real" view evolves into fiction as the viewer completes one rotation of the spiral: In other words, when the compass registers a compass co-ordinate approached from the same direction for the second time. After the first rotation, the images are no longer from above looking over the city. They are at street level, and introduce a character.

The photos of the female character are taken at nodal points along a spiral path wrapping around the hotel. The spiral, arbitrarily drawn on a map with the hotel as its center, begins about 4 kilometres away from the hotel and winds its way through the city looping closer and closer to the hotel, and ultimately, inside the lobby. There are approximately 70 nodes on the spiral corresponding to the intersection of the spiral with the eight compass axes of N, NW, W, SW, etc. Each node becomes an arbitrarily selected location for a photo. The photos are taken along one of the eight axes in the direction looking away from the hotel.

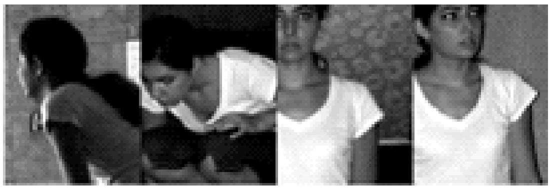
The nodes randomly occur on residential streets, commercial streets, in low-income areas adjacent to downtown and in the business district. They cut a looping section through the downtown area, delineating the topography, literally in terms of hills and valleys, and urbanistically in terms of function and economics. Getting back to the character positioned in each photo, With every node along the spiral path, the character moves one step closer, rotates a quarter turn, and occupies a different quadrant of the frame. In other words, if the viewer were to spin around and trigger a quick succession of changes in compass locations, she would see an animation of the character rotating and weaving back and forth across the frame, and coming closer, occluding more and more of her context. Consequently, the farthest point on the spiral is a long shot and the closest point on the spiral is an extreme close-up. Occasionally the character bends and crouches, looks at the ground. Her movements are somewhat peculiar and robotic. (The actor's instructions were to look for something).

Photos from nodes 51-54.

There is a spoken word fragment tied to each node/photo. The spoken word fragment that takes the longest amount of time to hear, of a length of one or two sentences, occurs at the first node on the spiral. The briefest spoken word segments - a word and even less, corresponds to the last nodes of the spiral, inside the hotel.

2.3 Story

The story is in the form a memoir. It is about the protagonist down on her luck getting a job in the human resources department of the hotel. Her task is to look for candidates to fill the role of hotel flower arranger. But the flower arrangements in question have unusual powers of recording and transmitting stories. The stories they tell are of the relationships between the hotel guests. There is some description of the flower arrangements and how they function as "archives" and transmitters of fiction. In the end, the protagonist ends up taking on the job of flower arranger herself



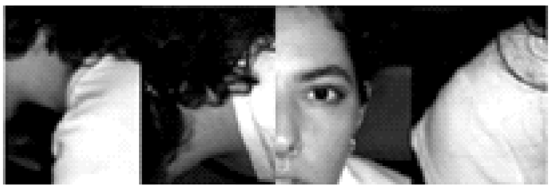
Photos from nodes 55-58.

2.4 Conclusion

The viewer will not be provided with many instructions. The piece is about the exploration of device and narrative. If the viewer doesn't stay "on track" in the spiral or move at a consistent rate, she will get a differently ordered version of the sound/image sequence: If she goes backwards, previous segments will be repeated. If she moves through the round lobby in a straight line, along a compass axis, nothing will happen: The compass coordinates will not have changed so the images and sound will not change. In the relationship of still image to narration, the piece is a little bit like "La Jetté (1963) by Chris Marker [1] however the fragmentary relationship of the image/word segments makes it more like "Around and About" [2] by Gary Hill (1980). In this case the piecing together of linguistic and narrative meaning depends on the speed and direction of viewer motion.

Photos from nodes 59-62

The Gambit involves photographs, music, sound, story, performance and dance but most significantly functions like landscape architecture. Like landscape architecture, it orders a given terrain through a narrativized system, although in this case the terrain in question is the city instead of nature. As in certain kinds of landscape architecture, and architecture, narrative is transmitted to the viewer through projected geometry and movement. In this case the geometry is a virtual spiral (actually a cone/spiral - an idealized flower - if you consider that the establishing shot is the view cast down over the city from the hotel's revolving restaurant). The Gambit also plays with shifts in scale: The hotel lobby is a model for the city and of a "cosmic order", like a Renaissance garden that is an idealized model of the city that contains it. Viewers experience narrative in landscape architecture randomly and in a fragmentary way, as they move through gardens according to their own routes. In the Gambit, each viewer will experience the narrative according to her unique trajectory.



Photos from nodes 63-66

2.5 Technical references

The PDA is a Casio Cassiopeia E-105 Windows CE with 32 MB of RAM and a 16-bit color screen. The compass is a C100 digital compass sensor from KVH Industries. The control application is written in Java and deployed on the device using the PersonalJava platform from Sun Microsystems. At runtime the control application polls the compass for updated bearing information 10 times per second. If the com-pass bearing has changed then the image and audio playback states are updated. Com-munication with the compass is done using the SerialIO Java serial port class library. A native WinCE/MIPS class controls audio playback because PersonalJava does not support high-resolution audio. Both PersonalJava and Waba were evaluated and PersonalJava was selected because of its support for multithreading, required by the MVC patterns employed in the application, its support for 16-bit images, and the fact that the high memory capacity of the Windows CE device made the virtual machine footprint less of an issue.

2.6 Finding and audience, user evaluation, comments and future work

A mailing will take place sometime in the fall inviting an audience, including members of the art community in Los Angeles, to the opening of The Gambit. For a subsequent period, The Gambit will be available to be seen by appointment. It is the author's intention to position The Gambit in an art context.

In experiencing the piece, the story becomes quite fragmented and would likely only be appreciated by an audience with a high tolerance and familiarity with fragmented narrative. Viewers who have seen it so far have appreciated the story and photos and have determined that the spiral ordering system is, appropriately, not recuperated, but rather has served as an ordering device for the composition of the photographs and audio elements.

A second chapter, a continuation of the story, is planned for 2002. This project will use the same or similar apparatus, (but preferably more in number), and will take place on a site in New York. The intention is that new chapters on other sites, in other cities, can be added in the future, ideally making modifications to the apparatus as new technology becomes available.

2.7 Visual and bibliographical references

[1] Film: Chris Marker, La Jetté (1963).

[2] Video: Gary Hill, Around and About (1980).

[3] Dance: Chair/Pillow Yvonne Rainer (1970); Trio A Pressured #3 (1966) Yvonne Rainer Satsfyin Lover Steve Paxton (1967)

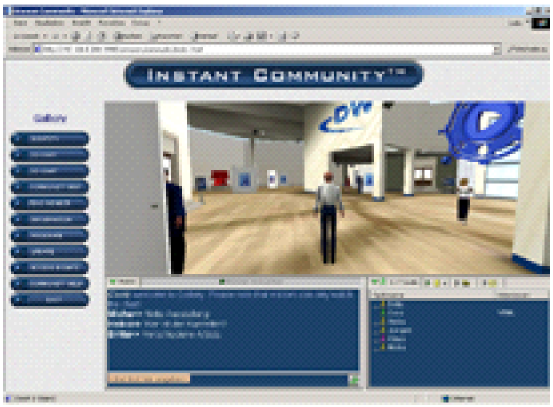
[4] As performed by Rainer, White Oak Dance Project and members of community Thursday June 7, 2001 at BAM, Brooklyn, NY

[5] Books: Jacob, Mary Jane Gordon Matta-Clark, Museum of Contemporary Art, Chicago, May 8-August 18, Chicago, 1985.

[6] Sandford, M. ed. Happenings and Other Acts Routledge, London, 1985.

[7] Elliot, James The Perfect Thought Works by James Lee Byars University art Museum, Berkeley, 1990

poster



dw3d – an inhabited tv format

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Abstract

In the EU co-funded project "I-TV" Deutsche Welle-online focused on the development of an Inhabited Internet TV show. A novel content format that invites users to interact with the programme itself. The goal was to create a fully interactive 3D-web environment representing the transformation of culture programs from DW-tv and DW-radio into a cross-media format. Users/Viewers can access the program - its content and interactive features - using avatars that will interact (chat, discuss, play) with each other and with the editors, thus creating a community around the DW culture programs.

Keywords: Inhabited TV, Web TV, Avatar, Community, Chat.

Project URLs:
http://itv.altus.de
http://www.dw3d.de

Project Partners: Terratools GmbH (D)

Aims of Research

Develop a content format that incorporates state-of-the-art Internet technology into a convergent media concept using resources from existing editorial boards/programme formats of Deutsche Welle.

ITV - towards an Inhabited TV format

In the current version of I-TV users can access 4 different virtual rooms:

- The "Lapidarium" (where the DW-tv culture programme "Arts Unlimited" is hosted)
- The Gallery.
- The concert hall
- The Multimedia Lounge

DW-online currently plans to launch the complete 3D environment end of 2001 by using the new domain http://www.DW3D.de to promote and evaluate the interactive format.

The interactive 3D-Gallery conceived by Deutsche Welle in the context of the I-TV project is an online environment for the presentation of media art. The 3-D Gallery program is being created in cooperation with netzspannung.org. The first demonstration is a navigable documentation of a successful exhibition of interactive art and technology, „FUSHIGI Jungle". The selection of works made by curator Machiko Kusahara and exhibited from 20.07- 2.9.01 in Kobe, Japan, is presented in the 3D-Gallery of DW3D.de, hosted by netzspannung.org. The concept of an on-line exhibition raise questions about adequate media representation and forms for documenting interactive spatial installations. The 3D online version of the FUSHIGI Jungle exhibition is a pilot study that enters virgin territory in concept and design of 3D shared spaces. At the same time there is the possibility for evaluation by the DW3D online community.

The FUSHIGI Jungle Exhibition online

In co-operation with project partners Terratools and netzspannung.org excerpts from a large scale interactive Art and Technology Exhibition „FUSHIGI Jungle“ will be accessible online via the virtual gallery within the DW3D.de domain. While the gallery offers chat functionality to the visitors they are able to communicate in realtime on the various art works on display.

Toshio Iwai : Composition on the Table

Fushigi Jungle is a part of 21Seiki Mirai Taiken-haku (21th Century Experiencing Future Expositon), which is a part of the Kobe 2001 Festival. The goal of the whole exposition is in presenting latest technologies and visualizing future. The exposition takes place in a 3000m2 hall, and has been attracting 1500 to 4000 visitors a day since it opened.

Fushigi Jungle is a 100% interactive exhibition focused on art and meant for general public. The aim of the show is in inviting visitors to experience and feel the wonder of digital interactive communication beyond the border of art and technology. Sixteen interactive art pieces and projects from artists, research laboratories and companies are exhibited on 500m2 floor space.

Some works such as Kazuhiko Hachiya's piece are site-specific, integrating images or texts from children that are entered to a joint competition. (http://www.mirai-kobe.com/mouma/index.html) Artists, engineers and researchers also contributed texts and messages for children, which are shown on the site on transparent balloons.

Motoshi Chikamori, Kyoko Kunoh : KAGE-KAGE

Since the exposition had opened, Fushigi Jungle has become the most popular part of the whole show attracting families, children and senior citizens as well as those who are interested in art and technology. Although it is a great challenge for both artists and organizers to run such a show for a long term with so many visitors, we hope the exhibition will prove the importance and possibility of bridging art and technology, and make them accessible to general public.

The exhibition is curated by Machiko Kusahara, produced by Noboru Tsubaki, coordinated by Atsuko Kobayashi, with number of students from universities and art institutions in Kobe, Osaka and Kyoto, who collaborated in organizing and operating the whole program. It is an experimental project as well, to establish a new model in organizing a large scale media art exhibition.The exhibition online will be one of the first complex media art environments accessible as interconnected knowledge space on the internet. The extended value of an interactive 3D exibition online is in the broad area of its dessemination for a global audiencebut but also is information space for experts such as art historians, curators or media teachers. The cast01 conference provides an ideal opportunity to demonstrate the integration of the novel DW3D Inhabited Internet TV format into the netzspannung.org platform as hosted by FhG-IMK.MARS.

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panel 5:

tools and strategies for intermedia production

poster

swamp

creative collaboration through wireless interactivity

Stephen Boyd, Napoleon Brousseau
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Abstract

Swamp is an artistic production that allows visitors to interact and collaborate with one another through generative music. Swamp marries surreal digital landscapes and interactive music to create a medium that provides participants with a new way to interact regardless of geography or language.

Swamp is designed for wireless input so that visitors use their cell phones or PDA's as remote controls to the graphics and audio presented on large-screen computers or iTV's. The wireless input allows multiple visitors to interact through the same presentation screen and to use their personal devices for input from anywhere they access Swamp.

Swamp was created in early 2001 by a team from the Canadian Film Centre. Swamp has been shown at Toronto SIGGRAPH and is scheduled for its first gallery showing at the DeLeon White Gallery in Toronto, Canada, November 2001.

Keywords: Wireless, generative audio, multiple user, digital environment, collaborative

Project URL:
http://theswamp.dhs.org/cast01/index.html

Year the work was created: 2000 / 2001

Project partners: Stephen Boyd, Project Leader, Technical Director, Napoleon Brousseau, Artistic Director, Rodrigo Caballero, Interactive Audio Design, Paul Szpakowski, Graphic Interaction Design, SSEYO Inc., creators of the Koan Vector Audio Engine, Adam Evans, Wireless Developer and Database Security, Michael Boyd, Wireless Developer

1. Aims of research

Swamp was developed to explore three concepts. Firstly, Swamp explored the use of music as the primary method of interaction in a digital space. We sought to determine how users would respond to a non-literal method of interaction, asking, for example, if they would like it more or less than text-based interactions, if they would spend more time interacting, and if they would find it frustrating or liberating.

Secondly, we examined the use of wireless devices to divorce the physical interface from the display device. We wanted to find out how users would react to using a cell phone or PDA as a 'remote control'. To date, the primary response has been one of surprise. Some assume it is being simulated, others are surprised at first and then think of it as a natural progression for the use of a cell phone, children and those least accustomed to wireless technology do not tend to think much about the technology or interface and simply begin using it.

Finally, we explored the use of generative music to expand the range of potential interactions and increase the creative potential of the users. By not limiting users to a predetermined set of outcomes, the possibilities for interaction are infinite, resulting in unique experiences on subsequent visits.

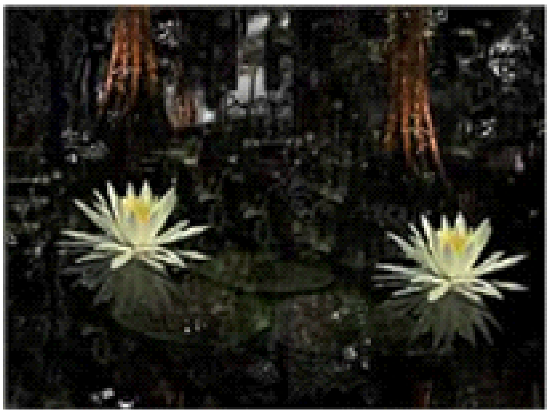


Figure 1 Lily Pads from the Turtle scene.

2. Project description

Swamp is a new form of digital environment for collaborative interaction. Visitors to Swamp have the ability to interact over the Internet with other Swamp participants by changing the music of the Swamp and the visual environment by association. Collectively, participants define the mood and feel through their contribution to the whole. Swamp is wireless enabled so that the audio and visual environments are presented on large-screen computers, iTV's or other Internet-connected devices, while the visitor interaction occurs through personal cell phones or PDA's.

The Swamp environment offers participants new ways to express and explore through the music of the swamp while they also collaborate with other visitors. Participants in the swamp are not represented as graphical icons or distinct characters, but, instead, visitors use their unique range of music and sounds to generate an awareness of their presence. Geographical and language barriers are non-existent in Swamp since visitors interact through music with input from wireless devices.

Although the scenes in Swamp are predisposed to different moods and are evocative of different feelings (Figure 1), visitors to Swamp are able to interact with the music to shape it to their liking.

"It's amazing that I actually made those sounds."

Stephen Boyd, Project Leader/Technical Director, will be on-hand to answer any questions regarding the conceptual or technological foundation of the project. Included will be information on the usability, development and technical integration that enables wireless interaction for multiple users.

3. User interaction

Visitors can participate in Swamp by registering and logging in to the system to join other Swamp visitors via the Internet.

"Very slow and trance-like but still engaging."

After a visitor logs in to Swamp, they are asked to select the sounds over which they will have exclusive control (e.g., bass, melody or rhythm). Once this selection is made, a prominent visual element appears in the scene to serve as a focal point for each user's visual feedback (e.g., the three music balls in Figure 2). This visual feedback has proven to be crucial in the single-user version of Swamp. User testing has shown that feedback must be immediate and obvious for it to be effective. The three-user version of Swamp further emphasizes the importance of visual feedback by making the users' feedback elements the most dominant visual elements on the screen.

Each set of sounds that visitors can choose from includes a small degree of randomness so that, while sounds may be familiar, every visit to the Swamp is unique. Subsequent users who log in are offered the remaining one or two sounds to control. If only one or two participants log in to Swamp, the sounds that are not being interacted with will still play with their initial settings to ensure that the music is melodious regardless of the number of users.

Users see three cell phone representations on the screen surrounding the scene graphics. These cell phone graphics display the different ways the music can be modified and which buttons to use to affect these characteristics (Figure 2).

Figure 2 Shooting Stars from the Coyote scene

As more users interact, the sounds in a scene are altered by their input. It is important to note that visitors do not need prior musical experience since they are not composing the music, but are modifying compositions within a broad range of musical parameters.

4. Technical details

The technology supporting user interaction within Swamp is based on standard Internet communication protocols, a central database that manages multi-user inputs, and the generative audio software Koan Pro, from Swamp's technology partner SSEYO Inc. (Figure 3).

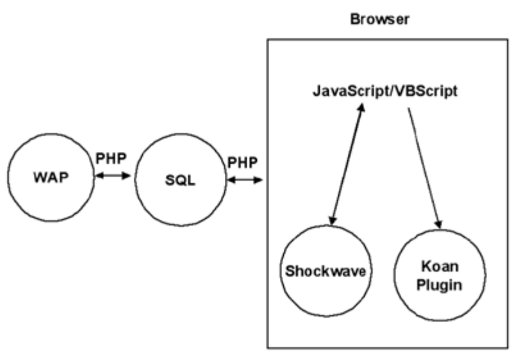


Figure 3 Technical description

Swamp uses a standard Apache web server with PHP embedded scripting language functionality to provide wireless device access to the user interaction options and to populate the Swamp database with the user input. The wireless interaction pages are currently delivered in

Handheld Markup Language (HDML) format, although testing is underway with Wireless Markup Language (WML).

The operation of Swamp is independent of the type of cellular network. Whether a network is based on GSM, CDMA, TDMA, or another system is not of concern. It is only important to have a digital network in place. The type of network is, however, a factor in the overall speed of the system between cellular input to visual and audio feedback.

When a user registers with Swamp, they are given a four-digit user number (Figure 4). This provides the state functionality to assign the users to a display session. Once the user number has been entered, the user is taken to the scene menu. The wireless pages are dynamically generated using PHP. The pages first check that the session and user number are valid, then check which key was pressed and update the appropriate database table value. The PHP engine subsequently generates the wireless interaction page for the scene with which the user is interacting. When the users move to a new scene, the scene number is updated in the database, and the new scene interaction menu is generated for the wireless device.

Figure 4 Logging in to Swamp.

Swamp was created in Macromedia's Director software. Director's plugin (Shockwave) receives input from the cell phone via the server database. Shockwave then performs certain actions according to the new input based on the musical functionality available to the user at that time. Shockwave uses JavaScript to pass a command to the Koan plugin embedded in the same web page. This command could be volume, key, instrument, tempo, or many other commands to affect the music (Figure 5). Shockwave simultaneously changes the visual scene in accordance with the user's input. For example, an increase in tempo will represent visually as a change in the rotational speed of the primary visual element in the scene, and the on-screen cell phone panel will highlight to show the change in that particular musical parameter.

Koan Pro is software that enables the creation of generative music, music that is based on mathematical algorithms (similar to vector graphics). Unlike most music, the algorithms for musical compositions in Koan describe the structure and style of the music but not each note. When users interact, they change characteristics of the sounds (e.g., tempo, instrument, key, mutation over time, reverberation, volume) within defined parameters to shape the music.

Figure 5 Interaction via cell phone.

5. Evaluation methods

Quantitative and qualitative analyses of Swamp are ongoing.

Quantitative evaluation of the design of the cell phone interface and the audio and visual feedback in Swamp will be conducted in three groups of five people new to the project. The final test group will be evaluated twice to gauge if familiarity with the interface affects the user experience. The three groups of users will be evaluated on a variety of tasks, including registering online, connecting to the Swamp cell phone web site, logging in to Swamp using the cell phone, choosing the sounds to interact with, identifying changes other participants are making in the scene, and purposefully changing their section of music.

"It's nothing like I expected, I don't know what to call it."

Qualitative analysis of Swamp is already occurring in the form of interview questions after a tester finishes a Swamp session. The verbal interview questions ask for general impressions, areas for improvement, level of comfort with the interface, and clear or confusing aspects of the project. The finalized web-enabled version of Swamp will include an optional form for qualitative analysis of the user experience.

6. Background

Swamp was conceived of and created during the New Media Design Programme at the Canadian Film Centre. Since development of the first prototype and the launch of Swamp in Toronto, Canada, earlier this year, the team has further developed the graphical richness and multi-user interaction to allow up to three different participants to interact with their own musical landscapes to affect the whole. Presented at cast01 will be the third version of Swamp since the initial prototype created at the Canadian Film Centre.

Swamp has an online presence that will enable visitors from the cast01 conference to further explore and contribute to Swamp, both during and after the conference.

We are unaware of any similar projects that use cell phones and PDA's as personal interface devices to interactive games displayed on computers or other rich media devices.

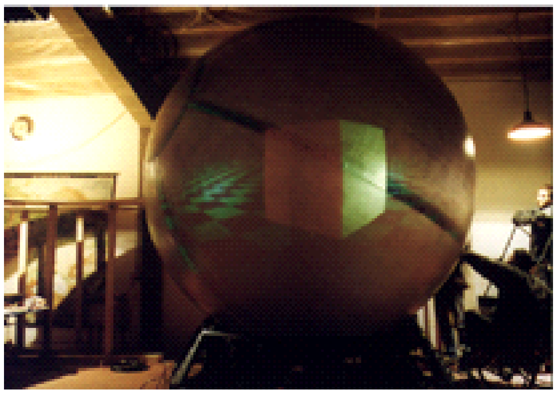
7. Future

The technological and conceptual designs of Swamp provide the basis for the development of a variety of personalized and collaborative digital user experiences.

Our team envisions a world in which people can access their entertainment from any rich media device using their own wireless device as a remote control-like interface. As mobile devices begin to rival current desktop computers in speed and computational capability, their capacity to allow users to access, store and customize information of all varieties will greatly increase. We will be able to take bits of our entertainment (e.g., songs, pictures, stories, characters) away with us, suiting them to our tastes. We will also be able to rearrange these pieces and re-insert them into our entertainment, and communicate with others doing the same. Being able to accomplish these tasks using your own wireless device offers you the benefits of a consistent and familiar interface.

Swamp extends the use of wireless devices beyond traditional communication or commercial applications by using them as an interface to creative expression.

poster



walking into mirrors

spin and the effective walkthrough

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Abstract

Existing in a Real World, we rely upon perceptual avenues to gain access to virtual spaces. That perception is rooted in the body is indisputable, yet the models of how this happens are still unclear. Nevertheless, incorporating the entire body into the perceptual interface, using its mass and sizes, allows the compositor of virtual spaces to coopt the complex developments that places our perceptual selves in our bodies, leading to more convincing and thus more interesting other realities. In this sense the user is not relieved of their body, rather accessoried and the perceived space becomes an explicitly mixed reality.

Keywords: SPIN: Spherical Projection Interface, Perception, Body, Embodiment, Biomechanics, Proprioception.

Project URL:
http://www.timesup.org/spin

1. Introduction:

Mixed reality systems, in order to be coherent, require a large degree of integration between the real space that includes the user and the virtuality that is added to it. Investigating the relations between perception, control and leads to a very physical notion of perception. The analysis of perceptual systems taking into account the embodied nature of our perception highlights the bodily aspects thereof. Ignoring this realisation lowers the degree of integrity in a mixed reality.

For this paper we restrict our considerations to visual perception.

The analysis of the public individual using the axes of perception, control and biomechanics [4] leads to many understandings of how the human biomechanical unit integrates perceptions. These ideas, assisted by the theoretical developments in perceptual theory developed in the physiological analysis of cognition and conciousness [1,3], help to create integral perceptual wholes using the embodied perceptual individual.

This paper introduces an outline of the grounding of perception in the body as perturbations of its own self image. The most elementary of self images is the position of the self in a landscape. Changes in this position are caused by the most intuitive of navigation instruments, the act of walking. An interface for mixed realities, the Spherical Projection Interface (SPIN) is described. Some results from public experiments with the interface are described, and used to demonstrate that such an interface allows a very effective, very intuitive visual interface for virtual spaces.

2. Perception

The nature of our world, mixed between reality and virtuality, leads to the necessity of using the details of perceptual engineering to make the connection as smooth and seamless as possible. Abrupt changes or gaps between virtual and real spaces are harsh, but far more important than this horizontal integration is a vertical integration through the perceptual system. It is not the case that our visual perceptual system is best understood as a pair of cameras, to be fooled by maximal detail in a rendered image. Rather, our visual perceptual system is a collection of processes, interrelating and feeding back, where the localisability of the act of perception is nigh upon impossible.

In order accentuate our worlds with virtuality, the integration of the virtual onto our learnt behaviours of perception is necessary. As we are unable to directly access virtual spaces (a tautology that begins to be a definition of what it means for something to be virtual), we need to translate them into our physical space. The human perceptual system then reacts upon these representations of the virtual in order to bring about a perception of the virtual space. The task in designing mixed reality systems lies in the design of representational methods that integrate well with the human perceptual system.

We might speak of two dimensions in the perceptual system, a vertical dimension from objects through the perceptual system, a horizontal dimension across perceived objects.The latter is a locus of much investigation; the raising of levels of detail, the creation of illusions that are as intricate as the objects inhabiting real space. Whether created on high end rendering engines in film studio offices or with models in the studio backlots, these illusions fulfill the cameral needs of a mixed reality; detail, detail, detail. Mixed properly with images taken directly from this (our, real) space, the illusion (if well done) is complete and seamless. This might be termed horizontal integration. The main problem with such a model of mixed reality is that our visual system is not (even usably) well modelled by a pair of cameras. Rather, it is a network of interrelations with input from our eyes contributing, in some analyses, as little as 5% of the information in the perceptual gestalt. Actually stating where perception itself takes place is difficult if not impossible, although recent studies with various high end, high powered visualisation systems have perhaps begun to localise single events such as recognition. It is arguable that the act of perception, or rather the process of perception is not only unlocalisable but perhaps can be properly understood as a global behaviour in the human central nervous system [2,5].

Regardless of these difficulties, various models are proposed for the process of perception, abstracting away from the tendency to say that perception can only work in a connectionist system. Using the abstractions provided, it is possible to begin to formulate methods which might be used for the representation of virtual objects so that they can be effectively perceived. Integrating the ideas of Maturana and Damasio [1,3], and omitting explanatory details which the two authors manage much better than could be achieved here in the space, we might take the following model. The early stages of perception take place as an object begins to make certain allowed changes in the internal state of the perceiver. The allowed changes may be delimited by physical properties of perceptual organs or by the voluntary actions of the perceiver, or may be simply not accounted for in the early modelling stages of the perceptual pathway. The recognition of these (unexpected) changes in the internal state of the perceiver and the interpretation of these perturbations as a relationship between the perceiver and an (external) object, or even as the perception of the object itself. (Can we perceive objects removed from an observer, or are all perceived objects necessarily in a relation with the (perhaps imagined) observer?) The focussing process, using external (e.g. moving eyes) and internal (e.g. attention levels) changes the state of the perceiver, thus changing the allowable changes as well as the internal bodily representation. The changes from the new body image caused by the external object, compared to the expected body image assembled by the perceiver, then becomes the (enhanced) perception of the object. The essential position of the perceiver as a physical entity with its own dynamic self image and the perturbations or distortions of that self image as being the perceptions of external objects, localises perception as an essentially embodied process.

This analysis of perception, where perceived objects are perturbations of the expected internal state of the perceiver, is one that accords with several experimental results, and is strongly opposed to highly reductionist models of perception as well as distinct from model-free subsumption theories.

The next section begins to draw apart the threads that are implicit in an understanding of perception as embodied, and identifies certain aspects that are fundamental for convincing representations. The following section then discusses these models in the context of SPIN, a haptic interface for virtuality integration.

3. Body

The body as locus and frame for perception is fundamental. Attempts to dislocate perception from the learnt tactics that we use lead to less convincing, less immersive experiences. The self image, including proprioception, is fundamental in our perceptions in realspace, in particular the aspects of our self image that incorporate the dynamics of motion. Such motions are not only often compensated for, but actively used by our perceptual systems to assist. The visual takes in a lot of extra information, peripheral vision and the suchlike, aspects that are not essential but seem to inform the perceptual system in a less direct way. It is the understanding of the mechanics of perception that allows us to cede the battle to overcome the perceptual system and its desire not to suspend disbelief, yet to win the war by coopting the complexities of the perceptual system as a whole, body-immersed system.

The previous section sketched the placement of the perceptual system in the physical body, with the bodies' interpretations and models of its internal state forming the basis upon which perception takes place. This places perception inside the physicality of the body, the body as a given structure in or upon which perceptions take place.The many intricacies and the richness of physical space, the details of parallax and focal distances, but more importantly the inclusion of the motions of the body and the resulting self image are the clues that the perceptual system uses its own self image to compose an image of the outside world. (Note that this discussion can be used as a step away from the body, as the abstractions apparent here allow us to begin to discuss virtual bodies and body images, but as we are not interested in machine perception here, rather in human perception, we leave that tangent for other times.)

The development of the human perceptual machinery is extremely complex. Without resorting to any kind of evolutionary psychology "Just So Story" babble, we can take the perceptual system as it is, or at least how it seems to be at our current (very incomplete) level of understanding. Our perceptual systems take great care in maintaining a body image, whether static or dynamic, and uses this to build perceptions. A simple experiment in this direction is to hold your hand at extended arms length with the palm away from you. Shaking your hand from side to side results in a blur. Holding your hand still and shaking your head from side to side results in very little blurring of the image (if something else happens, one is recommended to visit a doctor). The bodies' self-image is correcting for the motion. This phenomenon is related to the way that we can maintain a steady world view when running along uneven paths, or past a picket fence where a major part of the view is blocked by pickets yet our perceptual system builds up a coherent image of the space behind the fence. The existence of the blind spot in our eyes, demonstrable by simple experiments yet undetectable in everyday action, is an example where the body uses its control vector, in the form of eye motion, in the perceptual process to overcome gaps in the visual information.

It seems that, for whatever reasons, through a mixture of predetermined and learnt perceptual behaviour, our perceptual systems, closely allied with the control, biomechanical and proprioceptive systems, manage to build very detailed and complete images of reality. In our endeavours to accentuate that reality with virtual experiences, we cripple our attempts by limiting the perceptual aspect to simple vision or, at most, head position related views. Limiting navigation to nonintuitive mouse based or wand based systems is similarly self-defeating, although a case could be made for the effectiveness of a driving simulation given the amount of time we spend learning to use the interface intuitively.

Given that we can build sufficiently real models of perceptual processes, we can begin to integrate our representations of virtual spaces into the real space in such ways that the integration with whole body sensing is used to cooperate with the given body systems, rather than conflicting with them. If our models are good, perhaps we can get far enough that we are able to coopt the developments in the human perceptual system in order to enhance its perceptions of virtual spaces, perhaps even in the absence of high levels of horizontal perceptual integration. The next section describes the SPIN system for interfacing with virtual spaces. This system encloses the body and attempts to use as much as possible of the embodied perceptual system of the user in order to provide a well-integrated mixed reality experience.

4. SPIN

The Spherical Projection Interface (SPIN) has been developed over the past two years. The development of the interface followed from one aspect of a project developed in 1999, currently suspended. The collection of technological problems, closely related to perceptual problems, required quite some analysis and although incomplete, the resulting interface has proved extremely usable. Through public experiments and ongoing research, several interesting aspects of perceptual mechanisms have been observed.

SPIN was developed as one aspect of a system of interrelating labyrinths on a virtual as well as physical level. Afer spending time interacting with a physical labyrith and various interfaces (via screens, text based VR, head mounted displays) for virtual representations of it and other labyrinths, SPIN was conceived of as a way for the visitors in that space to take a walk in the virtual space of which the physical one they had experienced was merely a lossy representation. From the outset, SPIN was intended to add a haptic aspect to virtual spaces, to be used as complementary to existant interface hardware.

SPIN is a three metre diameter translucent sphere. A portal allows access to the interior of the sphere, where an adult can comfortably stand. The entrance is closed and secured so that the sphere becomes complete. The sphere is mounted upon a ring of bearings, allowing the sphere to spin in any direction. There is a brake ring mounted inside the bearing ring in order to hold the sphere in any given position, for instance to climb in or out. Inside the sphere, with the brake ring released, the user need simply step out in any direction. The movement of the centre of gravity away from the centre of the sphere causes the sphere to roll. For the user, it is very similar to the action of a giant mousewheel, except that it works in two dimensions. Walking inside SPIN is quite natural, the momentum of the sphere in motion being comparable yet distinct from the momentum of the body in motion. Most users find that it is relatively simple to walk naturally on the curved base of SPIN.

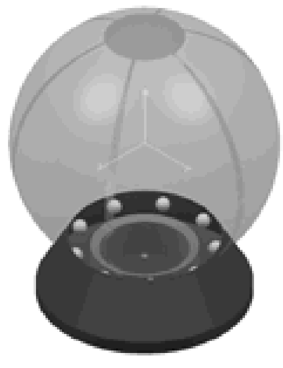

Figure 1 Schematic diagram of SPIN

The surface of SPIN is projected upon by a collection of projectors mounted outside. The projection surfaces meet so that the total projection surface is a large part of the sphere, surrounding the user completely. The projected image is deformed in such a way so that the user, standing in the middle of the sphere, sees an image that correlates with a flat Euclidean space outside the surface of the sphere. Thus the user has the perception of standing in a space, with peripheral vision extending to the limits of their view. As they walk in any direction, the rolling of the sphere is measured and the distance covered tracked. The movement of the point of view in the virtual space is coupled to the movement of the sphere, so that the subjective view matches with the view that would be seen if the same walking motion would be made in a real space.

This close relation of physical motion of the user using the most intuitive of navigational tools, the ability to walk, and the movement of the eye point in the virtual world projection, leads to an astoundingly convincing interface. The use of the most essential of the bodies proprioceptive aspects, "where am I," and the changes in that aspect brought about by the totally natural interface of walking movement, coopts the bodies' enormously complex control-perceptual system in order to make the perception of the virtual spaces most convincing.

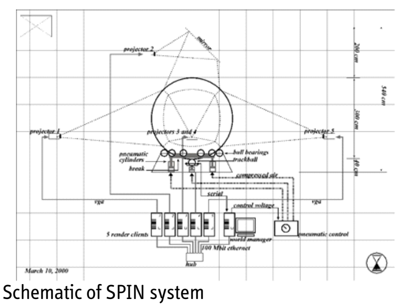

Figure 2 Schematic of SPIN system

All is not milk and honey. The projections upon the surface of SPIN are not perfect. The contradictory requirements of a projection surface and a walking surface make the structure of the sphere material itself imperfect. The need for an entrance, as well as the joins between various sections of the sphere, make the thickness uneven, further distorting the projected image, while the use of screw fastenings to hold the sphere together adds blackspots into the projection. The imperfect roundness of the sphere (tolerance +/- 5mm) is still enough to cause the edges of the projection, the points of maximal tangency, to move on the sphere surface, leading to overlaps and gaps between the areas of projection for each projector. That the system is usable, let alone actually convincing, is thus perhaps a surprise. The only reasonable explanation for this effectiveness in the face of such a suite of imperfections is that the perceptual system manages to use the body-centred nature of its mechanics to overcome these. Cooption.

5. Into the Looking Glass

SPIN is merely an interface, interesting as that might be. The main project, BodySPIN, that we have used SPIN for, has led to some other points of interest. More importantly, the use of SPIN in public has led to an appreciation of flaws in the system and the avenues that are open for future development.

BodySPIN, a project developed in 2000 to use the SPIN interface in conjunction with the fields of interest delineated by the "Closing the Loop" projects from 1998 onwards [4], involved placing the user inside virtual worlds generated from their own bodily functions. Using involuntary functions such as heartrate, semivoluntary functions such as breath volume and voluntary effects such as muscle control, the project aimed to immerse the user in a virtual world that was a representation of their own body. BodySPIN consciously used very simple graphics, wireframes related to early eighties video games, based mostly upon aesthetic decisions. Regardless of this low degree of horizontal integration, the environments remains extremely intuitive for a large number of users.

The BodyGear consists of a number of sensors feeding to Ed Severinghaus' BodySynth, a wireless device for converting EMG and other signals to midi controller data. A breast expansion belt is used to measure lung volume, electrodes attached near the heart measure the activity of the heart muscle and small 3-sensor pads monitor arm muscle activity. One channel was used to monitor a "panic" switch, and the users were kept in constant audio contact with the operators in order to allay possible fears or deal with any unusual circumstances.

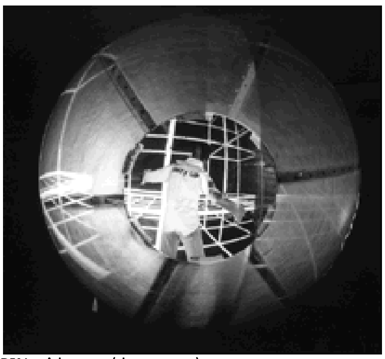

Figure 3 SPIN with user (door open)

Dealing with users who suffered claustrophobia threatened to be problematic. For those with stronger forms, BodySPIN was not usable, as they would not even enter the sphere. For those who convinced themselves that they could do it, the surprising result was that, once the projections started, especially once the user was in motion, feelings of containment disappeared immediately. The walls of the sphere disappear, from the perceptual point of view, and feelings of claustrophobia depart with them.

There are many developments that SPIN could profit from. The projections at the moment are based upon a fixed head position; motion tracking of the head position would lead to greater integration. Stereoscopy, another of the classics of virtual reality visualisation systems, has also not been implemented in the system, a lack that could be rather interesting to overcome. The list of possible developments carries on, but perhaps the fact that these two developments have been demonstrated so far not to be needed, indicates that the involvement of the body into the perceptual system, the coopting of the complexities of the human perceptual system, can lead to much higher degrees of immersion than purely technological fixes.

6. Contextualisation

The effective immersion of the user into virtual worlds is an ongoing goal. The two primary aspects of SPIN and BodySPIN are the spherical projection surface (see also J Shaw's "EVE") leading to the involvement of peripheral vision (absent in "EVE "and most headset immersive devices) and the integration of bodily functions; walking as the primary navigation and breath, pulse and heartrate as interfaces (see also C. Davies' "Osmose" which uses breath and balance). Walking interfaces have been experimented with from several angles, including treadmills (at DCIEM in Canada and the "Treadport" at the University of Utah), pedal systems (the US Army's "Dismounted Warrior Network") and footfollowers (the "GaitMaster" from the University of Tsukuba VR Lab). An English group based around J Eyre have built a device similar to SPIN.

7. Conclusion

Investigations into perception lead to an understanding of perception as an intrinsically embodied process. In order to compose convincing virtual space interfaces, the body must be explicitly included. SPIN uses the natural and intuitive walking behaviour as a navigational instrument and encloses the user in a spherical projection, thus achieving a high degree of immersion. Problematic aspects in the images are well compensated for by coopting the embodied perceptual systems qualities.

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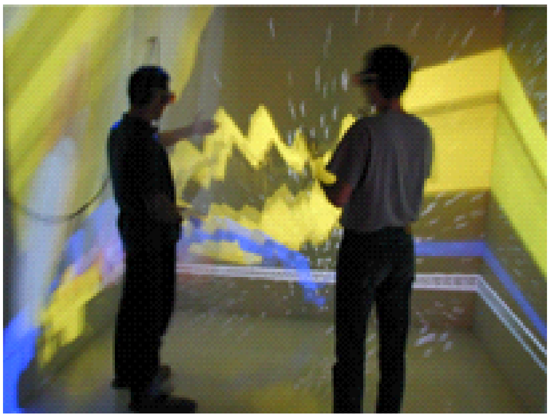

brokers delight

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Abstract

Processes at the stock exchange steadily create enormous amount of data. In the current situation this often results in permanent stress situations for the broker and a climate full of irrational decisions.

Brokers delight visualizes and organizes the information spatially in an artificial immersive environment. Making use of the potential of human perception and his experience of acting in a three-dimensional world the broker is offered an intuitive way of accessing, analyzing and deciding responsibly in complex situations overloaded with information.

brokers delight - an observe'n'decide tool for a virtual stock exchange.

Keywords: sensual data mining, information architecture.

Project URL:
http://www.brokersdelight.com

Year the Work was created: 2000

1. Introduction

At the stock exchange the broker permanently has access to an enormous amount of information - which seems to be a good basis for responsible trading. Nevertheless decisions are made which often cannot be described but irrational.

Program-trading, blind trusting in the opinion of analysts, just following to what the majority does – this can be read as a capitulation to the masses of data permanently generated. At the same time the rich potential of human perception does not seem to be taken advantage of.

The uncontrolled stream of information must be transformed into space in order to keep the cognitive-sensual orientation of the human being from being overflooded. A navigation-system is needed whose axis of trading is the same as the one of acting.

Aims of Research

The aim of brokers delight is to offer an intuitive access to abstract dataspaces in order to support the broker in his complex decision-processes and in responsible trading. The project has been developed for an immersive environment like the CAVE in order to use completely the potential of space as an source of information. At the same time it's strongly linked to the real world by putting the main emphasis on a physical interaction with the spatial structures - this way combining abstract data spaces with real-world interaction.

Project Description

Based on an analysis of the data and information that has to be located spatial structures are generated. They provide a level of clearness known from two-dimensional representations, moreover embedded in a spatial and temporal environment which incidentally offers more information to the context, both as to long-term developments and most recent changes.

This way the essence comes into focus, tendencies get realized incidentally, the broker separates the foreground from the background, he is actor and observer - and always insider.

2. 1 Analysis

The concept of brokers delight is based on the analyses of stock exchange, internet and datamining. The phenomenon stock exchange is not put into question on a moral, social, political or economic level. It's placed inside the existing framework trying to support more responsible trading.

The digital networks of the stock exchange steadily emit enormous amount of digital data. The broker has access to the latest news, computers support him in improving his methods of analysis. But despite of these neutral data and official news decisions are made which cannot be described but irrational – a phenomenon of crowd psychology in an abstract data space. This development is enforced by more and more private investors participating with the help of information provided by the internet.

Analysis is partly based on line-charts – a presentation form that replaced strict columns of figures showing the values at a certain time. Despite being an abstract geometrical form it has become the standard representation of the stock exchange because of its clearness showing the ups and downs at first sight. The history of presentation of the stock exchange data shows a permanent shifting between the abstract and efforts to bring data back into imagination – expressions like "head-shoulder-formation" (used for a certain geometrical pattern) picture the wish to have a common vocabulary when talking about development at the stock exchange.

The Internet has developed into a selfevident social and economic communication-medium in everyday life. Especially in the field of financial services it has become the most important information source due to the steady update of information. Moreover the personalization of information supports a precise focus on one's own particular interest. Mostly the presentation of information still reminds of print-media or television but more and more examples of spatially organized information can be found which base on the results of datamining projects.

Datamining organizes information in spatial structures and refers to familiar patterns of perception and acting in order to facilitate the access to information as well as its storing or editing. The more information gets emitted the more important an intelligent presentation gets. Inspiration has been drawn from several projects, among them: Map of the Market (smartmoney.com, Mark Wattenberg), The Legible City (Jeffrey Shaw), NewsMap (cartia.com), VRML-Model of the New York Stock Exchange (Asymptote Architecture), Chat-Circles (MIT), Visual Thesaurus (thinkmap.com), Lufthansa System Networks (Fork Unstable Media).

2.2 Concept

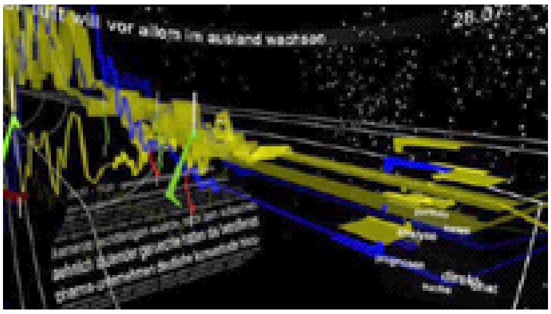
Artificial worlds are not bound to most of the restrictions of the real world. The concept of brokers delight however puts more emphasis on a familiar way of interacting than on the creation of unexplored artificial worlds.

Human beings live in three-dimensional spaces – ordinary linguistic usage like "getting background-information" shows the importance of space and its implicitness in one's moving, thinking and acting. brokers delight uses this potential to enforce existing datamining concepts.

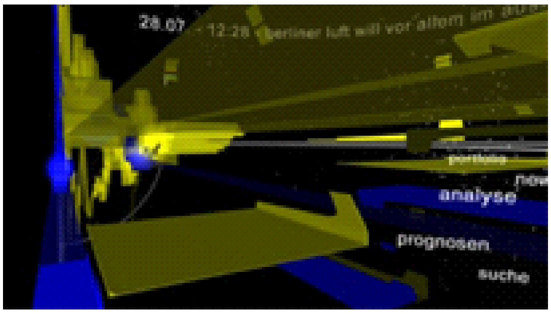
The integration of space and information aims at combining the precision of a two-dimensional presentation with information that is perceived incidentally – this is comparable to the situation of getting aware of a crowd of people which indicates that "there´s something going on" – an information quickly accessed but remaining on a general level. If you want to know more, you will have to get closer to the situation and e.g. ask one of the persons directly.

Physical interaction supports cognitive processes – like entering different floors on a high building by using the stairs. Probably one will remember the number of the floor ("was it on the 2nd or on the 7th ..?") much easier if he experienced the physical stress of using the stairs than if he just pushed a button at the elevator.

These reflections result in the following key points:



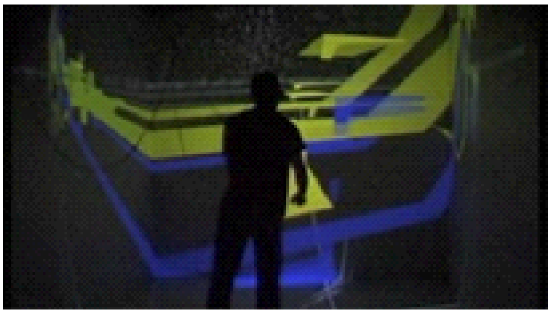
Sensual Data Mining - The sensually profiled interaction with the spatial structures is one of the main aspects of brokers delight – providing an intuitive navigation through the information and at the same time supporting cognitive processes with physical feedback.



Tool-Mode and Environment-Mode - The default navigation is a free movement in the spatial structures - the structures behave like an environment. In this mode information on a general level is triggered by "soft" actions (visual focus, staying at one place for a certain period of time,..). "Hard" actions (grabbing, pushing, ..) make the spatial structures change their behaviour – they now serve like a tool offering a quick access to precise information.

Profilation of Space and Time - Each information is spatially located on the base of its topic and date of emission. So each analysis can be described as a discrete situation in space, single situations being spatially separated. To get from one to the other analysis situation space must be passed through - a process lasting a certain period of time.

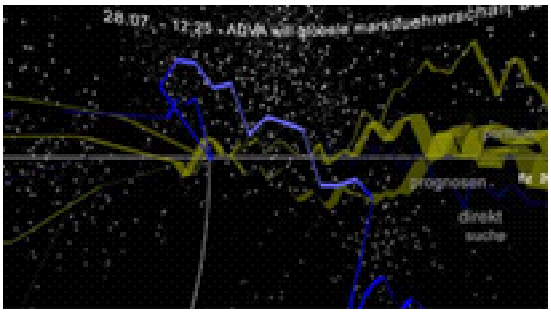
The crossed space and the required time are used to provide more information - information about one's own position in the data space, the relation between two analysis situations etc.



2.3 Spatial structures

The design of the spatial structures is based on an analysis of the characteristics of the data and information that are to be visualized and located in the environment. It refers to well-known images like line-charts or organization-systems like a time axis in order to create an abstract but familiar environment. The image below contains the most important elements:

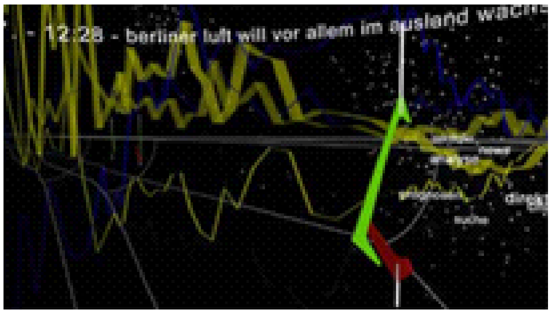
- line-charts – visualization of data which can be structured along a time axis
- document-fields – information organized thematically in similarity plots
- information-package – information (text, image, 3d-worlds, ...) drawn by the user for full access
- navigations-tool – tool for quick navigation, bound to the user's position
- priority-field – textbased ticker in the focus of the user's view
- transaction-marker – trendmarker, valuemarker, etc to easily observe changes and quickly execute decisions
- history signs – spatial history, allowing a quick access to analysis-situations already visited
- grid – structure that offers important points for orientation



2.4 The Use of brokers delight

Interaction with the environment is one of the main aspects of brokers delight – which can be experienced completely only in an immersive environment like the CAVE.

The images below give an impression of an analysis situation. The images including a person indicate direct interaction with the spatial structures.



2.5 Technical description

Based on stock data and information coming from news agencies the spatial elements are generated in real-time.

Interaction is triggered by video-capturing the movements of the user.

A spatial projection in a CAVE (or a similar immersive environment) is an essential part of the concept.

During the final project at the University of Stuttgart parts of brokers delight have been realized in a demo-version and shown in a 4-sided CAVE at the Höchstleistungsrechenzentrum der Universität Stuttgart.

2.6 State of development

In the current version realized with the resources of a study project the dynamic creation of the spatial elements as well as the interaction with them are simulated. Further development of a prototype requires financial support and know-how from the fields of industry and research.

2.7 Target group

In its complexity the application is designed as a professional tool. The concept itself can be adapted on other fields (for example air traffic control).

poster

affect space

semantics of caress

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Abstract

This project focuses on the development of a language of interaction based on developing an affect space in collaborative sensing environments. The goal is to design a networked semantics of caress, where the interactivity can recognize, understand, and even express non-rational states such as emotion or intention . This suggests the development of qualitative models for data flow and data-architecture and the development of languages of intimacy, gesture, and the extension of tactility. This project builds a suite of inter-related networked devices within the collaborative sensing environment.

Initially we are prototyping several wearable or portable input and output devices with the goal of developing a networked performance environment. Central to the creation of the suite of devices is the gestural interface toolkit (GIT) which integrates input and output devices and networking necessary for encoding, transmitting and synthesizing affect data. A key input technology is the advanced optical smart fabric, developed by Tactex Controls Inc. This fabric recognizes multiple simultaneous points of contact, and can measures hand movement space so that touch can be transformed and recognized qualitatively. In the output domain, input 'affect data' such as gesture, caress or physiological data such as heart-rate can be transmitted to a remote location as 'gestural output'.

Keywords: interface design, multi-modal device design, remote sensing, networked wearables, sensory extension, collaborative sensing environments, whole hand input

Acknowledgements: This research is supported by British Columbia Advanced Systems Institute (ASI), Tactex Controls Inc, NSERC, TechBC, and NewMIC.

1. Introduction

This project focuses on the development of a language of interaction based on affect space and the semantics of caress. In order for interactive systems to genuinely model intelligence, we must enable the development of interactivity that can recognize, understand, and even express non-rational states such as emotion or intention . Emotional intelligence systems, [as distinct from artificial intelligence systems] suggest the development of qualitative models for data flow and data-architecture, the inclusion of models for navigation through liminal space [where boundary conditions are fuzzy, transparent, or fluid], and the development of languages of intimacy, gesture, and the extension of tactility. An initial focus of the work is the notion of 'tactics of caress'.

This project builds a suite of inter-related networked devices within a collaborative sensing environment. Initially we are prototyping wearable or portable input and output devices to explore the 'affect space' and semantics of caress with the goal of developing a networked performance environment. Previous work in gestural languages generally focus on the pragmatics of interaction such as manipulation semantics (reference needed: MacKenzie, Mulder, McNeil.

Central to the creation of the suite of devices is the gestural interface toolkit (GIT). The toolkit integrates input and output devices and networking necessary for encoding, transmitting and synthesizing caress. A key input technology we explore is the advanced optical fabric, 'Smart Fabric' being developed by Tactex Controls Inc. The Smart Fabric is based on Tactex's Multi-touch Controller (MTC) that measures hand movement space so that touch can be transformed and recognized qualitatively: a stroke can be differentiated from a caress, for example. While the movement space of a caress has meaning in the physical domain, it also has meaning in an emotional domain as well. We are working with Tactex 'Smart Fabric' to design a range of form factors for wearable or portable application of this technology.

In the output domain, input 'affect data' such as gesture, caress or physiological data such as heart-rate can be transmitted to a remote location as 'gestural output'. An initial output prototype is a wearable 'hug' device which caresses the surface of the wearers body in response to input data

A central functional property of the Gestural Interface Toolkit (GIT) is the development of a prototype intention grammar. Gesture | Intentionality of the giver/sender can be recognized by analyzing the physical dimensions of input affect via caress and bio-sensor data. At 'the heart' of this project is the key notion that interface and device design can benefit from knowledge expressed within disciplines that incorporate experiential or body practice as a means to accessing and constructing knowledge. This knowledge is codified and exists in the forms of specific technical methodologies within the fields such as somatics, theatre, dance, bio-kinesiology, and non-western physical forms such as butoh. The giver/sender communicates through a language of interaction based on 'tactics of caress' sensing environment, devices and intentional grammars.

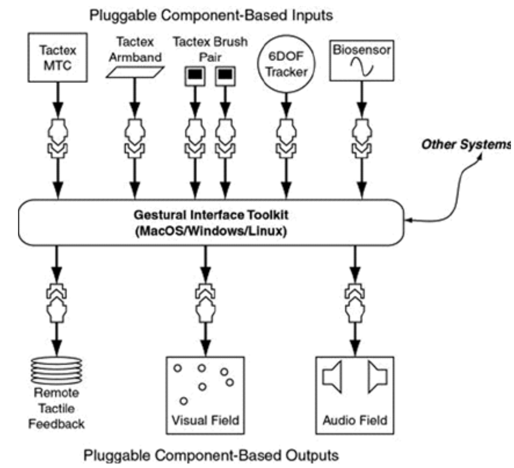
Contemporary research in neuroscience and the cognitive sciences suggest that the sensori-motor systems of the body are inter-connected to such as degree that the body can be seen as a 'fluid' system, capable of re-configuring functionality.[Varela, Damasio]. This metaphor of the body as fluid, re-configurable and networked provides the basis for the system design of our research. Various methodologies incorporating experiential body practice share the existence of definable processes based on the direction of attention in order to affect, alter or produce body state. Within Somatic disciplines, for example, retraining of perception through attention is produced through application of directed movement in the body [Sweigard, Benhke, Bartinieff, Cohen]. The concept of 'repeatability' of body-states, suggests that through the direction of attention along with a definable set of procedures the body can be trained to access or construct specific body states. 'Tactics of caress' borrows from these physical metaphors notions of re-configurability, direction of attention, state-space and networked connectivity. Our multiple configurable and networked selves are the blueprint for devices, networks and collaborative sensing environments.

1.1 Language of Caress

To develop the language of caress we have developed from both a top down, affective perspective and a bottom up perspective looking at the semantics of whole hand input and body gesture.

The affective aspects of caress involve the relationship between the sender and receiver. The sender's action and intention can 'touch' the receiver. The intent of touch is critical to the sense of the caress, where the sender may actively or passively caress with specific intent. These intentional gestures can be analysed to form a prototypical intentional grammar. As such, caress is an experiential phenomenon and the exploration of the affective space provides directions for development conceptually, culturally, as well as technically. The pragmatics of gesture form the basis of a bottom-up approach to understanding caress. Whole hand gesture pragmatics can be classified into grasping, claying, chiseling [Mulder, 1998]. Other manipulation semantics can be found in [Kendon] [MacKenzie][MacNeil].

1.2 Technologies for Caress



In order to realize a computer-supported networked language of interaction based on affect, intimacy, gesture and caress system, we consider four areas: input (incoming affect data), output (remote gestural feedback), network connectivity and signal processing (GIT - gestural interface toolkit). The basic structure of our architecture is shown in figure 1.

With incoming affect data, we are primarily concerned with capturing information artifacts that are often far less structured than is usually the case with computer-based systems. Traditional input devices, such as keyboards and mice, do not reflect a range of modes of human interaction involved in a collaborative sensing environment where a 'caress' can be recognized as containing properties that reside in the physical, emotional, as well as intentional domains. From the technical standpoint we are currently looking at three categories of input sensors: pressure, biometric response and location/position sensors. A device of particular interest is a pressure surface known as 'smart fabric' (developed by Tactex Inc.). An initial stage in our blueprint project is to extend the form factor of the pressure sensitive pad in order to incorporate a wearable armband. The data from the sensors are blended, transformed and interpreted by the GIT and delivered to the output space. We are using a wearable 'hug' device (in development), auditory and visual displays, including a CAVE, for affective rendering. Together, the whole system provides the affect space.

1.3 Affective Space: Applications of Caress

One direction for using the affect space considers the elements of navigation from the literal, expressive and symbolic perspective. Touch and caress play an active role in our desire to navigate affective space. Sensing interaction with the pressure-sensitive pad, made wearable and hand-held, enables logical navigation through a virtual dynamic environment or space. The navigation may be: literal, as in current desktop and web applications, expressive as in on-line gaming, installation spaces, computer animation and choreography, or symbolic, as in applications requiring semiotic interpretation of caress. Symbolic navigation is a context dependent, context aware, and configurable navigation space.

As an example of expressive navigation we are using the pressure sensitive devices for navigational within in an immersive collaborative VR environment such as the CAVE. The visual representational field is a fluid particle space composed of discrete particles set in motion, interacting with one another other through their own motion, and through the motion induced by the gestural interaction of the participants. This fluid particle field can be thought of as a 'verb' space, where the gesture of the participants is enacted through their input. Gestures such as cupping, funneling, pushing, dispersing, molding, and collecting effect and 'enact' the visual particle field. A gestural taxonomy can be contructed based on a variety of gesture classifications modeled in movement theory and practice.

1.4 Summary

Affect Space builds from a key notion that interface and device design can benefit from knowledge expressed within disciplines that incorporate experiential or body practice as a means to accessing and constructing knowledge. We are creating an ensemble of tools that explore the pragmatics and expressive possibilities of affect space, particularly in the context of tactility. Inter-related networked devices creative affect space within a collaborative sensing environment. Initially we are prototyping several wearable or portable input and output devices to explore the 'affect space' and semantics of caress with the goal of developing a networked performance environment.

A key input technology is the advanced optical smart fabric, developed by Tactex Controls Inc. This fabric recognizes multiple simultaneous points of contact, and can measures hand movement space so that touch can be transformed and recognized qualitatively. In the output domain, input 'affect data' such as gesture, caress or physiological data such as heart-rate can be transmitted to a remote location as 'gestural output'.

At the bottom level we are creating a suite of software and hardware tools to encode, transmit and synthesize the elements of touch. At the middle level we are developing a language of caress that enables the interpretation of touch and affective sensing such as the bio-sensor data.

The representation of tactility in a language of caress enables intent to be communicated and modeled, and through the development of an intentional grammar, provides a foundation for the top-level of applications. We are actively developing prototypes to explore the elements of caress and affective responses where remote tactility constructs intimate data spaces.

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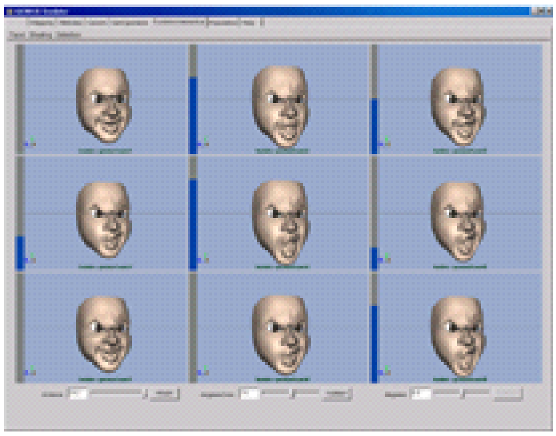

genius bodybuilder

a tool to create avatars by genetic modelling

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Abstract

GENIUS Bodybuilder is a tool for the evolutionary design of arbitrary closed surfaces that integrates seamlessly into the 3D-modelling process. In contrast to prevailing evolutionary tools it is not built on a proprietary object representation, but makes use of a deformative approach that can be applied to commonly used surface representations such as polygon meshes or NURBS faces.

The current implementation – GENIUS Sculptor – is used to create individual avatars out of prototypes by shape blending and free form deformation.

The next step – Genius Creator – will be concerned with the creation of arbitrary forms using embryology, L-Systems and Cellular Automata.

Keywords: avatars, computer graphics, genetic modelling, evolutionary algorithms, evolutionary design, free form deformation, facial features, shape blending, Maya, plug-in, L-systems, cellular automata

Project URL:
http://www.rz.tu-ilmenau.de/~marsu/genius/

1. Introduction

Today's avatars are either obtained by scanning in real world life forms or by creating them from scratch with a 3D-Modelling tool.

If these avatars provide the impression of vividness, then it's because of what they say and do. It is the vividness of the person behind the mask that shines through. But the avatar body that exists independently of his possessor's body is still lifeless.

Blowing life into the avatar means that its body must be shaped by the very rules of life. Biology tries to get a grip of these rules by genetics and evolutionary theory. GENIUS makes use of so called Evolutionary Algorithms (EAs) – methods applied in Computer Science to optimise certain parameters using the rules of evolution. By making EAs available for breeding Avatars, we establish a new form of Modelling, that we termed Genetic Modelling.

1.1 Genetic Modelling

Genetic Modelling is an extension of classical 3D-modelling techniques that not only makes use of Genetic Algorithms, but is also built on an evolutionary design paradigm. This paradigm implies that design is not regarded as a goal-oriented process anymore, but rather as an evolutionary one.

In order to extend classical 3D-modelling, the objects have to be represented in a way that is compatible with the generic representations used in contemporary modelling tools, i.e. polygon meshes or NURBS-faces.

1.2 Related Projects

This section provides a state of the art survey of Evolutionary Design Systems that introduced some of the basic principles GENIUS Sculptor is based on.

The Idea to implement an ED-tool as a Plug-In for a 3D-modelling environment has first been realized in MoSS [4]. This Plug-In can create a wide range of surfaces, but due to a simple representation using L-Systems, the surfaces tend to disrupt when the genome is changed. This may be the reason why MoSS is still lacking an evolutionary module.

With GADES [2] Peter Bentley presented a highly modularised ED-toolkit. The basic elements resemble foam rubber cubes that can be used to build arbitrary objects. Although this is a generic representation it cannot efficiently describe rounded shapes that are commonly used in organic modelling. Nevertheless it serves as an exemplary solution for a modularised approach: object properties like streamlinedness, volume and static are measured by sensor modules and transmitted to a weighting module. An evolution module then selects the best solutions for recombination and mutation, allowing for fully automatic evolution.

In contrary to the automatic approach, user-guided evolution integrates the designer into the evolutionary process by letting him perform the selection task, thus taking over the role of the breeder.

A well-known example is called Mutator [5]. It can create 3D-objects by duplicating geometric base shapes along special curves, position and shape class being genetically determined. Unfortunately this mapping cannot encode arbitrary objects, made of a single piece.

All of the projects described above follow a constructive approach. Due to the restrictions of their genetic representation none of them can be directly integrated into 3D Modelling:

They cannot efficiently encode arbitrary shapes, most of them only producing shapes of a very restricted class. The main problem is, that there exists no straightforward algorithm to transform an arbitrary object into an efficiently coded genome to make it available for further evolution. In Genius Sculptor we avoid this problem by giving the genetic algorithm indirect control over the representation using a deformative approach. The usability of Freeform Deformers (FFDs) for Genetic Shape Design was already investigated in [6]. These FFDs are also referred to as lattice boxes.

2 Basic Principles of GENIUS Sculptor

GENIUS Sculptor is grounded on four principles:

realisation as a plug-in, modularised design, user-guided evolution and a deformative approach.

The first three principles have been partially realized in diverse projects. The 4th principle is the most interesting one, since it allows for seamless integration into 3D-modelling environments, which is the main precondition for Genetic Modelling

2.1 Realization as Plug-In

GENIUS Sculptor was developed for Maya 3.0. The implementation as a plug-In for a widely used 3D-animation environment has two advantages: Firstly it moves Genetic Design from the researchers playground to the working place of 3D-design specialists, and secondly it saves the programmer from reinventing the wheel by developing a new rendering engine.

2.2 Modularised Design

There is a wide variety of genetic algorithms that differ in their genetic representation, mapping and the application of genetic operators. Which combination is best often depends on the specific design task. That's why we have chosen a modularised design, dividing the GA into modules that are easily interchangeable and reconnectable. A history module and a population module are used for storing past and current versions of the gene pool. The genome and gene expression modules are then employed to perform the genetic mapping, which results in a 3D-deformation. The deformed object can either be evaluated by user interaction or by several sensor modules connected to a weighting module. The scalar values resulting from the evaluation are successively fed into a gene operator chain that consists of modules for ranking, fitness assignment, selection, matchmaking, recombination and mutation.

2.3.1 Interactive Evolution

The interface of GENIUS Sculptor Interactive is shown in Figure 1. Each of the nine breeding cells is holding one individual of the current generation.

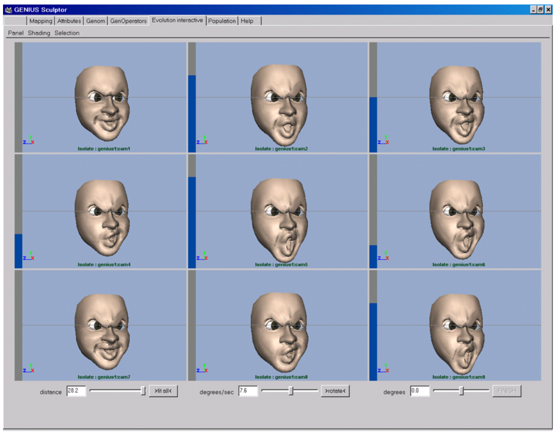

Figure 1 evolving facial features

The vertical bars represent the fitness rating that was assigned by the user. As can be seen in Figure 2 you can easily zoom in to evolve the details. To gain a quick impression, all objects can be rotated around the vertical axis at the same time.

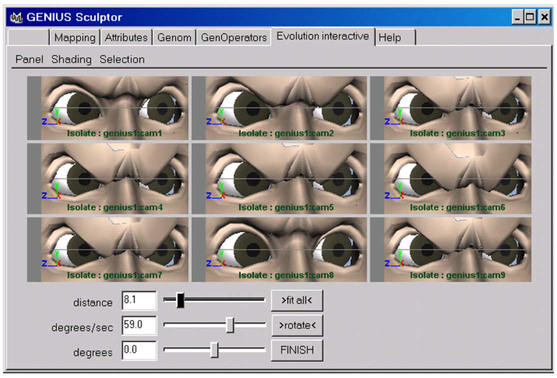

Figure 2 evolving the details

2.3.2 Automatic Evolution

If avatar quality can be measured mathematically, then the whole process of evolution can be automatised. GENIUS Sculptor Automatic comprises physical sensors to measure the surface, volume, mass centre and the inertia of an object according to [3], and optical sensors to calculate measures for axial symmetry and mirror symmetry using a continuous measure similar to the one proposed in [7].

2.4 Deformative Approach

Currently GENIUS achieves deformations via lattice boxes or blendshapes alternatively. A lattice box is a tool for free form deformation (FFD) that allows for arbitrary warping of a body inside the box. In [6] GAs were applied to evolve 3D-FFDs in order to optimise the area and other shape properties.

The backdraw of the proposed algorithm is, that the lattice may become absolutely scrambled by the genetic algorithm, so that it cannot be operated in an intuitive fashion by the user afterwards.

We have solved this problem by introducing a hierarchical mapping. In the hierarchical lattice box the genome doesn't contain the immediate coordinates of the control vertices, but only relative factors that can be arranged into a treelike form. The absolute coordinates are then resolved while walking down the tree. This does not only solve the scrambling problem but also reduces genome size and produces a meaningful gene interaction. Whereas root genes produce large-scale deformation, leaf genes affect only very small areas.

The blend shape tool provides a kind of morphing that blends several source shapes into a goal shape. The amount of influence of each source shape can be controlled independently via blending factors. These factors are controlled by scalar values that are directly encoded in the genome as a binary fixed length string.

3. Application

To test the usability of GENIUS as a tool for Genetic Modelling, we developed two practical scenarios.

In the first scenario, the task was to quickly develop a predefined facial expression out a collection of blendshapes from Alias|Wavefront's animation "Bingo". When using interactive evolution to control the factors, the user only had to evaluate the resulting avatars, each time yielding a new generation of faces that were closer to the facial expression the user wanted to obtain.

In the second scenario, we tried to evolve a whole population of different individuals from a single facial prototype. Problems of this kind have to be solved when creating vivid mass scenes like crowded soccer stadiums. For the evolution of individual faces a sensor for mirror symmetry was provided with a negative weight of –0.2, thus enforcing deviations from perfect symmetry. A distance based similarity sensor weighted with a factor of 0.8 was then used to counterbalance the first sensor. The similarity sensor rewarded faces that looked very similar to the original prototype. The prototype was then automatically evolved for 16 generations using a population of 16 individuals.

4. Results

In the facial expression scenario optically satisfying results were obtained in real-time interaction, but there was no objective measure for the improvement achieved by the EA. This problem is inherent in interactive evolution, since if such a measure existed beforehand, the evolution might as well have been performed by automatic evolution using this measure as a sensor.

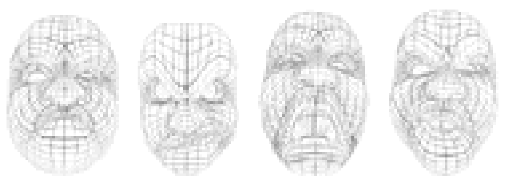

Figure 3 interactive evolution

The automatic evolution took about 5 minutes per generation on a regular PC. Since the similarity sensor works on a per vertex basis it slowed the algorithm down drastically. The resulting individuals were not optically convincing but the fitness value increased over time from 0.45 to 0.68, showing that the evolutionary algorithm worked.

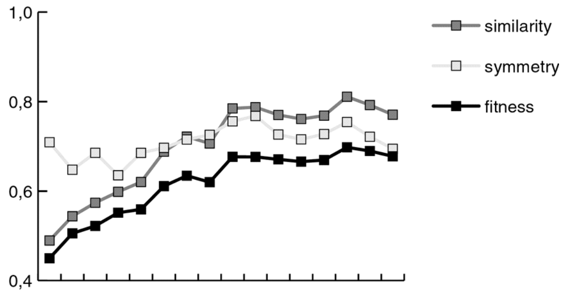

Figure 4 automatic evolution

The contradiction between optical and sensor results leads to the conclusion, that the sensors did not measure the properties they were supposed to.

This is not surprising, since the human notion of similarity includes invariance towards transformation, rotation and scaling, and shows varying tolerance for different facial regions. The similarity sensor in use only calculates mean square deviations of vertices, taking none of the above aspects into account.

So the prime challenge for automatic evolution in Genetic Modelling is to develop sensors that match the human intuition of what they are supposed to sense.

Given the objective to blow life into avatars, GENIUS Sculptor is only a first little puff. Avatars are shaped but not created, and the rules of selection are not guided by the virtual environment but rather superimposed from the outside world.

5. Future Investigations

Generative Evolution

Genius Creator will use an embriogenetic representation to allow for growing arbitrary 3D shapes from a single cell. Our representation is based on a Lindenmeyer-System that can be unfolded to a voxel skeleton. The growth of the muscle volume will then be obtained by expanding the weighted skeleton using cellular automata. Finally the voxel object is turned into a polyhedral surface using a variant of the marching cubes algorithm.

Reversible Mapping

A mapping is the function that maps the genotype of an object onto the corresponding phenotype. Our future objective is to create a compact reversible mapping for Genetic Modelling. If we achieve this, the genotype can be deduced from an arbitrary object by reverse engineering, applying algorithms for rasterisation, skeletonisation, and discrete line segmentation.

This would be a great step for Evolutionary Design, since it means that any object or person in existence may be rasterised and dumped into cyberspace to become further optimised by artificial evolution.

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poster

mediatecture

on the synergies of electronic media and architecture

Axel Wirths, 235 media, Mediatecture

Abstract

The synergies that can be achieved between electronic media and architecture, between virtual and real spaces, are being appreciated only slowly and are to be the theme of an exhibition with the programmatic title of "Mediatecture". The goal of the project is to make it possible to identify the direct link that exists between electronic media and built architecture and the fluid interfaces between real and virtual space. It is all about presenting an overview of the status quo and at the same time taking a look at visionary future media-architecture synergies. This allows the current discrepancy between theoretical discourse and working practice to be demonstrated: Although architects such as Nouvel, Ito, Sakamura, Koolhaas and the Viennese Coop Himmelb(l)au have done some groundwork and there is much talk of the use of electronic media in architecture, there have so far been only a few half-hearted projects ? and in these the application of electronic technologies was limited to the use of a web-server.

Keywords: Medien, Architektur, Design, Virtueller Raum, Realer Raum, Elektronische Medien, Electronic Space Media Art, City and Urbanity Synergie, Kybernetic Vision

1. Introduction

Mediatecture stands for the synergy of electronic media and the built environment. The exhibition's aim is to investigate the floating borderlines between the real and the virtual space as well as their real interfaces. The exhibition provides the visitor with the opportunity to experience the results of this investigation.

An exhibition with the subject "Mediatecture" - the amalgamation of electronic media and architecture – can be realised in different forms:

1. As a documentary presentation of those projects that have already been realised or are currently being planned
2. As a physical presentation of interface solutions and built components which can be entered, touched and experienced
3. As a mixture of both aforementioned forms, supplemented by a fringe programme including films, symposia etc.

This paper on Mediatecture introduces ideas and concepts of media artists and architects. The conceptual structure is deliberately be kept open and flexible in order to achieve a synergetic implementation of architecture and electronic media through a process of discourse or a form of interpolation as it were.

The exhibition intends to address a professional audience of architects, designers and those who work in the media. It should, however, also appeal to a broad public by offering extraordinary experiences through the presentation of installations, interface solutions, parts of buildings etc.

The fringe programme and the symposium should not attempt to rewrite the history of architecture, rather they should result in a small, high quality contribution to the current discussion that will attract general attention.

Bill Seaman, Exchange Fields, 2000 (see image above)

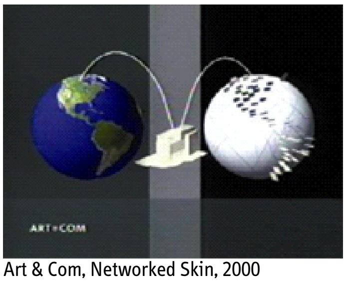
2. Mediatecture - Borderlines between the real and the virtual space

In the history of artistic expression through electronic media we can clearly observe a tendency towards spatial extension. While artists during the 70s still concentrated on the limited space of the TV box, this space was already being extended in the sculptures and closed-circuit installations by the likes of Nam June Paik and Bruce Nauman. In the early closed-circuit installations the ability of media art to interlink real spaces, temporal processes and constructed realities was already visible. The interactive installations emerging in the mid-80s with their increasingly complex interfaces radically reinforced this development. Since the beginning of the 90s, media art installations have rather turned into environments that integrate the complete space with all its details into the artwork. Since, on the other hand, the virtual space with its complex constructed realities is extending significantly in terms of size, use and qualities interactive, space-related interfaces are of increasing importance. The trend towards spatial extension continues and is not limited by walls. It seizes whole buildings as well as social and urban structures. In the latter case, media artists are still reaching their limits and a co-operation with architects and city planners becomes a precondition of constructive integration into the built environment.

The current status of an architectural work has to be determined on the basis of today's technological and perceptive possibilities. Electronically transferred information, like Walter Benjamin's "mechanical reproduction", reconstitutes not only the visible and the process, but also our understanding of time and matter.

Our real communication needs and existing technologies (telephone, fax, TV, radio etc.) find their counterparts in the virtual space of electronic networks. The real world is projected into the virtual space which simultaneously is being expanded by the medium's intrinsic qualities. At the present moment we are observing a virtual building boom. Particularly as far as hypertext, or more generally front-end interface software and their applications are concerned, we are finding ourselves in the centre of a fast growing global city. Here, too, we mainly encounter projections of the real world. But as opposed to traditional communication systems, we are able to create our own habitat within this environment. It is possible to lead a virtual life within the medium, the medium has become inhabitable.

How do these virtual forms of behaviour effect our real life, or is it at all justified to differentiate between the virtual and the real world? How will people who have a virtual past and those who have not interact with each other in future? And, most importantly, how will the interfaces between the virtual and the real be designed and how will those interface solutions be integrated into architecture? Can there be a synergy between the built and the virtual environment within a common urban structure?



Art & Com, Networked Skin, 2000

3. Aim of the exhibition

As can been seen by the very divergent evaluations of mediatecture - a small circle of insiders already considers the concept passé, while it is still unfamiliar even to the majority of architects - it is essential to begin with outlining its content in a more clear/concrete and vivid manner: Mediatecture can be described as the synergy of electronic media and architecture, of virtual and real spaces. This interface can be distinguished from TransArchitecture, that is virtual architecture, as well as from the simple use of media technology within the framework of architectural planning.

Neither the influence of media applications in the field of design nor the purely virtual character of architecture is to be placed in the foreground. Far more central in this context is the exposition of the interface between real and virtual space – presented in a way which makes its influence and quality sensuously perceptible to the visitor.

Since very few mediatectures have ever been realized and concepts of the synergies between electronic media and architecture have rarely been put into effect, the visitor will only be able to grasp this interface if it is possible to present a survey of those projects that have been conceived and/or realized, and when an interdisciplinary discourse can be initiated. The architects and artists who realize projects on media art and architecture are characterized by a clear tendency to extend space beyond its real and into its virtual capacity. In doing so they react seismographically to social tendencies like global networking and the growing importance of electronic media. However, the rapid development in the field of new media is leaving those architects who want to integrate a medial approach in their work increasingly helpless.

The area of media art with its direct access to technology, inventions and applications is steadily gaining importance in this context. Nevertheless: the interface between architecture and electronic media can only be dealt with sensibly and put do best use when developers of both areas are able to realize their ideas and visions jointly. In exploring this interface visitors of the exhibition will be able to experience the concrete synergies of electronic media and constructed architecture with their senses. Through this experience the fluid borderline of the interface between real and virtual space is directly perceived, which may help visitors to deal with the expanding role of electronic media in our social and urban surroundings more consciously.

Exhibition space will be devoted particularly to the medial and architectonic ideas and visions of the younger generation of architects and artists, the ones who have grown up with the expansion of multimedia. For they are the ones who strive for a genuine synergy of media and architecture, and this connection can be classified as mediatecture in the more narrow sense: real and virtual spatial situations and structures lose their special characteristics, spatial and temporal distances are overcome, space opens up around us - variations of spatial mutation become possible. In this context it is possible to approach the desired synergy of real and virtual space through either medially extending actual architectural constructions or by turning this process around and augmenting electronic media with real spaces. This synergy always entails the combination of real situations, chronological processes and constructed realities. Because space is virtually expanded, the space-time-interval is suspended and people can be everywhere at the same time - The actual location of architecture disappears to the extent that space and time are dissolved by the electronic media.

4. Artists and Architect

Christian Möller (D); Art+Com/ Joachim Sauter (D); Horst Prehn, D; Bill Seaman (USA); Studio Azzurro (I); ag 4 (D); NOX Architekten: Lars Spuybroek (NL); Greg Lynn (USA); Diller & Scofidio (USA); Foreign Office Architects (GB); b und k + (D); Marcos Novak (USA); Peter Anders (USA); Rafael Lozano-Hemmer (Mex); Asymtote, Hani Rashid & L.A. Couture (USA); and others.

5. Historic References - Designs in architectural history

Mediatecture is not an invention of the 90s, rather it can be related to various historic ideas and attempts. These references to the history of architecture shall be introduced in a special part of the exhibition.

Some attempts to extend spatial environments through the use of media and electronics in order to address all of the visitors' senses can already be found in the 1960s. Although only few of these ideas were actually implemented, some of the projects such as the Philips Pavilion by Le Corbusier are often cited again today.

In the theatre of "The kybernetic city" from Nicolas Schoeffer the audience sits on a rotating platform and is surrounded by flying sculptures. Light, color and sound projections intersect the space. "As the visitors enter the center, they simultaneously enter an audiovisual bath of warm, fragrant atmosphere flooded in mild hue, where sound, coloured lights and scents pulsate to a very slow rhythm. [1]

The "Spatiodynamischer Turm" from Nicolas Schoeffer (1961) measures various urban processes, in order to actively respond with sound, light and colour to alter the atmosphere.

An outlook will be delivered by the exhibition.

References

References are the works by artists and architects, presented in my talk. Copyright of pictures in this paper by the author Axel Wirths.

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Abb1. Constant, New Babylon, 1967

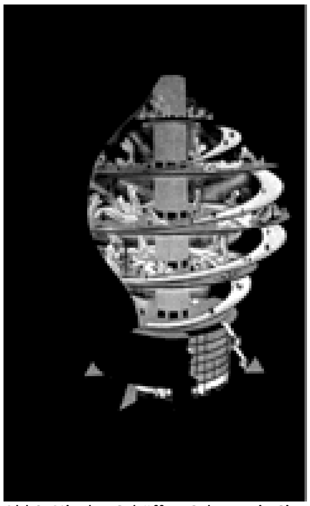
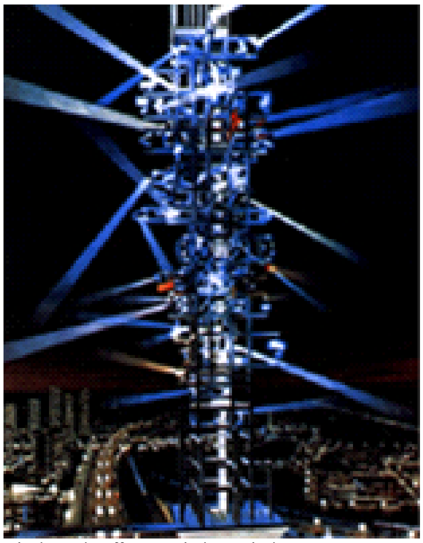


Abb2. Nicolas Schöffer, Cybernetic City, 1970.



Nicolas Schoeffer, Spatiodynamischer Turm, 1961

Le Corbusier, Varèse, Xenakis: Phillips Pavilion for the 1958 World Exhibition in Brussels

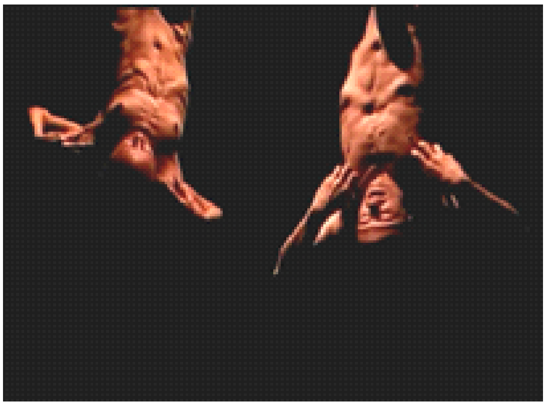
posters

panel 6:

performative perception

the body as instrument

poster



coexistence

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Abstract

Recent advances in mobile, wearable technology expand our ability to communicate remotely and connect to networked environments while still participating in the physical world around us. As technology allows us to more easily participate in simultaneous realities, aesthetic issues take on a central role. There is an opportunity to create new artistic experiences that blend both virtual and physical worlds and to create unique interfaces that more fully involve the senses.

This paper briefly describes an interactive art installation, titled Coexistence, that blurs the boundaries between physical reality and virtual reality, between biological life and artificial life, between performer and audience.

Coexistence questions our fundamental understanding of reality while exploring new forms of interface and experience design using networked wearable technology. This work includes innovative approaches to interaction, performance and immersion utilizing see-through head mounted displays and panoramic video. An important component involves a unique sensory interface that integrates breathing sensors and haptic feedback.

Keywords: Mixed Reality; wearable computing; machine vision; head mounted display; experimental performance

Year the Work was created: 2001

Project Partners: Emergence Team: Eitan Mendelowitz/Damon Seeley; USC Integrated Media Systems Center; Performers: HannahSim/MarkSteger/Osseus Labyrint.
This work is partially funded by Intel Corporation and Interaction Design Institute Ivrea.

1. Context

Mobile devices such as cell phones and PDAs provide ways to access information or communicate remotely while still engaging in the physical reality around us. As interfaces improve, it will seem natural to move in and out of cyberspace as we go about our daily lives. Portable digital devices allow us to interact in the physical world while coexisting in other places and virtual environments.

A visual counterpart to this involves new developments in head mounted displays. Head mounted display technology is becoming more compact and less expensive. In the near future we will be able to wear glasses that allow us to see more than the world in front of us. These glasses will serve as screens with variable transparency, allowing us to become immersed in a virtual environment, to interact with video, or to view any combination of the physical world mixed with a virtual world.

As mobile technology becomes more pervasive, interface and interaction design must be re-examined. We are moving from keyboard and mouse to sensing technologies that more fully engage the body.

In addition, people are becoming familiar with the notion of a distributed presence - a distributed self that exists in many worlds and plays many roles at the same time. Emerging digital technology allows us to distribute our presence and interact with others over multiple channels. It also presents us with increasingly sophisticated re-presentations of artificial life in which objects, both virtual and physical, can behave in ways that suggest "aliveness".

As technology allows us to more easily participate in simultaneous and mixed realities, aesthetic issues take on a central role. There is an opportunity to create new artistic experiences that blend both virtual and physical worlds and to create unique interfaces that more fully involve the senses.

Exploration into these areas led to the creation of an interactive art installation titled Coexistence.

2. Coexistence

Coexistence is a new work by Rebecca Allen in collaboration with her Emergence team at University of California Los Angeles, the Integrated Media Systems Center at University of Southern California and the performance group Osseus Labyrint.

This work blurs the boundaries between physical reality and virtual reality, between biological life and artificial life and between performer and viewer. It questions our fundamental understanding of reality through new forms of creative experience.

Using see-through head mounted displays and panoramic video, we explore innovative approaches to interaction, performance and immersion. An important component involves a unique sensory interface that integrates breathing sensors and haptic feedback.

To experience this work a person wears a head mounted display (HMD) that includes a position tracker to track head orientation, audio headphones and an attached camera to see the world in front of you. A computer vision system has been developed to track physical objects. This allows virtual and physical objects to appear to be in the same physical space.

The interface involves breath and tactile feedback. Using breath sensors, performers and artificial life forms come to life and respond to the participants' input. A hand-held controller provides haptic feedback as a form of communication between multiple participants or with virtual characters.

3. Mixed Reality

Fuelled by the rapid growth of networked digital technology and the parallel growth in mobile computing, there has been an increasing interest in techniques that combine real and virtual environments to create mixed realities.

Between the extremes of physical reality and virtual reality lies the spectrum of mixed reality. Unlike virtual reality that replaces the physical world, mixed reality research aims to develop technologies that mix computer generated virtual objects and characters with the real world.

In Coexistence a person experiences multiple realities that encourage interaction. Wearing a head mounted display the participants will at times see through the attached camera and view the space and physical objects around them. With the breath sensor one can bring computer generated images to life. These virtual objects appear in the physical space and seem to be connected to physical objects. For instance, a virtual object grows out of a physical container and eventually surrounds it.

The breath is used as a metaphor for breathing life into an object. By blowing into the breath sensor a person affects his or her environment. When a person blows into the sensor a computer generated image will come alive and metamorphose. Whenever one participant blows into the sensor the other participant will "feel" their breath through a haptic force-feedback controller.

The breath is also used as an interface to emphasize the connection of our physical body to mixed reality. Breathing is the ultimate expression of our physicality. In Coexistence we not only maintain our simultaneous awareness of physical and virtual space but of our own physicality intermingled with virtual life.

4. A New Platform for Performance Art and Interactive Experiences

During the Coexistence experience one will be transported to a strange, engaging, immersive performance experienced from a unique viewpoint. Instead of sitting with an audience watching a performance, you feel as if you are on stage, standing in the center of a unique performance. One is able to look around in any direction as the performers approach you and perform all around you.

This unique interactive performance utilizes a 360-degree panoramic video system developed by Professor Ulrich Neuman and his research team from the Integrated Media Systems Center at University of Southern California. The panoramic video can be viewed through a HMD. During playback the HMD head-tracking device allows participants to turn their heads freely to observe the desired portions of the panoramic scene.

We are using this panoramic video system to explore new forms of art and performance and to reconsider relationships between performer and audience. When viewing the performance with a HMD it seems as if you are in the center of a performance that takes place all around you. The performers are directing their actions to you, an audience of one.

During the performance one can use the breath sensor to activate and modify the actions of the performers. This presents a new type of immersive and interactive experience, connecting an audience member to a performance in a way that has not previously been explored.

The performance is choreographed and performed by Hannah Sim and Mark Steger, founders of the performance group Osseus Labyrint. They were invited to collaborate because of their extreme focus on the physical appearance and movements of the human body, an appropriate counterpart to a virtual experience.

Osseus Labyrint performances are otherworldly, very physical but bizarrely alien. As described by a reviewer, "...the death defying duo explores the outer limits of what the human body can achieve... Their joint image, twin-like and androgynous, is a science-fiction nightmare. As man and woman they create the illusion of a spare, post-human race."

5. Technical Description

This artistic work utilizes a proprietary software system called Emergence [2]. The Emergence Engine was designed to be modular and highly flexible. The engine's flexibility is achieved through the use of an innovative scene graph formulation. The Emergence scene graphs have more components than standard scene graphs such as those employed by Java3D [4], and VRML97 [1]. The Emergence scene graph does not merely store hierarchies of geometric primitives and their attributes, the scene graph contains complex data structures called topologies, assets, elements, and controllers. Descriptive information can be associated with each of these structures in the form of properties. The Emergence scene graph allows for the easy integration of new technologies, as they are required. The following paper gives an overview of the Emergence scene graph structure and explains how it has been used for Coexistence to add mixed reality technologies including head mounted displays, real-time video mapping, "breath" sensing, and machine vision systems.

6. Topologies

The topology is the basic building block of the Emergence scene graph. There are different types of topologies. Topology types include such types as "Immovable Object," "Moveable Object," and "Creature." These type definitions help to define characteristics of the topology. Each topology has a name and properties that are used to describe the topology. Many of a topology's properties describe physical characteristics such as location, mass, and elasticity. Topologies may have an arbitrary number of children. A topology's location in the virtual world is relative to that of its parent. As a result, any geometric transformation applied to a parent is inherited by its children. The emergence scene graph must be a tree (i.e. except for the root, every topology must have one and only one parent). There is one special topology called "World" which serves as the root node for the emergence scene graph.

Topologies, by themselves, are static and invisible - they have no geometry, no motion, and no behavior. Topologies may be associated with assets, elements, and controllers. It is these structures that provide the scene graph with substance.

7. Assets

Assets are structures that store data for topologies. Assets include such things as texture maps used to texture geometry, wave files used as sounds, and network sockets for TCP/IP network messages. For our new mixed-reality installation, titled Coexistence, we created a new asset that contains a real-time video stream that can be acquired from any Video For Windows or DirectShow compatible camera; currently we are using a FireWire web-cam. Like all assets, any member of the emergence scene graph can use the video stream asset.

8. Elements

In addition to assets, topologies can have Elements with which they are associated. Elements are responsible for the Emergence Engine's input and output. They define how topologies look, sound, and what they can sense from the physical world. Example output elements include geometry, particle systems, sound, and interfaces for haptic controllers. Each element of every topology is called once per frame at which point the element is responsible for its own output (usually performed though OpenGL rendering calls). Because every element is responsible for its own render, arbitrary new elements can be created and added to the scene graph without having to modify the Emergence Engine as a whole. Elements can have properties that effect how the element is rendered. Properties can be set either interactively though the Emergence Engine's GUI or through the emergence scripting. In addition elements can be disabled or enabled in the same manner.

New output elements added to the emergence engine for Coexistence include a real time video stream, and a panoramic video display system. The real time video steam acquires video frames from the video stream asset and texture maps them onto a plane. The location and orientation of the frame in the virtual world can be set through the element's properties.

The panoramic video element was created using DLLs provided by the Integrated Media Systems Center at USC based on their panoramic video system [3]. The panoramic video is captured by five separate camera feeds that are stitched together to form one ultra-wide image representing a 360-degree field of view. When active, the panoramic video element determines the participant's point of view (using information from the head mounted display input element) and maps an appropriate segment of the stitched image onto the inside of a cylinder. The result is an immersive panoramic video experience where the user can look around 360 degrees and up and down. Properties control such things as qualities as the current frame being rendered and the frame rate. Like all properties these values can be set through the Emergence GUI or the Emergence scripting language.

Like output elements, input elements are called once per frame. Input elements contain properties that represent the state of input devices. These properties can be displayed by the emergence GUI, read by a script, or accessed by other members of the scene graph. Examples of input elements include keyboards, joysticks, and game-pads. For Coexistence we added input elements for a head mounted display (HMD) and a "breath" sensor. For each frame the HMD input element sets its pitch, yaw, and roll properties by querying the motion trackers that are built into the HMD.

In order to explore the interface modality of breath the Emergence team created a "breath" sensor. The breath sensor is a standard microphone coupled with signal processing performed by the breath sensor input element. Each frame the breath sensor analyzes the waveform captured by the microphone. When a participant blows (even gently) on a microphone this can be distinguished from a loud sound by enumerating the samples above a set threshold. While load sounds are characterized by a high average amplitude they still have a wave structure and therefore tend to have a lower number of samples above the given threshold than one's breath. The breath sensor's properties include threshold, amplitude, and the number of samples above the threshold.

The addition of these complex elements point to a strength of Emergence's scene graph formulation. The real time video stream, panoramic video, HMD, and breath sensor were all added without any modification to the rest of the emergence system. In addition the use of properties by the scene graphs allows for control of these new elements without any extensions to the emergence scripting language or the emergence GUI.

9. Controllers

Controllers are responsible for creating change in Emergence worlds. A controller's sole task is modifying the properties of other components in the scene graph. There are many different types of controllers. Physics controllers implement the virtual world's physics including gravity, friction, and collisions. Other examples include animation controllers that control the key frame animation of models, scripting controllers that run Emergence scripts, and behavior controllers. Behavior controllers implement a behavior based artificial intelligence system that allow for the creation of autonomous situated agents in Emergence worlds [2].

For Coexistence we added two new controllers. The first controller modifies the orientation of the (virtual) camera in response to changes in pitch, yaw, and roll of the HMD as detected by the HMD element. This allows the Emergence participant to move his/her head and look around the virtual world (or a panoramic video sequence).

10. Machine Vision Controller

The second controller enables mixed (or augmented) reality. The machine vision controller examines the video stream from the video stream asset, identifies pre-defined targets placed in the room, and, from the location of the targets as observed in the video images, determines the physical camera's location in the room. The controller then uses the location of the physical camera to set the location of the virtual camera in the virtual world. Moving the camera in the real world corresponds to the same movement of the virtual camera in the virtual world. Using this controller we are able to allow objects in the virtual world to augment the real time video image of the physical world. For example, we can place a virtual flower in a physical pot.

The Emergence Engine was designed with artists in mind. It is part of the Emergence Lab's mission to make tools accessible to artists by making sure they run on standard consumer PCs. In addition, for the Emergence Engine to be immersive it must run at high frame rates (at least 20 frames per second). To these ends, the machine vision controller must run highly efficiently.

In order to minimize the vision controllers computational load constraints are placed on the targets. All targets must be of solid predefined colors. These particular colors cannot appear elsewhere in the installation space.

In addition, targets are required to be within a certain range of the camera. Too far away and the target may be ignored, too close and the targets position may not be accurately determined. By imposing these constraints, the machine vision system no longer has to look at each and every pixel of the video image (a time consuming task). Instead the vision controller is able to sample a fraction of the image and quickly find any targets that may be present.

Once a target is located, the vision system performs a more refined sample in the region of the target to determine the targets size in the image (and hence its distance from the camera). The location of the targets in the image and distance of targets from the camera are used to determine the location of the physical camera through basic geometry. This location is then used to set the location of the virtual camera.

Summary

Coexistence is an artistic experience that questions our fundamental understanding of reality by blurring the boundaries between physical reality and virtual reality, between biological life and artificial life and between performer and audience.

This work includes innovative approaches to interaction, performance and immersion utilizing see-through head mounted displays and panoramic video. An important component involves a unique sensory interface that integrates breathing sensors and haptic feedback.

In Coexistence we envision a future in which our distributed presence exists in multiple realities creating, perhaps, a richer life experience.

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poster

audiohyperspace

from hoerspiel to interactive radio art in the digital networks

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Abstract

This poster sketches the current work in progress which SWR/Southwestgerman Radio's "Audiohyperspace" program is developing, to transform radio art of the broadcast age to interactive acoustic media art of the digital networks' age.

Audiohyperspace researches and emphasizes the importance of dramaturgical concepts as a basis for interactive acoustic media art, from which the development of the necessary technology and media architecture have to be derived from for the production: It is aiming to find convincing dramaturgies for interactive audio art, which reflect, in its creative potential as well as in its critical aspects, the new role of its artist, the shift of its recipient's role as well as the fundamental changes in the notion of art itself.

These interactive dramaturgies focus on creating an aesthetic-communicative audio experience through the combined use of radio and digital networks. Not the technological tools themselves, but the overall media architecture and its behaviour is, what forms sense and meaning.

Keywords: Radio art, interactive art, audio art, Hoerspiel, dramaturgy, listening culture.

Project URL:
http://www.swr2.de/hoerspiel/audiohyperspace

Year the Work was created: Ongoing, from 1998

Introduction

Hoerspiel ("radio drama) is an art form, therefore beyond the usual informational categories and its related aesthetic standards, from which the vast majority of radio program formats derived. In fact, Hoerspiel is not a format at all. Based on artistic claims, it is seeking the whole diversity of forms, contents, materials and modes of acoustic expression which transgress standardized media production.

"Radiokunst" or "radio art", Hoerspiel's radical sister, is doing this in most consequent ways. As a genre, which reflects the use and the electroacoustic identity of material, tool, dramaturgy, time and space concepts, it was already described and imagined in the early 1920s by the famous German composer Kurt Weill.

Radio Art is media art, and therefore trying out the technological, conceptual as well as the metaphorical potential of the apparatus. Since the digital networks came up recently, the electroacoustic media space, where radio art is based on, has become different. Its new architecture makes available a shared environment, a distributed space, with – finally - bi-directional communication possibilities.

Southwestgerman's Audiohyperspace-webpage and its on-air programs are tracing and reviewing the newest developments of web-based acoustic media art, investigating the aesthetic potentials of digital networks beyond the utilitarian purposes of Internet & Co.

Aims of Research

Based on SWR's monthly "Audiohyperspace"- webpage, we are aiming

- to develop acoustic media art dramaturgies specifically for the potential of digital networks
- to build up acoustic media architectures which allow an interactive aesthetic dynamic between artist and audience, by combining radio and digital networks
- to explore cultural shifts of acoustic perception modes through the use of participatory strategies and the aesthetic use of the new relationship between acoustic media and its audience
- to identify quality criteria for audience participation and, based on this, encourage the creation of autonomous acoustic media art, in order to sustain and develop a culture of listening adequate to networks and multimedia spaces.

1. Project Description
What is Audiohyperspace?

"Audiohyperspace" is a bi-lingual webpage of Southwestgerman Radio's (SWR's) Radio Drama Department. Since 1998 it traces the development of mediaspecific acoustic artforms in the digital networks.

It reviews the latest and most interesting of these productions found on the Internet, presents them on its webpage, links them, and offers background information. Its main focus during the last two years was on the questions of interactivity.

Additionally, to inspire the discourse on the topic, "Audiohyperspace" goes occasionally on air with one-hour long radiophonic essays. They illuminate questions of media or aesthetic theory, related to the topic of acoustic media art in the digital networks. These broadcasts can be also downloaded as texts and audio on demand.

Audiohyperspace understands itself as a guide through the diversity of network audio art and as a filter, which draws the listeners' and users' attention to worthwhile projects. At the same time it wants to serve as a criteria builder for the quality of participatory or interactive radio/audio art.

Quality criteria are for example:

- The media specificy of audio art projects in the digital networks
- The acoustic autonomy of the piece
- The quality of its sound language and its worthiness of listening to it concentratedly
- The degree of creative interactivity and participation for the user/listener
- Based on these criteria Audiohyperspace wants to build up the genre of a future interactive radio art in the digital networks.

2. The origins of Audiohyperspace: October 1924

October 1924: The first German original radio drama (Zauberei auf dem Sender/"Radio Magic" [1] by Hans Flesch), aired by Radio Frankfurt, leads us immediately into today's electroacoustic space of networks and its interactive and participative possibilities.

Created in a time when radio was considered a new medium it tells humourously about a mysterious radio program disturbance: Instead of the scheduled Blue Danube Waltz a strange multilayered audio collage is on air with voices, noises, and music. By a mysterious force the ether had become an auditory multi-user space.

Like this might have sounded the early days of radio in the US before WWI, where the ether was accessible for everybody, and call and answer happened on the same frequency, quite similar to today's chat on the Internet. However, the program director in the piece insists on re-establishing the order of the broadcast principle: one sends – many listen. Therefore the reason for the acoustic on-air-anarchy had to be found and made quiet: a magician, who, by his witchcraft, had put all available live sounds and electromagnetic waves as a wild audio mix on air, something, which the usual radio audience had never heard before.

"Zauberei auf dem Sender"/"Radio Magic" describes the conflict between two radio concepts, which was still virulent at the time of its first broadcast:

- Radio as broadcast (one transmits, many listen)
- Radio as bi-directional multi-user space

The political decision, to identify radio with broadcast, was finalized in Germany and many other states by the beginning of the 1920s. During the following years it was fundamentally critized by artists and theoreticians like for example Bertolt Brecht (1932) and Rudolf Arnheim (1933).

Beyond these critics, which aim at the political, social and communicative limitations of the broadcast principle, the first German Hoerspiel emphasizes, that opening up a participatory media architecture also breaks up aesthetic limitations. It requires different concepts especially

- of material, form, dramaturgy
- to produce sense and meaning
- of art, artist and recipients

Although since the end of the 1960s a number of radio pieces became participatory by using the telephone as an interactive tool it hasn't been since a few years, that the digital networks have made a bi-directional electroacoustic multi-user space available. Therefore SWR's webpage Audiohyperspace and its on-air programs try to take up again the almost lost thread of network based audio art, which had been already spun by the first German Hoerspiel in 1924, developing today appropriate concepts for the new media architecture.

3. How can radio art become interactive?

By monitoring and searching for interactive internet based audio projects, Audiohyperspace found the following typologies for participatory concepts which break up the mono-directional broadcast principle (all examples can be found on

http://www.swr2.de/hoerspiel/audiohyperspace/engl_version/interaktion_e.html):

3.1. Dramaturgies based on navigation

Example 1: "Electrica" by skop (multioptional navigation)

Example 2: BBC's first interactive radio drama "The Wheel of Fortune" by Nick Fisher (multi-channel broadcast; acoustic hypertext-principle; navigatory choice between three options)

3.2. Productions, based on the flexibility of the sender/receiver relation

Example 1: "Via Napster into radio drama", "Siren's Voice" (reconstructing a radio drama by filesharing).

Example 2: the worldwide "Loop"-events of the Webcast artist group "re-lab.net" (webcast audiostreams are picked up by participants, remixed and made available to the next webcast participant etc.; the loop gets closed, when the stream is picked up by the station which sent it out initially).

3.3. Concepts, based on network-architectural principles ("distributed space" and "shared environment")

Example 1: "mp3q" by Atau Tanaka (enables the user to do his own audio mix with selected materials or to contribute his own mp3-files, he can access via the website hundreds of linked mp3-files, stored on hundreds different servers worldwide).

Example 2: WebDrum, a multi-user application (up to eight participants can meet in a virtual space and can create together in realtime a drum session).

In combination with the acoustic broadcast medium all these concepts and strategies can open up radio for the audience's participation.

3.4. What concepts and strategies are still missing?

Speech- and dialogue-based radio art concepts are nearly completely missing within the artistic attempts to create interactive webbased audio works.

The main reasons:

- Difficulties in programming speech-based dialogue data bases.
- Critical realtime conditions of the digital networks.
- Clients' computers often too slow.
- Insufficient bandwidth.

4. Considering paradigm shifts, their creative possibilites and problematics

Audiohyperspace's aim to develop new dramaturgies for acoustic media art in the digital networks has to identify and to consider the cultural shifts of production and perception, caused by the network's new prerequisites: These shifts also imply difficulties and new challenges for the artistic concept and the dramaturgy itself.

4.1. The artist: From concentrator to moderator

Working within the field of the networks' interactive possibilities, the artist sees him- or herself not as the creator of a closed and finished art work. Instead, he offers a frame, in which others can become active. He is less a "concentrator", who distils meaning and defines the exact phyisiognomy of the piece, but a moderator, who defines the topic and has formulated a set of exercised rules, by which the form and content of the input is processed. As the framework stays empty without input, the artist needs the recipient, whom he has to inspire to become operative.

Problematic: If the framework and its rules are not enough defined, the aesthetic statement becomes arbitrary. If the rules and the frame are too complicated, the recipient is overwhelmed and might use the artistic offer to participate in a superficial or trivializing way. If the frame is too simple, the value of experience is little and the motivation to participate as well. There is also a risk of loss of editorial and artistic responsibility, if it is the user who is supposed to produce the artwork.

Therefore, the invitations by the artistic framework to the recipients have to be balanced delicately.

4.2. The recipient: From listener to user

Where a framework needs to be filled by the interacting user, the process of appropriating and understanding of the artwork happens less through contemplation (receptive listening), than through operation. Acoustic media art in the interactive networks provokes a perception model similar to what Walter Benjamin, at the beginning of the 1930s, called "tactile reception". He compares it to the perception of buildings, which are "perceived in a double way: through tactile use and through its contemplation. (...) The tactile reception is not based on attentiveness, but on habituation." [2] According to this reception model, appropriating the artist's intention by the audience does not primarily take place by listening, but through searching, trying out, intervening, rejecting and trying out again.

Problematic: The strong operational involve-ment of the user, implies the tendency that listening becomes replaced by zapping and non-stop activity. As contemplation and listening are essential for understanding and using the artist's offer in a qualified way, it is important to develop a concept which encourages the user not only to interact, but also to listen.

4.3. The Concept of art: From semiology to behaviour

The set of rules offered by the artist, alters the users input according to his artistic intentions. This means that processing the input, treating the user's contribution by the "system,, becomes a central characteristic of an artwork itself. Such a process is conceived and programmed as part of the artistic framework, and plays a decisive role to create the intended sense and meaning. Roy Ascott: "Not so much meaning, content, appearance, in brief: semiology will be important for the future of art, but its behaviour toward the recipient" [3], and therefore its response toward the user's input. The artwork becomes a kind of dynamic environment or even a living entity, with which the recipient can communicate and converse.

Problematic: To identify the borderline where a responsive artwork becomes perpetual animation. This can involve a loss of autonomy for the recipient as it becomes unclear: is it he who appropriates the artwork or is it the art, the system, the digital environment, by which he becomes appropriated?

5. Conclusions for an interactive radio art in the digital networks

5.1. Assigning a role for radio

The combination of broadcast and network media can avoid the mentioned problematics which tend to derive from operational interactivity. Combining can mean for example: an interactive audio art piece can be tried out in its non-linear, multi-optional aesthetic behaviour by the users on the Internet. A radiobroadcast can serve as a meta-channel for the same work: by airing it as a linear program, its artist can demonstrate its aesthetic refinement, which in most cases will probably exceed the users' trials and errors.

By this the audience can also experience, that the artist's claims, which are formulated in the interactive concept and setting, can be fulfilled and don't stay mere intentions. By the linear broadcast, which requires listening, also the possibility of contemplation, which is a prerequisite of understanding, can be made accessible for the audience. Finally, experiencing the artwork on the Internet, it will be an individual experience, whereas broadcast is a shared one. The broadcast program can be understood as a window on the processual and interactive artistic network setting in a certain moment.

5.2. Conceiving the recipient

Interactivity and participation in an artistic context is based on the vision of an exchange between subjects. A recipient, who just executes a set of options would be nothing more than a tool. Therefore, an interactive radio art needs the user, who is taken for serious as a creative one and who is asked to give a qualified aesthetic input.

5.3. Conceiving the experience

The goal: to create an aesthetic-communicative experience within a culture of listening. This can be compared to the satisfaction given by an excellent conversation: A conversation exists within a frame of topic and behaviour, which is filled by the improvisational liberty and the intellectual and emotional qualities of its participants. If they apply constantly the framework, then the conversation is directed and redirected towards sense and meaning. This does not only need the participants' operation and action, but also very essentially their faculty and willingness to listen, in order to understand each other.

5.4. The pilot project: "Frankensteins Netz"

Based on the reflections derived from Audiohyperspace, SWR's radio drama department prepares an interactive network and radio art piece, being aired live on March 23, 2002 on SWR's cultural channel. Its title: "Frankensteins Netz. Prométhée Numérique. Wiretapping the Beast" by Atau Tanaka [4], a co-production between Southwestgerman Radio, ZKM Karlsruhe, Deutschlandradio Berlin, Radio Canada and the Goethe-Institut Tokyo. Its main performance hub is the ZKM Karlsruhe, connected with two remote performer cities (Montreal, Tokyo).

The work focuses the idea of the Internet being a living organism, which the listener/user feeds, raises and activates through data input. Similar to the Frankenstein-novel and the Prometheus-myth, this living organism gets out of control and has to be tamed and sedated.

Already one month before the performance the "living entity" reaches out for its listeners, communicating with them via SMS and inviting them to participate, even during the performance itself, in uploading texts, sounds, visuals. The user is not asked to simply click a number of options, but to enter the setting with creative and playful input. This input will be contextualized and processed by the "creature"/the system itself as well as by the composer, both before and during the performance.

The piece can be accessed not only by radio but worldwide by a webinterface, which reflects the mysterious and dynamic topic of the piece. It will be also streamed live through the web, in order to provide a "window" on the momentarily state of the living entity.

As we want you to be our participants and creative users, we don't want to reveal too much at them moment, but are hoping to get you in contact with the creature for a thrilling aesthetic-communicative experience.

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[3] Roy Ascott in: Sabine Breitsameter, "Unterhaltungen im Internet. Hörspiel als Interaktion", broadcast Dec. 14, 2000, SWR2, script and audiofile: http://www.swr2.de/hoerspiel/audiohyperspace/sendung/20001214/index.html

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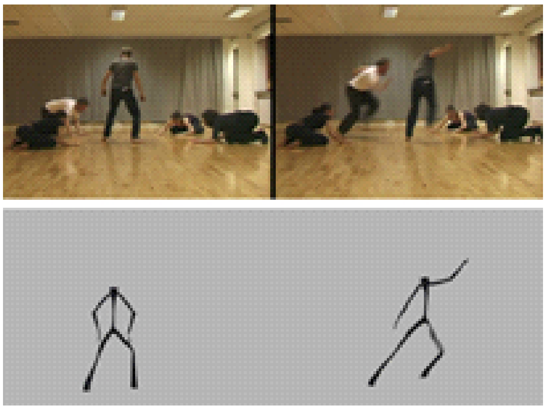

common playground

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Abstract

In this poster we present our experiences in using a computer game platform as a development tool in the areas of art, architecture and drama. Our approach has been to find ways to do quick prototyping and testing of ideas in a virtual space. We strive at building general applications independent of the 3D platform used for the specific case rather than getting stuck in a certain game engine or technological generation. The focus has been on the constant dialogue between the concept and its form. Today's Computer games seem very fit for our purpose.

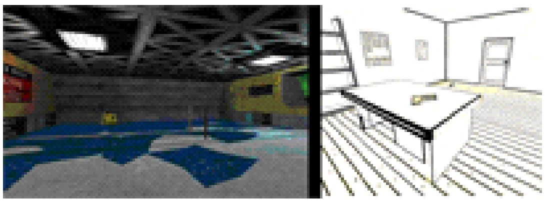
Projects presented run at Space respectively Narrativity Studio, Interactive Institute in Malmö.

Keywords: art, drama, computer games, virtual space, avatar, body movement, collaborative drama, theatre

Project URL:
http://www.creativemotion.dk

1. Introduction

With the goal to produce and work interactive with virtual environment we found computer game technology as a suitable playground. In this poster we presented a concept of MoodBody used in the project Communicating Moods in Space, in the Narrativity studio.



2. Aims of Research

The project Communicating Moods in Space, defined in Narrativity Studio, aims at developing innovative metaphors for spatial expression and communication. To design a virtual narrative space, which combined with event scenarios, inspires collaborative creative processes and establishes a meaningful relationship between virtual space and reality. The mode of communication is physical rather than textual.

3. Half-Life as playground

For the purposes described above, a virtual environment to support: multi user environment, open SDK for application development, openness for character animation and behaviour control was needed. In collaboration with the Space studio Half-Life was chosen as first test platform. During the first half-year prototype focus has been on two areas:

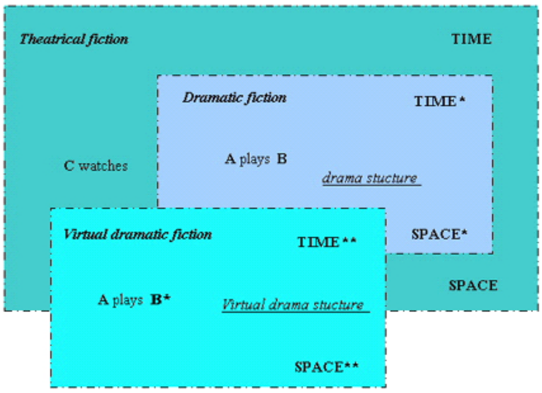
- Pace in Space: How do we physically communicate and experience stories together in virtual space? How to create a virtual space that in a haptic sense inspires the pace in space.
- Trace of Pace: How to define dynamic drama structures, where space itself becomes an actor. In the role of actor the space may embody memories and let events and stories told integrate physically in space as trace of pace - the story and memories of actors pace as well as the space itself.

4. Moving between fiction layers

Working with drama creates a doubling of space and time as well as the double role as actor-spectator. To be active in both Roles gives the participants a wider view and stimulates thinking of the best for the whole and not only the own performance as an individual. Working with presence and impact in virtual drama is a similar situation. It is important to have a clear contract and framing for actors to know if your inside or outside the dramatic fiction.

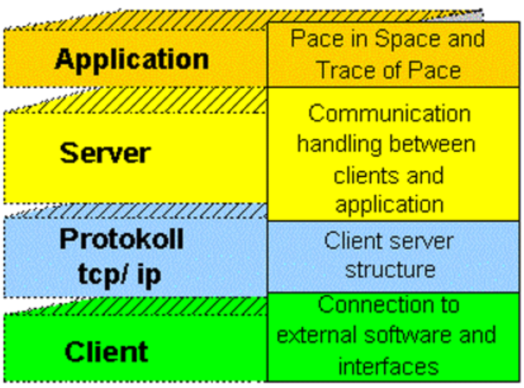
In first version I have worked with different view angles and character sound as representation/ identification by for actor-spectators. Another aspect of presence is how to communicate the Role to the actor: "How do I know I am a virtual wolf?" This game is confusing also in live version by the continuous role changing, which is the part of the quality - this make you alert and the surprise and change effect keeps you engaged in the game.

Staging collaborative drama in theatre/drama training for presence, collaboration and playful communication uses the quality of both being actor - spectator. This quality gives you as actor a constant reflection of the drama taking place both from inside and outside the drama as well as relation to the doubling of time and space [1].



Working with drama in mixed reality gives an extra fiction layer – as an extra reflection level. As well as the inspiration of moving, cross communicating and playing with identities in those different fiction layers. To play in mixed realities are also experimented and discussed in the area of theatre and drama as for example playing "between and betwixt" for analyzing cultures and rituals for liminal and other cross border states. In this area there is also new expressions to be found using new media.

With a long-term goal of building a flexible and open application and not putting too much effort in Half-Life specific solutions, a Mixed Reality Platform was formulated. The aim of this platform is to create a flexible meeting point between physical and virtual space, an open environment and interface to different 3D engines as well as flexibility in relation to user interfaces. The platform consists of a protocol and a software package (API), based on the same protocol.

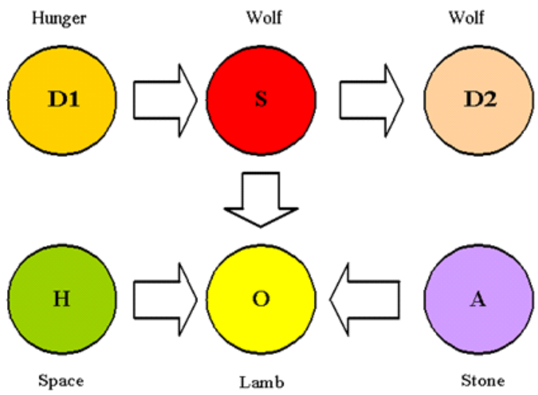


The protocol is to handle positioning, movements in virtual and physical environments and support several input devices and systems - in the range from microphones to tracking systems [2].

5. Creating Drama

The choice of drama structure is striving at finding ways of "fighting" for collaboration. This is the point of concentration in theatre improvisation and many traditional games. To implement the method of creating drama by establishing a conflict, I have chosen an old tagging game called "Stone, Wolf and Lamb" in the first prototype. The plot in short gives Wolf hunts Lamb. If Wolf gets Lamb they change roles. Lamb may jump over a Stone (also a Role character playing a stone), then Lamb becomes Stone, Stone becomes Wolf and Wolf becomes Lamb. This game is implemented as a multi player computer game in Half-Life, where actors interacts through Roles in first person view.

Specific for the chosen game is a constant change of Role. This gives the actor/ player different relation and point of view in the game played. This changing of roles also creates the circular dramaturgy where there is no winner.



The theoretical model used for structuring the dramatic scenarios is Semantique Structurale [3], a structural interpretation of a narrative where a subject (S) with driving force and quest (destinateur D1) to get object (O), with the goal to satisfy receiver (D2). Added to this main story, there is the helper (H) who supports the main story and an antagonist (A) counter acting the main story – in all 6 actants.

Applying this structure for playing the tagging game in a virtual playground opens up for a dynamic environment introducing Fools (autonomous Roles), Space, "God-Role", Sound or groups of Roles acting as helper or antagonist to the main story with a common dramatic function.

A feature in the Mixed Reality Platform is a 2D overview of the playground and current active players in a LAN network. In relation to the dramatic structure this may be interpreted as a "God-Role" acting as director or Fate acting as different actants, but is not yet explored as part of the game.

This drama structure is also interesting when looking on definition of actor viewpoint. In what Role do you experience the story told? In the prototype I have chosen the actor to be as well of the three main characters Stone, Wolf or Lamb.

6. MoodBody – emotions in virtual space

The ways to communicate emotions as sorrow, fear, happiness are many. We laugh and hug each other using our body, but how do you communicate all this at distance, different time and space – in virtual space? The design of the MoodBody is inspired of physical theatre and focusing on body expression and communication rather than facial expressions. Striving for a non-realistic environment and scenario the movement design is in the field of extra daily behavior.

Looking at virtual characters you may define three main categories: Virtual humans (focusing on realistic bodies, Virtual Personalities (focusing on social skills)

Avatars (focusing on representation of actor). The goal was to find a non-realistic "clean" character body, optimal for body expressions and with a neutral mask (avatar). These criteria's also to open up for the Role change transformations through metamorphosis. The 3D character models are developed together with Michael Johansson in the Space studio. My inspiration for character is simple line drawings by Carlo Blasis [4]

Character movement is designed in the context of the game. In the process of defining motion for expressing moods, I find it important to put the moods in context. Like in improvisation relations is as important for the development of the story as individual basic moods and emotions.

Looking for the essentials in an animated mood expression, it is not necessary with realistic perfected motion tracking. For formulation of emotions and relations of virtual bodies, our mode of motion capture for this first prototype were by shooting live workshops in video, which was the raw material for the 3D character animation. This gives a further step in concentration of human movement. By formulating drama and relations in animation art, we learn about ourselves. Using and relating to the virtual spaces and bodies opens up for even further focus on formulation of expressive mode as MoodBody. Workshops were arranged in collaboration with Kent Sjöström, Malmö Theatre Academy.

7. Pace in space, Trace of pace and Space

The virtualplayground is a white rectangular space – narrow but with high roof staged by light and sound as ending in "heaven" and "hell" respectively.

The Pace in space implements the tagging game and MoodBody as the basic game rules, controlling the drama structure, multi user environment and the over all behavior and timing.

The Trace of pace is concerning "physical" embodiment of dramatic events, spatial events and Role behaviour. This is Space taking part in the drama as an actant. In the prototype traces are implemented for Role change, traffic in space and Wolf behaviour (a good or bad in relation to Role defined goal). As examples implemented, a role change will place a plant to grow, creating a jungle over time, movement in space as traffic will generate markers of different intensity and colour and Wolf getting tired in relation to the tempo and performance of his Lamb hunt etc.

Experiences in the Forsite project on Computer Games in Architectural Design did show inertia to make people move around when visiting virtual workplaces etc [5]. As an experiment to inspire actors/users experience space in an open-minded way, the method of drama was used. At an internal institute workshop on re-arranging our own studio workspace, the Stone Wolf and Lamb game was used as a "Design game" – an introduction to use and experience space as well as a motivation to learn the Half-Life interface in a playful way. This workshop focused on space design in relation to the dramatic structure – Space as helper / antagonist. In contrast to the original rectangular open space, a lot of effort where put in finding the object of desire when playing in a more complex and layered space, which need to be integrated and considered in relation to play structure.

8. Experiences of virtual play

Using VR as augmented imagination is stimulating when playing games. Playing in virtual space gives a unique opportunity to design exciting and dynamic play space as non-realistic, interactive and participating.

With actors playing in first person, the aspect of design for presence is important - to communicate the Role - "How do I know I am a virtual wolf?"

The neutral character bodies are designed in order to be open to actor's fantasy and interpretation. In this prototype the body language and character behaviour is not fully developed which gives the disadvantage of some confusion of identity. This is partly due to the game itself (it is really confusing also in material space, which is part of the game...).

For the final prototype state the Role identity is designed by character sound (Stone Wolf and Lamb), different view points and sound markers for Role change as well as Wolf using paw for hunting. Finally we worked with Role head to identify actors in Role. As long as actors not playing they keep their neutral body.

When focusing on body as expressive media and mood communicator, the question of alternative user interface is of big importance when finding solutions to integrate body and technology. Next step in project is to look at our relationship to technology and how technology integrates itself into the creative process, shapes content and potentially can assist in taking the work to a deeper level of consciousness where both form and content are interwoven.

In the development of this project I will look at group dynamic as input as a collaborative and more ambiguous interaction mode compared to for example individual direct input using body mask. When working with theatre and drama presence and collaboration is of great interest. As with the motion capture, the process of group dynamics will be experimented with, to formulate essentials also in relation to the virtual space and characters.

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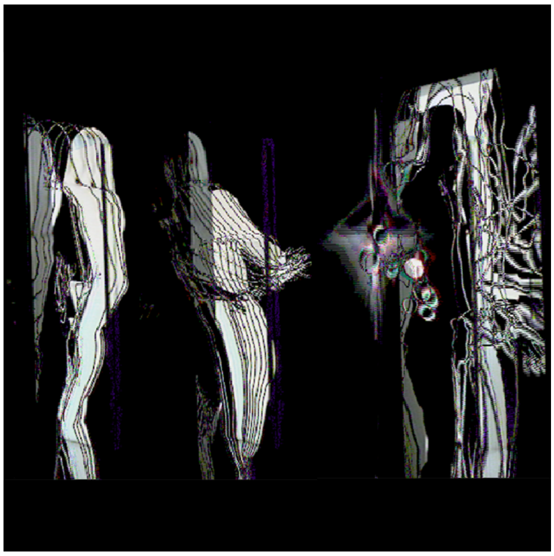

drawing spaces

experiments in presence and awareness of body and space in mixed realities

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Abstract

The interactive installation "Drawing Spaces" investigates strategies for creating a bodily sense of presence and awareness in networked space created through intersection of shared physical and virtual spaces. This paper presents two „Drawing Spaces" experiments: 1) a configuration where real-time generated virtual space mediates participants' interaction in a shared physical space (exhibited at CYNETArt 2000, Dresden), and 2) a networked configuration where separate physical spaces are connected into a networked Mixed Reality Space based on body movement and gesture (to be realised at University of Brighton in November 2001). In contrast to a „virtual reality" experience external to real space, Drawing Spaces attempts to employ the virtual as a means for heightening the participants' bodily awareness of real space and their physical presence.

Keywords: Mixed Reality, Interactive Environments, Human-Computer Interaction, Presence, Digital Storytelling, Media Art

Year the Work was created: 1998-2001

Introduction

The notion of virtual space as a new context of interaction and perception of the world can be followed back to the origins of virtual reality [Suth65] and interactive environments [Krueg83]. The different approaches range from the virtual reality immersion metaphor of „a world to be observed" [Suth65] [Cruz93], to explorations of telepresence as perception of remote people and spaces [SermTD], to shared communication spaces [GallRab80] [ArsEl92], to the current merging of real and virtual into different notions of mixed reality [MilKis94] [Mann97] [Ishii97] [Benf98] [BillKa99] [FleiStra00]. If the details of technological realisation are abstracted to different means of representation of computer-generated imagery and sound and to different means for the user to influence them in real-time, then all these approaches can be grouped under the general notion of interactive environments. From this point of view the two basic issues in exploring different concepts of interactive environments become: 1) what motivates the interaction of the participants with the environment, and the interaction between each other and 2) what is the relationship between real and virtual space i.e. how do participants perceive their physical presence and the presence of remote others.

In this paper we present the interactive installation „Drawing Spaces" as our approach to exploring concepts of interactive environments based on movement as a means for connecting the participants' perception of real and virtual space into a Mixed Reality situation.

Fig. 1. Screenshot from „Drawing Spaces“

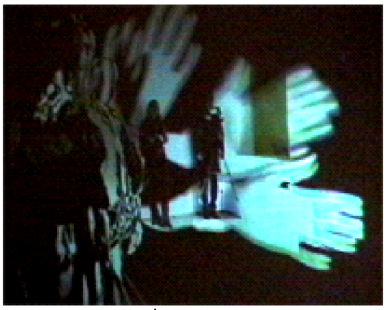

Fig. 3. Movement uncovers real space

Aims of Research

The interactive installation “Drawing Spaces” aims at exploring how bodily awareness of space and presence can be amplified through dynamic interactive environments. The basis of all experiments is creating a playful situation where movement and gesture in real space create a dynamic virtual space serving as a means of mediating interaction and communication between local or remote participants. By realising the experiments as installation in public space we explore the fusion of everyday behaviour with interaction in computer-mediated situations.

Basic Concept

Drawing Spaces starts with an “empty” virtual space – a black surface on the projection screen. As soon as the user enters the physical space of the installation the abstracted trace of his movement begins filling the empty space on the screen. Movement is the source and the only reason of the existence of the virtual space and of the perception of real space in this installation. Without movement no space exists.

As the visitors move within the space of the installation they draw spaces of movement. Fast movement creates large surfaces, while subtle movements result in fine lines. Moving closer or farther away from the camera changes the size of the body-brush that paints the screen. Body shape, size, distance, speed and rhythm of movement are parameters that translate participants actions into imaginary spaces on the projection screen.

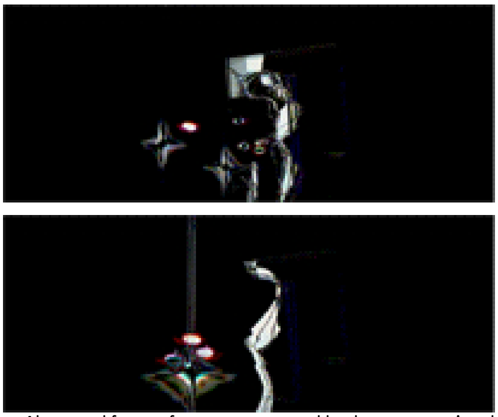

Fig. 2. Abstracted forms of movement created by the user entering the installation

As depicted in Fig. 3. another crucial element in Drawing Spaces is the reflection of the real space in the resulting images on the screen . Through fast movement image surfaces can be created that incorporate parts of the real space which is normally filtered out as „it doesn’t move“. In this way movement is exposed as the means for „uncovering“ the real space.

Technical realisation and spatial setup

The basic principle of “Drawing Spaces” is realised by real-time image processing of the video stream of the participants’ actions picked up by a camera . The individual phases of movement are extracted by the difference module that subtracts the consecutive frames in order to filter out still objects. The composition module transforms and overlays the resulting frames into a single image. As more and more of the transformed "difference-images" are superposed an abstracted trace of movement appears. This is displayed on the projection screen.

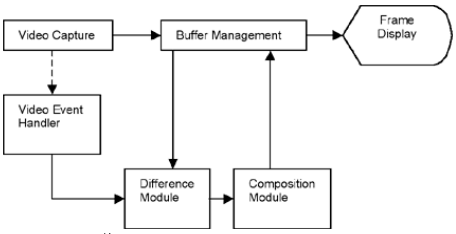

Fig. 4. Programme diagram

In this way the visitors’ movement in space is captured by the computer, transformed, and drawn as traces of light on a projection screen. Still objects, or immobile visitors, dissolve – only movement is present. But the program is not independent from the spatial setting, and this is a deliberate decision. As the camera output is processed directly without compensation for uneven lighting conditions, the lighting in the installation space significantly determines the result of the programme i.e. the nature of the image space created through participants’ movement. This adds to the richness of the interaction space of the installation.

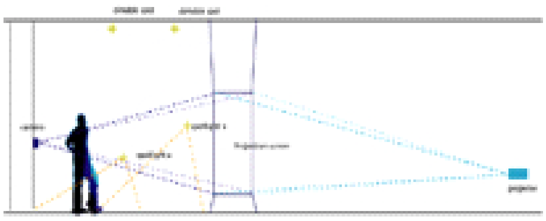

Fig. 5. Basic setup for Drawing Spaces in shared physical space (CYNETart 2000)

Mediating interaction and presence

The set-up for CYNETART (Fig. 5. and 6.) focuses on investigating the role of a visual “virtual space” constructed through participants’ action as a means for mediating haptic qualities of perception and interaction in real space. It is motivated by understanding the perception of a “given” reality as largely determined by the available means of interaction and communication with other people. The sense of presence in Drawing Spaces is conveyed through action rather than the representational means of 3D environment and avatars

[AvPan97]. Action enables presence, dissolving the reality of our physical extension as body around the active possibility of movement.

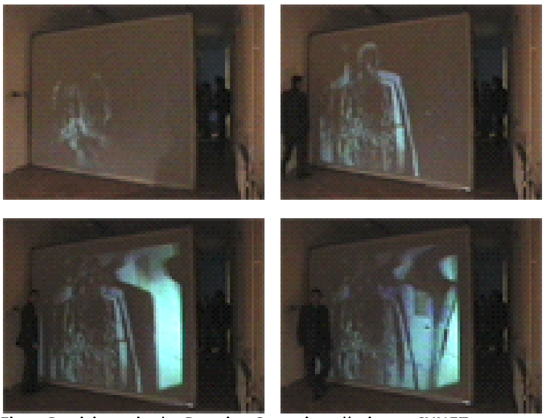

Fig. 6. Participant in the Drawing Space installation at CYNETart 2000

In technical terms, there is no virtual 3D scene, no viewpoint to be controlled, no objects to manipulate. There are no pre-programmed responses to users' actions. There is no goal, no purpose, or selection of possibilities as the basis of interaction. The visual forms on the screen do not intend to represent a "virtual world for our beholding" as in the classic approach of VR. They do not stand for a user's figurative embodiment (avatar) in a 3D computer scene nor do they offer a pre-made story to follow, modify or expand.

The image spaces that participants produce through their movement in real space communicate an abstraction of the relationship between their body - its size, physicality and motion - and movement. Their purpose is similar to a kind of a "magic mirror" confronting the user with the individuality of his/her movement in space: something that s/he cannot see and is only peripherally aware of in everyday life. The play-full situation, which is discovered, is based on recognising oneself within the frame, not as form, but through the individuality of one's movement and gesture.

This underlying „magic mirror" metaphor of the interaction concept can be compared to works such as Video-place (M. Krueger, 1974) [Krue83][ArsEl90], or Liquid Views/Rigid Waves (M. Fleischmann, W. Strauss, C. A. Bohn, 1993) [FleiStra97]. The notion of bodily sense of movement and gesture as the primary means for connecting and experiencing real and virtual space can be referenced to works such as Telematic Dreaming (P. Sermon, 1992) [Kozel94] or Murmuring Fields (M. Fleischmann, W. Strauss et. Al, 1998-2001), albeit they employ different technological means .

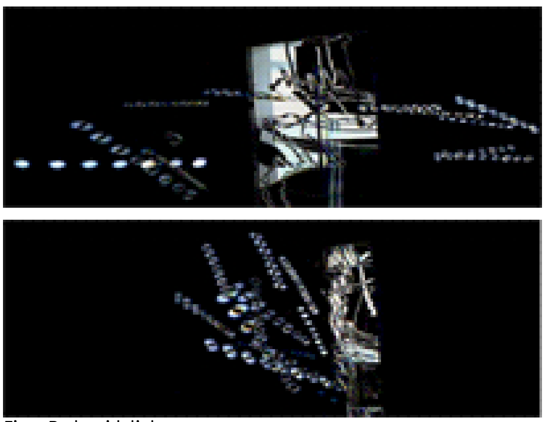

Fig 7. Body with light source

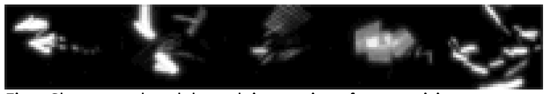

Fig 8. Shapes produced through interaction of two participants

Creating a networked Mixed Reality space

The next step in our experiments with Drawing Spaces is a networked configuration where separate physical spaces are connected into a networked Mixed Reality Space based on body movement and gesture (to be realised at University of Brighton in November 2001). We are investigating two scenarios for realising this: (1) merging live streams of the abstracted forms of movement of distant participants into a new image plane, (2) combining movement in physical space with a VRML based environment embedding live stream of abstracted forms of movement as means of presence and interaction of the participants (Fig. 8).

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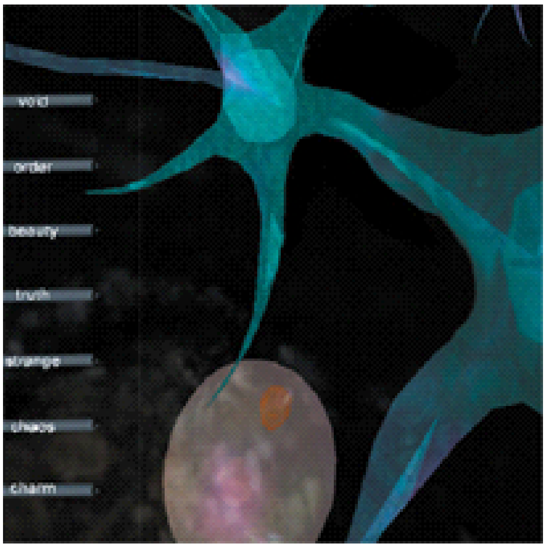

empyrean / soft e_scape

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Abstract

Empyrean is a web based, multi-user VRML environment, investigating the concept of the net being a living organic space - presenting a post colonial perspective by redressing the dominant net desire to recycle virtual space as a poor imitation of the real. This parallel universe of seven intertwined e-scapes, are contained and constructed in electronic space - a "soft scape". It is a place of emptiness - of hungry voids, transversed by avatistic in-tensions and strange attractions. In empyrean multiple users interact via their avatars within the art work, to become part of that empyrean, navigating thru poetic texts, intricate soundscapes, and subtly transparent images within the worlds of order, truth, beauty, strangeness, charm, chaos, and void.

Keywords: Multi-user VRML, Open Source, Post Colonialism, Soft Scape, Avatar,

Project URL:
http://www.subtle.net/empyrean

Year the Work was created: 2000-2001

Project Partners:
Sound Design: Dr Mitchell Whitelaw
Additional Scripting and Modeling: Horst Kiechle
Additional Production Support:
College of Fine Arts, UNSW
Australia Council for the Arts
Banff Center for the Arts, Canada
Vislab, Sydney

Introduction

Empyrean is a three-dimensional, web based, single user and multi-user VRML environment, running on an Open Source VNet server; which also currently exists as an offline installation; as a 13-minute documentary video - "soft skinned e_scape"; and as a Real Video streaming from the web site.

Aims of Research

The work is an investigation of the colonization of the virtual - re-dressing the seemingly prevalent net desire to remake online virtual space as a poor imitation of the real, which can be seen in many popular virtual arenas like Activeworlds, where users re-create urban spaces and propagate the pioneering metaphor that has infested the web. Empyrean offers an online environment, which has no horizon line to anchor oneself against, and no attachment to offline "hard" space. Here we are transparently and softly embodied, [Figure 1] communicating by sound and gesture rather than being represented by avatars of idealized racial and gender stereotypes which communicate via text.

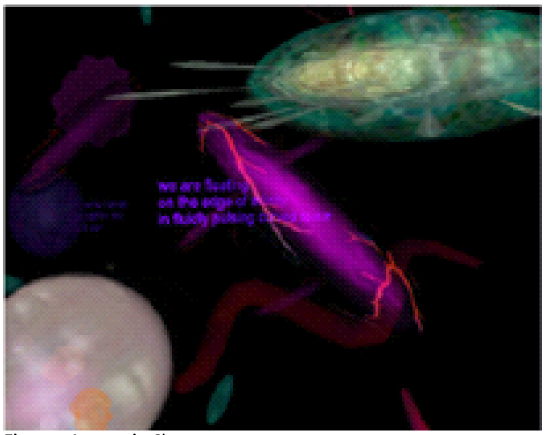
Figure 1 Avatars in Charm scape.

Utilizing Virtual Reality Modeling Language, a self reflective, invocational language, developed in the early 1990's as a way of exploring the three dimensional spatiality of the internet rather than its two dimensional hypertextual qualities. It has the great advantage of operating within low enough bandwidth to network relatively complex environments containing multiple users. VRML diverts Virtual Reality from its early ideals of seamless sensory immersion into a duplication of hardspace made possible only to a few by supercomputing technology; into an easily accessible application which allows mass participation and interactions in mixed reality, remaining opaque to remind us that we are the creators of our own simultaneously subjective and objective viewpoint.

Project Description

User Interaction

Users interact via avatars that have no human characteristics whatsoever, rather being cellular or electronic constructions. This addresses the worrying trend in to homogenize avatar representation to a tall western silicone enhanced stereotype. Users communicate with each other through a text interface on the net site developed by the Open Source V-net Server As the avatars and the site develops to maturity over the next year or so, the prioritization of text is reversed and users will primarily interact through sound and gesture. Avatars may squeak, squawk, blink, swell up and go opaque, gurgle, giggle, blush, etc to communicate with each other, and they will have invisible "attractions" to other objects in the scapes scripted in. By using means other than text for communication the multiuser VRML domain is not tied to a dominant language group, age category or educational factors.

Sound

The VRML scape sound design by Mitchell Whitelaw is spatialized and attached to the etheric objects, which are mostly moving and often set at different pitches, so once inside the world the soundscape is constantly shifting around the viewer's avatar. In a sense you could navigate by sound alone as each zone has a distinctive soundscape, like the glassy crunching and grinding spheres of "chaos", or the frenetic cellular skating rink in "charm", or the tinkling birdsong of the delicately choreographed neurons in "void."[Figure 2]

Installation

Keeping with its organic nature, Empyrean is a project that expands and contacts to fit each distinct installation site. Its most straightforward manifestation is as either a website on a desktop computer as it was in the Montreal Biennale, or as a Video in the Microwave Festival in Hong Kong. The VRML world can also meld with other VRML spaces, as it did at Soundspace at Stuttgart Filmwinter where the online world was accessible from a central hub with 5 other VRML worlds so users could navigate between continuous online spaces, possibly in keeping with Mark Pesce's Labyrinthine vision for the net, outlined in the1994 paper Cyberspace.

In the Virtual Mine Project in the disused industrial site of the coal mine Gegenort in Neunkirchen, Germany in August and September 2001 Empyrean takes on additional dimensions. Within the darkened shipping container are two discreet and overlapping reality scapes - installed at opposite ends. One end houses the networked and projected multiuser world, and at the opposite end the projected video of avatar "miss_fluffy's" journey through the Empyrean scapes is playing, so that the hybrid reality of being an interactive navigator thru the web site and encountering and communicating with others online is available in the same physical space as a more passenger like cinematic experience of being immersed in the webspaces with an avatar as the navigator.

In Multimedia Art Asia Pacific Festival in October 2001, Empyrean doubles its physical reality space when users will interact live inside the work simultaneously in two gallery locations in the Powerhouse, Brisbane, Australia in the southern hemisphere and at Nabi Art Center in Seoul, Korea in the northern hemisphere so users are co-present in both geographically separate gallery spaces as well as globally online.

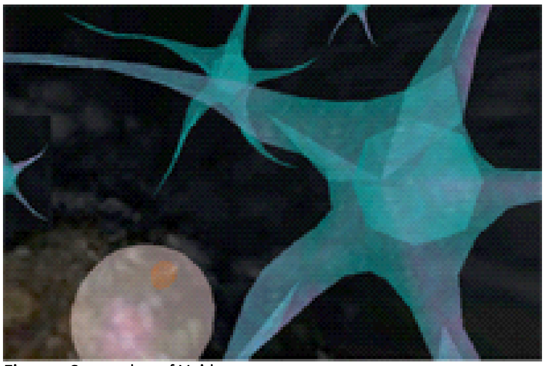

Figure 2 Screenshot of Void scape.

Ongoing Development

The immediate future of this project is to translate the work in the Wedge - a relatively low cost 2 sided immersive CAVE type VR environment utilizing shutter glasses, located in the Powerhouse Museum in Sydney, the Australian National University in Canberra, and several other locations though-out Australia. By mid 2002 my aim is to connect the VR Museum spaces to the net so that users online, at home, or within another Museum/Festival space can interact with users in any empyrean space - online or onsite - totally interactively networked. This multiuser net connected installation enables users to become energetic avatars immersed in another dimension, at once intimately and privately online, and publicly embodied in networked hardspaces, the intersection of which constitute a reality beyond both domains.

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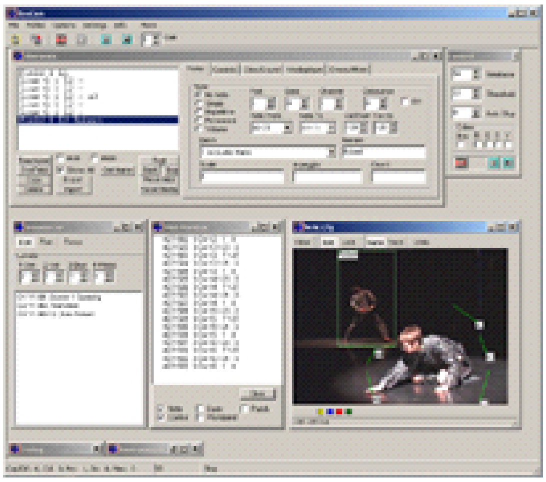

seine hohle form

artistic collaboration in an interactive dance and music performance environment: a project report

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Abstract

Unique and largely unexplored problems face composers and choreographers as they collaborate on interactive performance works, not the least of which is settling on schemes for mapping the various parameters of human movement to those possible in the world of sound. The authors' piece, Seine hohle Form, is used as a case study in the development of effective mapping strategies, focusing on dance gesture to real-time music synthesis. Perceptual correlation of these mapping strategies is stressed, albeit through varying levels of abstraction.

Project URL:
http://www.palindrome.de (video excerpt available on-line)

1. Introduction

The use of choreographic gesture as a control component in music composition/performance for dance has been a concern of choreographers and musicians for almost half a century. As electronic instrument builders of the 20th century struggled to devise effective interfaces for their unique instruments, choreographers such as Merce Cunningham offered the surprising option of extending the concept of gestural control to the world of dance. The Cage/Cunningham experiments of the 1960s using Theremin technology to sense body motion are only one example of this experiment that still continues today.

When musical control was relinquished to dance gesture, the union of open-air (non-contact) gesture to sound raised many intriguing questions. Even though the technology has progressed to the point where current dance systems rely on sophisticated video tracking instead of the antennae of a Theremin, the cause and effect relationship between sound and gesture has remained an elusive problem. To this day, most interactive dance/music systems have relied on fairly simple relationships between gesture and sound. Meanwhile, most interactive dance/music systems have relied on fairly simple relationships between gesture and sound, such as the basic presence or absence of sound, volume control, possibly pitch control.

The lack of progress has been complicated by the tenuous threads of communication between the computer music and dance fields. Indeed, although much work has been done recently in the world of computer music by composers/performers developing and composing for gestural controllers, the world of dance has remained largely isolated from these developments.

Today's tools, however, provide the possibility of rich relationships between dance and music in interactive systems. Real-time software for music synthesis and digital signal processing (i.e., MAX/MSP, developed by Miller Puckette and David Zicarelli, and jMAX, developed at IRCAM in Paris is readily available and runs on standard desktop and laptop PCs (Macintosh and PC LINUX). Likewise, comparable developments in video image tracking/processing as a source of gestural information (e.g. Palindrome's EyeCon system) have given composers and choreographers powerful tools with which to harness the expressive gestures of dance. Still, the remarkable lack of communication between the two fields, and the often-limited concept of interaction in this context, has limited, in the authors' opinions, the expressive possibilities of such collaborative work.

Working alternately in Nürnberg, Germany, and Denton, Texas, Palindrome Intermedia Performance Group and the Center for Experimental Music and Intermedia (CEMI) have explored these issues in their ongoing work together.

A body of interactive dance/computer music works is emerging, as well as a dance-specific vocabulary of gesture mappings between movement-recognition and real-time digital sound synthesis.

2. Mapping

In an interactive system, sensors are responsible for "translating" one form of energy into another. Specifically, the physical gestures of dance are translated via sensors, analog/digital converters, and so on into a signal representation inside of a computer. One the gesture is available as an abstract value expressed as computer data, however, the important question arises: what do we do with it?

"Mapping" is the process of connecting one data port to another, somewhat like the early telephone operator patch bays. In our case mapping has a very specific connotation - it means the applying of a given gestural data, obtained via a sensor system, to the control of a given sound synthesis parameter. The dramatic effectiveness of a dance, however, invariably depends on myriad factors - movement dynamics of body parts and torso, movement in space, location on stage, direction of focus, use of weight, muscle tension, and so on. And although sensors may be available to detect all of these parameters, the question remains: which ones to apply in a given setting, and then to which of the equally many musical parameters to assign it.

Herein lies the basic quandary. Making these mapping choices, it turns out, is anything but trivial. Indeed, designing an interactive system is somewhat of a paradox. The system should have components (dance input, musical output) that are obviously autonomous, but which, at the same time, must show a degree of cause-and-effect that creates a perceptual interaction. Unless the mapping choices are made with considerable care, the musical composition and choreography can easily end up being slaves to the system. In some cases, interaction might not occur at all. Not in a technical sense - the movement will indeed control the music - but in the sense that no one (except perhaps the performers) will notice that anything special is going on!

Some have argued that it is largely irrelevant whether or not an audience is aware that interaction is taking place (through technological means). Even if the artist is completely alone in experiencing the interactivity, for some it may be enough that the system of interaction "privately" affects the performer's expression within the piece. The audience is thus vicariously part of the interactive experience.

Palindrome Intermedia Performance Group has pursued a different approach. We have attempted instead to design a degree of transparency into our collaborative works. The pursuit of which, logically raises two possibilities:

- One is for the choreographer and composer to create their work especially for a given technological system. Not, of course, that every dance gesture needs to trigger every musical event - there is actually considerable playroom in this regard. Palindrome's performing experience have shown that, generally speaking, when only part of a piece is really clear and convincing in its interactive relationships, audiences tend to accept additional more complex relationships. They become "attuned", as it were, to the functionality of the piece.
- The second possibility, which does not exclude the first, entails developing deliberate and targeted mapping strategies. This is a more complicated, but rewarding approach, since it means that the technical system is born out of a need to serve the artistic vision, instead of the other way around. Herein lies the central focus of our work.

Mapping strategies should focus and harness the decisive qualities or parameters of the movement and sound, while acknowledging the perceptual dimensions of dance and music. The perception of human movement or sound can, after all, differ vastly from the visual or acoustic information actually present. That is, the video-camera and computer (or other sensor system) "sees" dance differently than we do.

While this distinction may seem somewhat arcane, it lies in fact at the heart of our quest. The first step in assigning mappings is to identify these "decisive parameters" within the dance (or perhaps small scene thereof). The possibilities which EyeCon makes available are outlined below.

From this point, the work may go in two directions: On the one side, the tendency for the choreographer is to seek out parallels between these chosen movement artifacts and those available within the music control system (in our case, within the MAX programming environment). On the other side, there are compositional concerns as well. Hence, the choreography may be designed or redesigned to achieve musical phrases according too the demands of the composition.

While the amount of give-and-take in such a collaboration varies (not to mention the direction thereof - who is "giving" and who the "taking"), some letting go of habituated methods of working and collaborating is inevitable. Either or both collaborating artists generally need to modify their artistic priorities.

Still, in the best case, such a collaborative endeavor stands to generate a vocabulary, even a semiotic structure, for dance-music communication with enormous expressive potential.

3. Gestural Coherence

Just as is true of the sound world, we do not perceive the human body in motion in a very objective or scientific way. What we perceive in dance is highly filtered and often illusory - the choreographer and dancer work hard to achieve this effect. A given movement quality, such as "flow", may dominate our perception of a phrase so thoroughly that the individual shapes of the body go unnoticed. At another moment, geometrical shapes may override our perception of how the body is moving through space. And of course sound - particularly musical sound - has a powerful affect on how we perceive dance.

Our projects in Palindrome have explored these issues of perception and movement. In particular, we have concentrated on the notion of "gestural coherence"; that is, the perceptual coherence between sound and the movement that generates it. Within the context of this search, we make the following postulations:

- An emergent integrity arises when the relationship between the dance and music systems is "believable".
- Believability depends upon gestural coherence.
- Gestural coherence is achieved through a system of mapping that mediates the two parallel structural systems (musical and choreographic).
- Musical structure emerges from dance gesture through a schema that provides for a mixture of the following gesture-to-synthesis parameter mapping strategies:
  - one-to-one, or "direct" mapping
  - one-to-many, or "divergent" mapping
  - many-to-one, or "convergent" mapping

4. Application: "Seine hohle Form"

The words "seine hohle Form" are a fragment from the poem "Gesichter" by Rainer Maria Rilke, roughly translating to "its hollow form." As a starting point for this interactive work, premiered at CEMI in November 2000, the title words serve as an emblem for the interesting challenge of creating a musical work that only exists when a dancer moves, and a dance in which movement must be approached as both functional, music-creating gesture as well as expressive or decorative elements. The collaboration between music and dance on this piece was complete; that is, the movement and sound were not designed separately, but interactively.

The choreography is affected by the live generation of sound through the use of sensors and real-time synthesis, and the resulting music is in turn shaped by these movements. There are no musical cues for the dancers, since without their movements the music is either nonexistent, or at other times, missing key elements. This method of working forced not only an inherent degree of improvisation upon the group, but also prompted a sharing of artistic roles in the working process: dancer became musician, composer became choreographer...

"Seine hohle Form" is not the first interactive computer-controlled dance. As mentioned earlier, interactive dance has a long history. Recent important contributions include the work of David Rokeby, Richard Powall, Troika Ranch, Antonio Camurri, among others. Our work may be unique, however, in the extent to which multi-dimensional mapping strategies are applied within a framework of gestural coherence.

4.1 Technique

In Palindrome works, the dancers' gestures are tracked using the EyeCon video-tracking system, designed by Frieder Weiß of Palindrome. EyeCon is based on frame-grabbing technology, or the capturing of video images in the computer's memory. By frame-grabbing and processing a dancer's movements, it is essentially possible to convert their gestures into computer data that can then be mapped into control of music or other media. For "Seine hohle Form" we use three small video cameras set up above and diagonally in front of the stage.

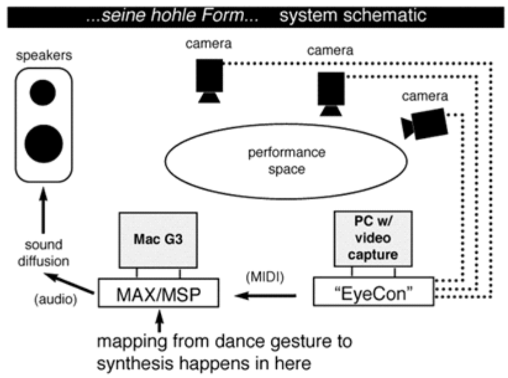

Figure 1: Schematic layout of performance environment.

The analysis features of the EyeCon video-tracking system include the following six movement parameters:

1. Changes in the presence or absence of a body part at a give position in space.
2. Movement dynamics, or amount of movement occurring within a defined field.
3. Position of the center of the body (or topmost, bottommost, left or rightmost part of the body) in horizontal or vertical space.
4. Relative positions (closeness to each other, etc.) of multiple dancers (using costume color-recognition).
5. Degree of right-left symmetry in the body - how similar in shape the two sides of body are.
6. Degree of expansion or contraction in the body.

The real-time sound synthesis environment was designed in MAX/MSP by Butch Rovan. A PC running EyeCon is linked to a Macintosh PowerBook running MAX/MSP, sending the gestural data gathered by EyeCon to the real-time sound synthesis parameters.

All mapping is accomplished within the MAX/MSP environment, and changes throughout the work. (see Figure 2)

Figure 2: The MAX/MSP program for "Seine hohle Form", designed by Butch Rovan, is a musical synthesis environment that provides many control parameters, addressing a number of custom-built DSP modules that include granular sampling/synthesis, additive synthesis, spectral filtering, etc.
Control of the musical score to "Seine hohle Form" is accomplished through a cue list that enables/disables various EyeCon movement analysis parameters (see Figure 3), mapping and DSP modules to be implemented centrally.

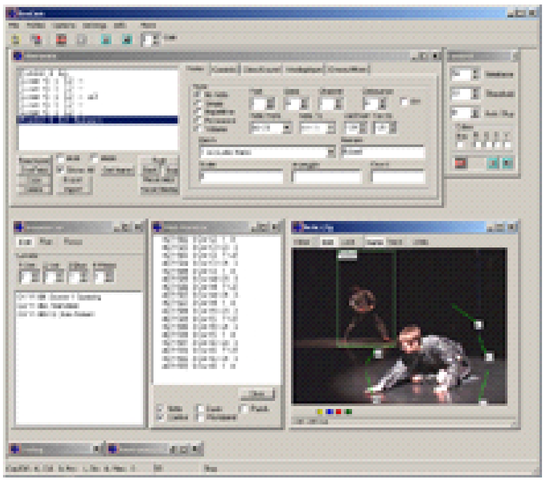

Figure 3. This screen image of the EyeCon control window shows five open operations windows. The last of these, in the lower right, is the video window. In it, is seen a moment in the Seine hohle Form dance. The female dancer in the foreground is triggering a touchline with her right hand, while the male dancer in the background steers a dynamic field with whole body movements to the left and right. The former is sensitive to the presence or absence of body parts at defined locations, while the latter detects the quantity and amount and speed of movement within defined fields.

Both EyeCon and MAX/MSP software components are organized as a series of "scenes", each describing a unique configuration of video tracking, mapping, and DSP. Scene changes for both computers are initiated by a single keystroke.

4.2 Examples from "Seine hohle Form"

The following description of excerpts from "Seine hohle Form" is certainly not complete. Even within the described scenes there is a good deal more going on than reported here. Nevertheless, such may offer an introduction to our working methods. (NOTE: a QuickTime movie excerpt of SHF is available at www.palindrome.de).

The 12 minute SHF is divided into 23 scenes (some coincide with clear changes in the choreography, such as the end of the female solo and the beginning of male, and noticeably alter the music while others are extremely subtle). In the opening scene, the first dancer (female) controls nine relatively clear and isolated additive synthesis tones with the extension of her limbs into the space around her (an example of one-to-one mapping). An algorithm in MAX/MSP modifies the pitch and timbre slightly with each extension. Meanwhile, the second dancer (male), standing with back to audience, uses small, whole-body movements to cut off quieter, "whiter" sounds which build continuously as long as he is not moving.

In scene 5 the male dancer manipulates a stream of loud, aggressive sound fragments derived through granular sampling. He activates the sounds through equally aggressive side-to-side torso movements. The speed and velocity of his movements shape the parameters of the granular sampling engine continuously, with many interactions between incoming gesture parameters (an example of convergent mapping). In scene 8, male dancer finally rises from his low stance and approaches the audience. Here, his height (highest body-part from floor) controls the parameters of a real-time spectral filter, producing a thinner and more continuous musical texture the higher he rises. The effect is much subtler and less direct than what has come before and lends a sense of disorientation to his part, softening his role following the opening solo, and thus opening the way for the female dancer to begin her own solo.

5. Conclusions and Future Work

The basic technical system described in this paper has been operational for almost a year (and had been tested in performances in Munich, Dresden and, most recently at the 2001 conference of the Society for Electro-Acoustic Music in the United States in Baton Rouge, Louisiana). It has, however, become increasingly clear to us that our current process for gestural mapping could be improved by creating a clearer hierarchy among the parameters that govern relationship between the video-tracking system (EyeCon) and the sound synthesis software (MAX/MSP). In particular, we are working to segregate more clearly the tasks that are assigned to each component of the system.

Of course, making use of the inexhaustible mappings between movement and sound requires an understanding of the different and potentially conflicting-goals that drive composers and choreographers. In the past, traditional models of collaboration between composers and choreographers have subjugated either dance or music, or sidestepped the question altogether by removing all correlation between movement and sound. In a collaborative work such as "Seine hohle Form," a new opportunity exists, one that results neither in subjugation nor in conceptual abstraction. Rather, this "conflict" in artistic goals is seen in the light of heightened interactivity (in the traditional interpersonal sense) by making the work of choreographer and composer inter-dependent rather than contingent; fused instead of segregated.

Acknowledgments

The authors would like to thank CEMI (Center for Experimental Music and Intermedia) and 01plus Institute for Art, Design and New Media, in Nuremberg, Germany, for their assistance and support. Thanks also to Helena Zwiauer and Jon Nelson.

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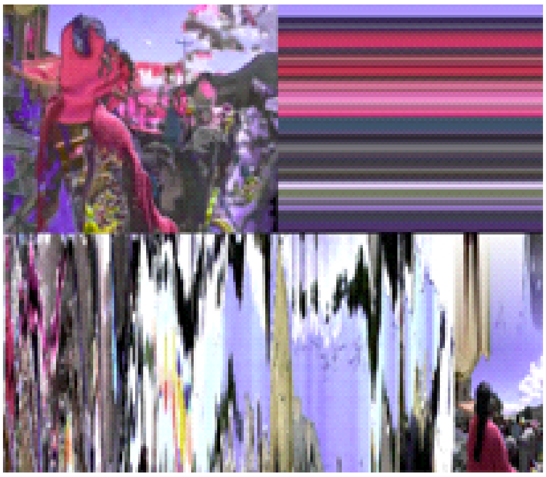

morphoscopy of the transient

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Abstract

This paper presents an installation of digital video tableaux, issuing from an experimental approach to the problem of representing the passage of time in a unified, instantaneous image. The works presented here explore, literally, the depth of the temporal dimension of the video images. To produce the tableaux, animation and tri-dimensional data visualization methods are applied to the raw video images. Afterwards, video compositions are created where the montage is reconsidered as much in the graphic as in the cinematographic sense of the term.

One of the fundamental characteristics of the digital environments is the theoretical absence of spatial or temporal boundaries. This specific property stimulates the deconstruction of the representational models of the traditional film montage and opens motion pictures to fields formerly reserved for "spatial arts".

Keywords: Spatio-temporal digital video objects. Experimental aesthetics. Composition. Montage. Lithochronic. Photodynamic.

Year the Work was created: 2000.

Introduction

The translation of moving images toward spaces other than the horizontal rectangle of standard proportions adopted by the cinematography was present very early in the productions of the 20th century artistic avant-garde. Several restrictions, mainly of a technical nature, limited the possibilities of those experiments.

Advances in data processing and display systems allow the reordering of videographic spaces and prefigure the disruption of the monocular perspective inscribed in the camera apparatus.

Aims of Research

The construction of digital video tableaux, issuing from an experimental approach to the problem of representing the passage of time in a unified, instantaneous image

1. Project Description

1.1 The construction of spatio-temporal digital video objects.

From extrapolation towards the space of the temporal data registered in the video, we obtain images corresponding to the trace left by the recorded events and to the print of their inherent movement. (fig. 1) The video sequences obtained by this method, contrary to what one might think, are far from being abstract images. Their texture and fluidity reveal their attachment to the physical world. By putting the invisible movement of the frames within the range of the human eye, they decipher the traces of events, actions and gestures recorded.

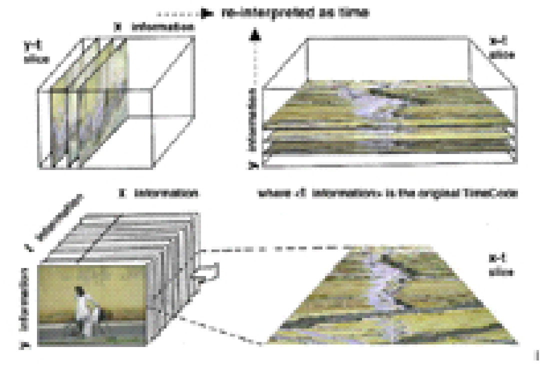

Figure 1 Spatio-temporal digital video objects

The animations obtained through the x-axis are fluid designs resulting from the intermixing of camera movement and recorded subject. The animations obtained through the y-axis appear as a sort of anamorphisms which recall the futurist photodynamic experiments.

Fixed space-time video images were firstly used as a method of automatic analysis of the camera work during recording[1]. The interest of these images, obtained by technical means largely exceeds the intention of the authors (the "objective" analysis of a video data sequence). A tool borrowed from medical imagery coupled with the existing software of image processing proved to be essential. A close co-operation was established with Roberto Toro, electronic engineer and doctoral student in cognitive sciences. who had developed ZEN, a data-visualisation tool for the study of the human cortex. ZEN was diverted a posteriori to the presentation of a consistent image of the temporal dimension of a video image.

1.2 Montage & composition

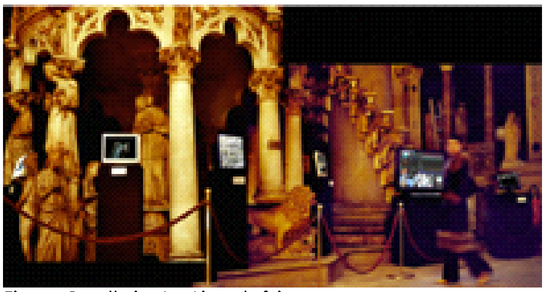

Figure 2 Installation Les Lieux du faits

ISEA 2000 - Chapelle des Petits Agustins Ecole Nationale Supèrieure des Beaux-Arts de Paris

Six compositions, exposed as an installation, are retrieved from fast local disks on flat high-resolution computers screens.

The CPUs are hidden behind the black plinths, which sustain the screens. The logic of the composition is rethought for each tableau in order to maintain an interplay between the form and the content of the image. What follows is the exposition of the principles of the montage of four of these tableaux.

1.2.1 Ephemera

Figure 3 Weaving a spatio-temporal object

This video is built starting from a side panning sequence. Two other squared images come from the animations of the sections x-t and y-t (see fig. 1).The links between the video image and its projections are re-established through a process analogous to that of weaving.

1.2.2 The marked road

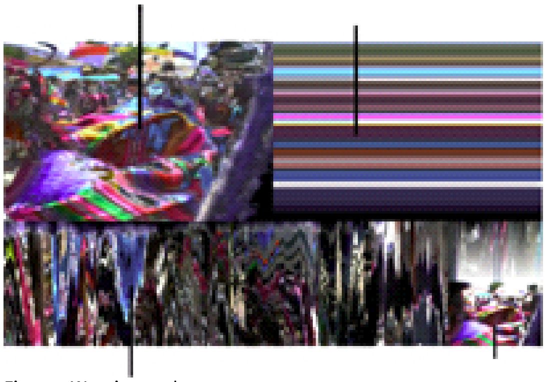

Figure 4 Weaving work

Huari Market in Bolivia. The composition started from a single sequence shot. The montage is an homage to the textile traditions of Andean Altiplano.

1.2.3 The waiting line

Figure 5 Space-event reconstitution video

In La Paz City, a long waiting line to receive the retirement payment is formed in front of an administrative building. The line does not advance, ostensibly. In the montage, the line's original place was roughly rebuilt, which results as a long line of images, a reconstruction of the scene. The video contains this reproduction on two different scales. At the bottom of the screen, the image on a small scale shows us the constitution of the whole line. At the top, the scale enables us to observe people in the line and the formation of x-t images on the borders. The repositioning of the image at every moment gives it a certain feeling of hesitation

1.2.4 Coming out of the school

Figure 6 Pictorial multiple video composition

Time to go home (in front of a girl's school at Ho-Chi-Mihncity). Video composed by the simultaneous assembly of the35 video sequences and the interweaving of their animated temporal sections. The montage moves from its time-line towards the surface as a pictorial composition, where the continuity of the sequences becomes spatial contiguity. The motion stabilization of each shot keeps a figure centred. The objective is to produce a picture that could keep simultaneously the realist motion of video and the transcendent immobility of painting.

2 Technical and procedural issues

The intended result of the production of moving images of the highest resolution available is the reproduction of the sort of physical relationship the viewer experiences before a VanEyck or a Bosch painting. That kind of image forces the viewer to physically vary his position before it in order to take account, by turns, of the profusion of details and of the composition in its totality, thus obliging him to trace multiple paths through it.

Resistant to the immediacy of images production and consumption and to the worship of novelty which characterize many contemporary digital works, the process of imagery-development adopted in this project is artisanal and slow. The video takes are acquired through a long process of displacement, waiting, and reflection. These takes are then submitted to selection, dismembering, and remembering in the attempt to recover the underlying pattern of the events previously destroyed by the act of recording.

2.1 Hardware and software

2.1.1 For the recording

- MiniDV pocket camcorder

2.1.2 For the montage

- Macintosh G3s and G4s
- Zen software
- Adobe After effects
- Gimp

2.1.3 For the exhibition

- 2 Macintosh G3 / 4 Macintosh G4
- 2 SCSI UW Discs
- 3 XGA, 15' LCD screens
- 2 UXGA 17" LCD screens
- 1 Plasma screen
- 3 Prospectives

The works presented here are inscribed within a broader project involving the production of more complex two-dimensional tableaux and three-dimensional work. The exploration of video's volume and depth in terms of its connection to sculpture, physical prototypes of «lithochronic surfaces» , and haptical interfaces for digital spatio-temporal video objects are being conceived.

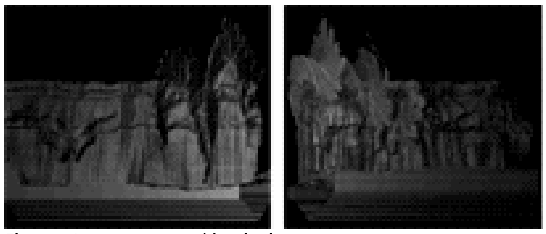

Figure 7 A gesture as an object in time

4 Related works

The question of the visual representation of time is present throughout the entire history of art. The complex stakes of this question largely exceed the frame of the current article, which restricts itself to the citation of a few examples of techniques and procedures relevant to the project being presented.

4.1 The construction of digital video objects

Techniques putting in play the question of the spatialization of pre-recorded moving images appeared very early in experiments in digital imagery. In 1978, Michael Naimark, with Andrew Lippman's Machine Architecture Groups, was one of the first to combine photographic images and three-dimensional spaces, producing the Aspen Movie Map. Aspen was a simulation permitting the user to «drive» through the city of Aspen. This work was the first to perform a sort of inversion of the film capture device, reconstructing a space which is no longer that of the city, but a cinematographic space in the literal sense. It is remarkable that the squared structure of the actual city fit perfectly with that of the computing architecture at that time. The relationship that the «imprisoned» images entertain with the space to which they had once been attached, would remain a constant in Naimark's concerns. In 1997, Joachim Sauter, of the German collective Art+Com , produced «The Invisible Shape of Things Past»3 an application which transforms film into interactive virtual objects. This transformation is based on the camera parameters during the shooting of a sequence (movement, perspective, focal length). By means of this information, the film images are aligned following the trajectory of the camera while they are being transfered back to a three-dimensional space. The skin of the resultant film-object converges with the architecture of the shot space. Even though Sauter's device is much more complex, and focused in an architectural representation rather than in the traces of events, spatio-temporal images do occur in the boundaries.

4.2 The construction of spatio-temporal digital video objects

Cuts issuing of visualisation of temporal data in a three-dimensional space, particularly the anamorphic (photodynamic)images obtained through the y-axis had been presented as interactive video installations (following Tonomura & Akutsu 1994 method of extrapolation of time code to space). Christian Keßler describes the images from his 1998 scrolling printed paper and video projection installation «Transverser» as follows:

The stripe of time is constantly rebuilt from left to right; each frozen moment stays visible for half a minute until it is painted over again. Depending on how the visitors react differently, distorted images emerge: movements in direction of the rebuilding time stripe appear like a camera image, movements against the direction in contrary like a mirror image. The same device was taken up again by Widrich and Reinhart at DEAF00.

4.3 Montage and composition

Examples of experiments with filmic time/space simultaneity are abundant on the 1920s (remarkably Vertov's, Calvacanti's, Ruttmann's and Gance's). The intention of representing and reproducing the simultaneity of events and their endless flux was also widespread in the form of inclusive, polyptych and panoptic film installations known as Expanded Cinema in the 1960s, and in the works of early video pioneers.

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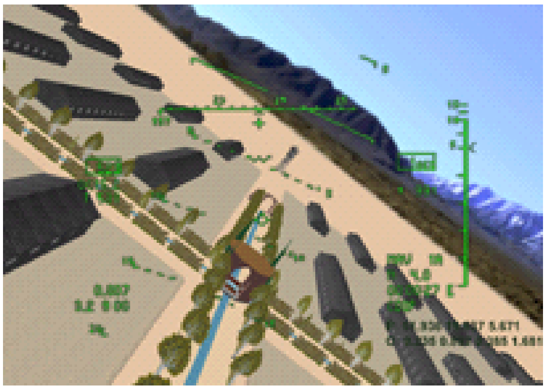

beyond manzanar

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Abstract

Beyond Manzanar uses navigable 3D graphics projected on a large screen to create an experiential virtual environment transformed by dream and memory. It explores parallels between experiences of Japanese Americans interned at Manzanar during World War II and Iranian Americans threatened during the 1979-1980 Hostage Crisis. A realist reconstruction of the internment camp becomes the framework for interior visions of personal responses to the betrayal of the "American Dream," and imagined landscapes of Japanese and Iranian gardens explore the healing processes of memory and cultural grounding.

Historic images, newspaper articles, poems, paintings and music are used to construct a mixed reality of past events and future fears that Manzanar evokes in these two immigrant groups. Users are alternately given or denied control of their own movement to emotionally underscore how the vicissitudes of politics can control one's own fate.

Keywords: Cultural Archives; Hypermedia Formats (VRML;) Artistic Productions / Mixed Reality Environments; Awareness, Memory Space and Knowledge Discovery.

Project URL:
http://mission.base.com/manzanar/

Year the Work was created: 2000.

Project Partners: International Academy of the Media Arts and Sciences (IAMAS), Intel Corporation, blaxxun Interactive Inc., WIRED Magazine, Asian American Arts Foundation.

1 Introduction

The interactive virtual reality work Beyond Manzanar uses navigable PC-based 3D graphics to simulate the Manzanar Internment Camp in California, USA, transformed by dreams and memories. It explores parallels between experiences of Japanese Americans interned at the camp during World War II and Iranian Americans threatened with a similar fate during the 1979-'80 Hostage Crisis. A realist reconstruction of the internment camp becomes a framework for interior visions of personal responses to the betrayal of the American Dream, and imagined landscapes of Japanese and Iranian gardens explore the healing processes of memory and cultural grounding.

Archival photographs, newspaper articles, classic and modern poems, songs and music are used to invest the Manzanar site with cultural artifacts and memories from American immigrants of Japanese and Iranian heritage, constructing a mixed reality of past events and future fears that Manzanar evokes in these two groups.

The first-person viewpoint and user-controlled navigation put the focus onto users and their emotional reactions to the space, giving them a sense of agency as they traverse the dramatic arc of the piece.

2 Aims of Research

Beyond Manzanar explores the capabilities of virtual reality, a technology developed by the military for training jetfighter pilots, to communicate the experience of being trapped in between when your home country and your adopted country are at war. Archival material from government and media sources is used to emphasize the reality of events, while material from private sources is used to communicate the consequences and emotional effects of public events on personal lives. A strongly structured dramatic experience that alternately gives and denies the user freedom of movement underscores what it means to your dignity as a person when prejudice and war rob you of all control over your own fate.

Since an important target group is former Manzanar internees, the youngest of whom are now over 55, the initial version of the interface and installation is designed to be accessible by the aged and infirm. It had to be simple, secure and low cost to enable it to be shown at cultural festivals that are not used to dealing with high technology.

3 Project Description

3.1 Historical Background

Manzanar, an oasis in the high desert of Eastern California, was the first of over 10 internment camps erected during World War II to incarcerate Japanese American families solely on the basis of their ancestry. [1] Though this specific instance was ruled "not justified" in 1988, mass internment of an entire group without due process "in cases of military necessity" is still legal. Ethnic groups whose countries of origin are considered rogue states by the American government can be legally interned without trial if tensions between the countries escalate into violence.

In 1979-'80 during the Iranian Hostage Crisis there were physical attacks on Iranian Americans and calls for their internment and deportation, regardless of their personal political stances. [2]

For an Iranian American, Manzanar is an especially ironic symbol of this threat: the site is hauntingly reminiscent of the landscapes of Iran. The grid of roads drawn by the military through desert scrub echoes the geometric order of Iranian paradise gardens - a further irony, for the Japanese Americans did indeed create gardens, an ancient form of virtual reality, within the barbed-wire fences. Manzanar is therefore the ideal site for a metaphorical exploration of parallels between the wartime experiences of Japanese Americans and current discrimination against Iranian Americans as "the face of the enemy."

3.2 Installation form, hardware and software

Beyond Manzanar is shown as a room installation, with the image of the virtual environment projected life-sized on a large screen. This creates the feeling of an immersive space while still allowing groups of people to view the piece together. One user at a time controls the navigation, moving through the virtual space in first-person viewpoint with a small 2-degrees-of-freedom joystick, such as is used by heavily handicapped people to steer powered wheelchairs through real space. All interaction within the virtual space is done via proximity triggers that respond to the position and movement of the user.

Figure 1 Installation view, Tokyo.

The piece is written on the Virtual Reality Modeling Language (VRML) platform using the blaxxun Contact browser plug-in with Internet Explorer 5.5 It runs off the hard drive of a Pentium III PC with 256 MB of RAM and an AGP graphics card with minimum 32 MB of video RAM.

As of 2001 this sort of PC is relatively easy to acquire for the duration of a showing. As many venues cannot afford close security, the simplest version of the installation encloses the PC in a locked box, making it impossible for users to hack the system.

3.3 Usage of archival material

Beyond Manzanar layers material from personal collections and government archives to move from the realistic into the surreal, overlaying historic facts with internal and personal emotions. We surround the recreation of the internment camp barracks with wartime newspaper headlines that hover in the sky, emphasizing the events and the hate that created this camp. The signs are not always there; they fade slowly in and out, like a memory that can be suppressed but will always return. The windows of the barracks are filled with historic photographs showing the daily life of the internees at Manzanar.

Figure 2 Internment camp.

Texts and songs in English, Japanese and Farsi integrate a narrative voice into the physical structure of the 3D environment. At the barbed-wire fence, the user is confronted with poems that underscore the visual and physical message of the fence: you are a prisoner.

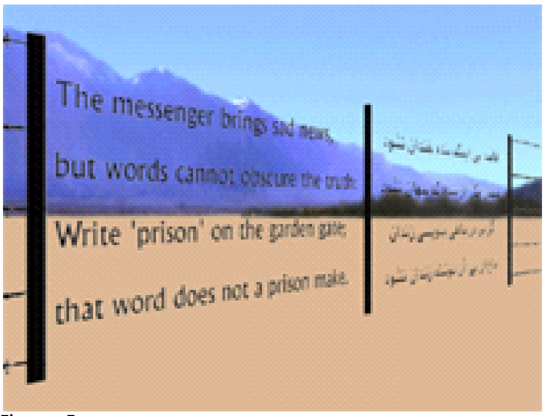

Figure 3 Fence poems.

The Hostage Crisis scene uses newspaper articles from 1979 – including reactions remarking on the parallels with WW2 – to evoke the violent atmosphere of the time. This media material is enclosed within an interior space, emphasizing the claustrophobic fear that political events will invade and destroy the security of the home.

Figure 4 Hostage crisis.

As a contrast to external threats projected by the media, private photos donated by Iranian Americans and Japanese Americans evoke their families' attempts to achieve and live the American Dream. Framed and hung on living room walls, these photographs are personal evocations of the very mixed realities that evolve in the process of defining a self between two different cultures.

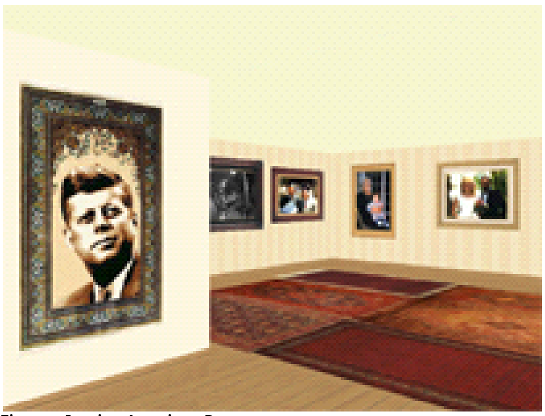

Figure 5 Iranian American Dream room.

3.4 User agency in dramatic structure

Interactive virtual reality allows us to engage the user's kinesthetic and volitional senses in the dramatic structure of the piece. The life-sized screen projection engages users' sense of physicality and scale. Their speed of movement is restricted to a contemplatively slow walking pace. Their freedom of movement is constrained by circumstances that enhance the dramatic narrative of the piece. If they try to run away from the barracks the barbed-wire fence appears in front of them to block their path. As users move between scenes, doors close behind them to underscore that "you can't go back" and regain what has been lost. In an ironic reference to computer games, when an F-15 sweeps users up into the air we take away all control: the all-powerful jetfighter pilot's perspective is the most powerless moment in the piece.

Figure 6 War.

Each scene in Beyond Manzanar is designed to evoke either positive or negative emotions in the user. Scenes are concatenated in sequences as a music composer would arrange phrases of music, creating dramatic structure by complementing or alternating emotional states, building suspense or releasing it dramatically. [3]

When creating dramatic structure one must also provide meaningful resolutions in order to produce an emotional release for the user. Although the looping structure of Beyond Manzanar provides no true beginning or ending, it still has a strong dramatic climax followed by resolution: the war scene is followed by the "Resolution Poem," asking the mountains, winds, earth and sky to bear witness to this place called Manzanar, so its history need never repeat.

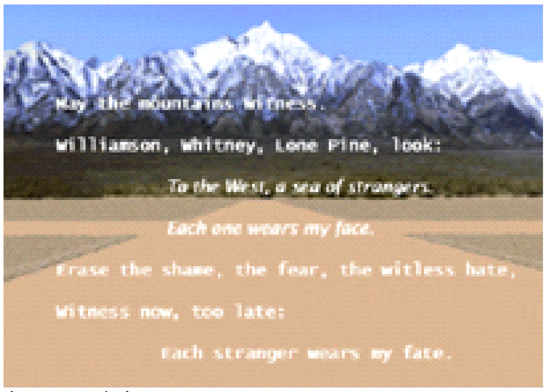

Figure 7 Resolution.

3.5 Evaluation and future possibilities

Beyond Manzanar has already been shown in Japan, the USA and Europe, and a showing is planned for Teheran, Iran in 2002. The depth of content combined with the similarity to game technology makes the piece an excellent bridge between generations. Young children are fascinated by the technology and proudly show their elders how to navigate the piece. Adults are attracted to the piece's depth of content and meaning, and even grandmothers have been seen to jump at the chance to get control of the joystick.

Former internees remark on how the ability to move around the space of the internment camp, combined with the sounds of the wind and footsteps crunching on gravel, transport them emotionally back into the camp in a way that photographs cannot. Iranian Americans, who often deny or hide their ethnicity in public as Japanese-Americans tried to hide their ethnicity after WW2, are excited by the poetic evocation of their culture and their dilemma. Users of all backgrounds remark on how embedding the images within a 3D context, whether barrack or home, situates the experience bodily in a way that photographs alone cannot.

The piece references a wealth of historic, political and cultural background material. During exhibitions we provide supplementary images, background information and copies of newspaper articles for those who wish to learn more, and the project website provides links to other online material as well. Showings of Beyond Manzanar together with other artistic or historical exhibits that provide complementary material can create a powerful synergy: the piece attracts young people in a way that traditional material does not, and the immersive and interactive quality of the piece provides a kinesthetic experience of space and confinement that flat images simply cannot.

Although the installation is finished and complete as it stands, there are other possibilities for Beyond Manzanar that would be fascinating to explore. If the floor of the installation room could be covered with desert dirt or sand, the scent and uneven feel of the ground would connect the virtual space of Manzanar with the physical space of the user. The PC would be hidden from view and the only artifact in the room would be the wooden joystick, mounted on a tripod like some sort of homemade instrument from the camp.

We are also hoping that institutions with access to high-tech interface and display devices will be interested in showing this piece using their systems:

A more sophisticated user interface that incorporates the body rather than just the hand could engage the user more physically in the virtual space.

A showing in a VR CAVE with a floor projection screen would give a very visceral dimension to Beyond Manzanar's use of the vertical dimension during parts of the dramatic narrative.

Beyond Manzanar could be used as a virtual stage for performances if poets, dancers etc. could be inserted into the virtual environments via streaming video.

Conversely, augmented reality technology could use head-mounted displays and audio to insert the virtual built environments of Beyond Manzanar onto the actual physical environment of the Manzanar Historical Site, now essentially empty since the barracks were torn down after the war. As Manzanar is the camp site closest to urban centers it is now the focus of public efforts to rebuild parts of the camp in order to illuminate the Internment experience for future generations.

5 References

[1] For a well-linked site on the WWII internment of Japanese Americans see the San Francisco State University webpages http://bss.sfsu.edu/internment/documents.html.

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posters

panel 7

media art education

teaching new media

media art education

teaching new media

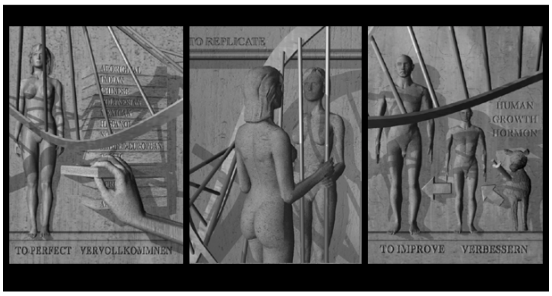
This panel represents latest developments in the learning of media and the development of new courses and training methods at universities. Young scientists and researchers, as well as students in different fields and media artists are invited to presents their experiences within this new situations of learning.

Enge at the Hochschule für Gestaltung und Kunst Zürich presents the new postgraduate course called Mobile Application Design. The main focus is on the development of innovative applications for third-generation mobile technologies in a team setting.

Roch at the Lab III, situated at the Academy of Media Arts Cologne talks about the lab as an experimental space in the key area of Art and Media Studies, especially Computer Science. The Lab educates and experiments with fully mobile computing facilities in open workshop situations. He will present the projects by the students Morawe and Kirschner.

For Vande Moere / Keller at ETH Zürich, the combination of the field of architecture and currently available multi-user technology could be considered as an ideal testbed for designing the vision of shared cyberspaces. A concrete CAAD course is described to demonstrate how architectural knowledge is used to create a virtual exhibition inside an online, three-dimensional, avatar-based environment.

Hagedorn, Kaldrack and Schreiber, young artists present their recent projects developed within this education environments.



mapping the media curricula in germany and abroad

Jill Scott

This panel represents latest developments in the learning of media as well as the changing roles of the audience, the artists and the students who have become collaborators, hackers and participators exploring new techno-zones and crossing boundaries. The subjects covered by the panel include thematic based interactive media and net sharing, the collapsing of the barriers between art and science, as well as theory and practice, the necessary exploration and curiosity for technological invention and the potential of new tools and mobile concepts including the construction of on-line environments and the creation of new performative roles.

It is time for a more creative approach to on-line education. My introduction will focus on the potential of how media curricula could include creative and innovative on-line exhibition projects between international Universities, ones that might become a welcome adjunct to tele-teaching and e-education in the future or offer viable alternatives to droning and long winded web-casts. I will give examples that prove that the content, context and spatial metaphors of the past are in the process of great change.

It has long been my practice to encourage student projects to develop which attempt to bridge the gap between techno/scientific metaphors and virtual space. Can students flourish best under the potential of thematic headings, which allow for a broad range of technological applications? Is a mandatory level of theoretical research still necessary? As a media artist I continue to be interested in the relationship between the body, science, the interface and spatial metaphors, and how to apply these questions to media-learning and research. Certainly the discussions of these issues can lead to the invention of new metaphors, which may help to explain the contraction and collapsing of time and space inherent in the act of networking.

Part of this process of making art is to openly discuss the issues and the challenges of scientific discovery, microbiology and innovation and how will these effect our spatial and ethical reality as well as our hope for some kind of global consciousness.

Many western societies currently engage in a critical analysis of traditional educational practice, as we witness that the old specialists lines between disciplines as well as between the students, the hackers, the e-workers and the artists are collapsing. The artists, who may have trouble keeping abreast of technological changes, must collaborate as the movement emphasizes commercial interfaces and playgrounds as well as a precious loss of authorship. There are still differing factors to consider. While in Germany, it may be a challenge for creative people to fabricate the future well as reconcile and analyze the past, America seems to be constantly dealing with the fluctuations between loss of authorial control and monopolies by commercial software giants.

These are just some of the issues which effect learning today and are shared on-line or internationally traded as secrets. Thus a wealth of international discourse and creative potential can be gained from experimenting with different cultural collaborators on-line in real-time. We have already seen the potential of "open source" programming (e.g. Linux) and numbers of people who co-operate simultaneously on shared processes. These opportunities not only increase the virtual and social dialogue with others, but emphasize a new performative role for human bodies: collapsing them into the same virtual environment, where they can fuse inside the shared digital zone. This is a similar metaphorical scenario to what Donna Haraway calls the syndrome of "modern cyborg" whose infiltration of media into our daily lives has caused a permanent re-construction.

At the Bauhaus University in Weimar, we are attempting to create similar context and content in a yearly experimental event called FUSION. Fusion brought together under different themes every year (identity, time etc.) FUSION is an innovative series collaborative interactive tele-presence-events. Three events have taken place so far. (FUSION 99,00,01) Currently the collaborators are: The Media Faculty of the Bauhaus University in Weimar (Prof Dr. Jill Scott) The Department of Design in Los Angeles. (Prof Dr. Victoria Vesna) The College of Art and Design, University of New South Wales. Sydney. (Associate Professor: John Gillies)

In FUSION both the students and the staff and invited programmers and artists, explore the current break down of definitions, dualism's, and geographical boundaries in a point to point net experience. In the past this has cumulated in a three day intensive event with a program of interactive on-line projects between students and staff from three Universities. As well as explore the potential of fusion inside a real-time zone, which may re-define space, place and time. They offer an annual opportunity to showcase the creative use of the latest technology available for on-line interaction, plus allow us to explore new programming possibilities, these can be usage of existing programs (i.e. "Empyrean" by Melinda Rackham (VRML Multi-user - site) -a Sydney artist; or "Tidal Current" by Felix Sattler and Ludger Henning (Nato and Max Software) - Weimar students or the Ubu Project by Silvia Rigon (on line theatre using Real Video Audio) - from UCLA.

Alternatively the event can become a test-bed for experiments international programming, like "FUTURE BODIES". This project began as an event with artists and students, which explored the real-time potential of virtual characters over the net with the University of New South Wales, College of Fine Arts and ANAT Australia. Others who happen to be on-line at the same time could also join in. As initial author of the project I set up some thematic parameters in the beginning and created a set of three characters, which had an initial illustration but their real personalities actually appeared in the common protocol of a Hotline Chat. The characters were called The Poor, The Rich and The Perfect. With students from both universities we wrote a program using C+ similar to an Eliza program. These characters or "bots", had "Brains" or programmed responses. Their comments appeared as text inside the hotline chat and they automatically responded to peoples typed in keywords but the program also allowed them to conjugate and respond randomly at different times. During the Fusion 1999 event these characters lived in a virtual environment and participants were encouraged to find out more about them as well as write some programs to change their moods This work experimented with the notion of shared interactivity and unpredictability through the potentials of generic programming. It researched the potential of script-writing over the net and resultant interactive drama and it extended the current interest in virtual characters and interactive viewing. The project uses differing cultural backgrounds as impute devices and allows the characters to be influenced and change accordingly, cross over between gender and perhaps be modified not only by us, but also by the other fabricated characters.

Today the traditional ideas of the scriptwriter, characterization and stage have changed. Together they have fused into a virtual "zone" where a great deal of new interpretations are mixed with a type of collapsed time and place. Moreover the audience' has shifted to mean the participant and the collaborator and the content of Western media has mostly evolved from an emphasis on dualistic metaphors (70's) to pluralistic concepts (80's) to an articulation of new paradigms (90's). Similarly in Science, in the field of psychology and technology, the metaphors have changed from Freud's dualism to Lacanian pluralism and onto Deleuzian philosophy. Consequently, the nineties present students and artists with new paradigms of Mixed Realities. That the resultant 90's paradigm values bionic, generic, and interdependent concepts opens up more paradoxical and ironical metaphors, but also utopic and ethically suspect ones. A major question of the future will certainly be: Can education serve to provide a deeper and more variegated context, as our shared techo-temporal zones become more universal?

"Future Bodies-Fused Metaphors in Transformed Space"

http://www.uni-weimar.de/~fusion,
http://eda.ucla.edu/fusion01, http://www.cofa.unsw.edu.au

poster

mobile application design

neuer studiengang an der hgk zürich

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Abstract:

Mobile Application Design is the title of a new postgraduate course at the Hochschule für Gestaltung und Kunst Zürich. The main focus is on the development of innovative applications for third-generation mobile technologies in a team setting. This work is backed up by classes covering a broad spectrum of expertise.

Keywords: Mobile Application, SMS, UMTS, GPRS
Project URL: http://mad.li/ve
Entstehungsjahr: 2001

Einleitung

Mobile Application Design wurde als wahrscheinlich erster Studiengang seiner Art an der Hochschule für Gestaltung und Kunst Zürich ins Leben gerufen. Er soll in einem kreativen Umfeld die Entwicklung von innovativen mobilen Anwendungen für die nächsten Mobilfunkgenerationen (3G, 4G) ermöglichen. Die Studenten beschränken sich dabei nicht auf die aktuelle Technik, sondern entwickeln und verwirklichen ihre Ideen in Hinblick auf zukünftige Möglichkeiten. Einzigartig dürfte die Kooperation mit Industriepartnern sein, die in dieser Zusammensetzung sehr selten gemeinsam an einem Projekt partizipiert. Neben der Wissensvermittlung versteht sich der Studiengang auch als Inkubator für neue Geschäftsideen.

Studieninhalte

Ergänzend zur Projektarbeit bekommen die Studenten ein breites Spektrum an theoretischem und praktischem Wissen vermittelt. Dazu ist der Studiengang in folgende Module unterteilt:

- Theorie und Geschichte der Medien
- Medienmanagement, Management komplexer Systeme
- Grundlagen der Marktforschung
- New Economy Mobile Computing
- Rechtliche Grundlagen
- Produktion von Inhalten / Verteiltes Erzählen
- Webdesign / Anwendungsdesign
- Mensch-Maschine-Dialog (Interfacedesign)
- Telematik
- Datenbanktechnologie
- Konzeption eigener Anwendungen
- Vermarktung eigener Prototypen

Mit Abschluss des Studiums werden die Teilnehmer Anwendungen für mobile Systeme entwerfen können. Darüber hinaus werden sie auch in der Lage sein, diese im Markt zu positionieren und zu vermarkten.

Kooperationen

Die Ziele des Studienganges sind ohne Kooperationspartner aus der freien Wirtschaft nicht zu erreichen. Zu unseren Partnern gehören neben Telekommunikationsfirmen, Herstellern von Mobilen Endgeräten und Software auch Unternehmensberatungen. Unterstützt von diesen Partnern wird es möglich sein, Projekte auf Basis neuester Technologien durchzuführen. Zusätzlich zur Bereitstellung technischer Mittel kommt dem Studiengang Unterstützung in der Wissensvermittlung in Form von Vorträgen durch Mitarbeiter der Kooperationspartner zu.

Projekte

Die Studenten sollen zur Verwirklichung von Ideen Projektgruppen bilden, in denen sich Teilnehmer aus verschiedenen Berufssparten zusammenfinden. Gemeinsam lernen sie ihre Ziele zu realisieren. Das notwendige Wissen, um die Kommunikation im Team zu ermöglichen, wird in den verschiedenen Vorlesungsmodulen vermittelt.

Sind Projekte oder Ideen erfolgversprechend, erhalten die Studenten die Möglichkeit, diese vollständig zu realisieren und vermarkten. Hier unterstützen wiederum die Kooperationspartner.

Beispielprojekt: Fußball

Ein prototypisch realisiertes Projekt ist Pocket Soccer. Diese Applikation ermöglicht das zeitnahe Abspielen von Spielzügen eines Fußballspiels in mobilen Endgeräten. Als Plattform wurde ein PocketPC vom Typ Compaq iPAQ mit WindowsCE gewählt. Dieses System ist aufgrund seiner Eigenschaften für multimediale Anwendungen im mobilen Umgebungen gut geeignet.

Figure 1. Fußball

Diese Anwendung ist leicht via Internetzugang auf den PocketPC zu übertragen. Danach werden nur noch jene Daten geladen, die zur Darstellung von Spielzügen nötig sind. Aufgrund der optimalen Skalierbarkeit, die Auflösung und Länge der Spielzüge betreffend, kann man schon mit Datenmengen, die in einer SMS Platz haben, eine Torsituation nachstellen. Bei leistungsfähigerer Anbindung können auch komplette Fußballspiele übertragen werden.

Dieses Projekt wurde auf dem World Sports Forum Lausanne 2001 vorgestellt und fand dort positiven Anklang. Eine Umsetzung anderer Sportarten auf dieses System ist geplant.

poster

a morphological approach to interactive storytelling

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Abstract

Few attempts have yet been made to implement a story engine for guiding interactive drama. Most of them rely on the computer's ability to generate the story in full detail. By focusing on story guidance at the level of morphological functions as defined by Russian formalist Vladimir Propp, we take a different approach. We do not attempt to provide a model for generating stories in detail. Instead, we expect human authors to create specific interactive scenarios for each function in advance. Our primary concerns are high-level guidance of plot, as well as finding the best compromise between author input and machine generation. By providing access to the story model itself, we allow authors to control the story at all levels of detail. Our first prototype features a wide variety of plots being generated from a limited number of scenes.

Keywords: story engine, nonlinear, interactive storytelling, narrative intelligence, Propp

Project URL:
http://www.zgdv.de/zgdv/departments/z5

Introduction

Story engines are tools that tell interactive stories. It is evident that static narrative structures are in conflict with interactivity. Interactive storytelling is a live experience. Therefore, we need a run-time engine taking care of the user's experience as the story keeps unfolding.

Interactive drama is the class of narratives generated by story engines. In most cases, it allows the user to step into the role of the protagonist and witness the events from a first person perspective.

In recent years, several interactive storytelling systems have been developed. The Erasmatron, a story engine developed and implemented by C. Crawford, is based on a sophisticated world model. It seeks to balance character-based and plot-based approaches by using verbs as the basic components of action. Crawford does not believe in story generation through algorithms and therefore plans for the author to create a useful set of verbs that the engine can work with [1]. When designing a story engine for the DEFACTO project, N. M. Sgouros followed a different approach. Using a rule-based system, he aimed at shaping interactive plot into the structure of Aristotelian drama by modeling rising conflict between the characters [2]. M. Mateas and A. Stern are working on an interactive story world. They define beats as the basic units of plot and interaction [3].

All of these approaches control the plot at a very detailed level. The advantage of these designs lies in providing the user with frequent opportunities for influencing the plot. Although this is obviously an important goal for interactive storytelling, we feel technology does not yet provide us with means to create meaningful stories under this condition.

In this paper, we will describe a different approach to interactive storytelling. We have chosen to deal with interactive plot at a higher level – the level of morphological functions as defined by Russian formalist V. Propp [4]. Our story engine is designed for a mixed reality scenario in which the user wanders through physical space while wearing augmented reality devices.

Adaptation to user preferences

It is difficult for us to imagine the potentials of interactive narrative, because we grew up with linear media. One of the opportunities we envision is shaping the overall experience according to the needs of the user. If films can be classified in regard to violence, language and sexual activity, this should be possible for the elements of interactive stories, as well. We have implemented a system that chooses which scenes to show according to the age and preferences of the user. By not offending the personal tastes of the audience, we believe emotional immersion can be improved.

The story model

P. Sengers points out that narratives are always particular [5]. It is in the details that the shaping influence of the author becomes visible. We do not believe that machines are able to create convincing details. Therefore, we have decided to put the responsibility of generation at scene level and below entirely into the hands of the author. This is a critical decision in our design, since it has some major drawbacks. We cannot expect human authors to write more than a few dozen scenes, as well as the rules defining their flow. Basically, a small number of scenes are all that our engine can work with. However, we believe that even under these restrictions, our system features a sufficient variety of engaging plots.

The story model of our prototype is based on V. Propp's "Morphology of the folktale", which was written in 1928. As the basis of his study, he used an arbitrary sample of 100 Russian fairy tales. As mentioned by S. Bringsjord and D. Ferrucci [6], Propp's system of classification inspired research on story grammars, one of the fundamental approaches to story generation. Since our goal is not story generation, but rather guiding interactive drama, we use Propp's work to create rules and algorithms for the run-time engine instead of defining a grammar. The application of Propp's morphological approach to interactive storytelling was suggested and sketched by J. Murray [7].

Propp defines function as follows: "Function must be taken as an act of dramatis personae, which is defined from the point of view of its significance for the course of action of a tale as a whole" [4]. Propp uses capital letters to denote functions. For example, "A" represents a function in which the villain causes harm or injury: In Star Wars, Luke's foster parents are killed. Later, the protagonist is tested by a potential donor (function D). Depending on his reaction (E), he is either given a magical agent (F) or not. It is important to note that one and the same action can have different functions depending on the context of the surrounding plot. Thus, functions are independent of the specific characters, as well as of the particular actions that perform them.

We have chosen to implement Propp's system for a variety of reasons. B. Linane-Mallon and B. R. Webb argue that the elements of stories are highly interrelated [8]. P. Sengers [5] points out that the cause and effect of narrative events are more important than the events themselves. Therefore, it seems that stories cannot be divided into discrete modules. We believe Propp has solved this problem by defining functions in the context of the surrounding story.

Sengers also notes that narratives are specific to their culture. By starting out with a model based on fairy tales, we believe to have minimized cultural barriers of understanding, since fairy tales and myths are known to be very similar across different cultures [9]. However, we encourage the author to reinvent the story model according to the specific set of stories that are to be told.

Comparing Propp's classification of plots to other approaches, e.g. [10], we see its primary advantage in the fact that it integrates all possible variants in one unified model, making it especially applicable to interactive storytelling. Instead of viewing different plots as distinct and linear entities, Propp's classification is continuously aware of the storyteller's branching possibilities between morphological variants.

Architecture

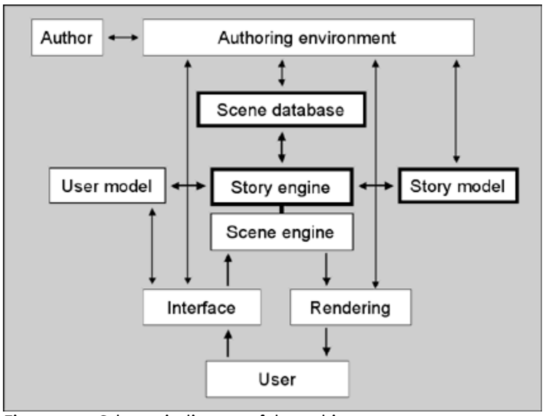

Figure 1: Schematic diagram of the architecture

Figure 1 gives an overview of our system. Modules in bold borders have been implemented in the prototype. It consists of the story engine, a story model and a small number of scenes. In the system we envision, interface and rendering modules separate the story engine from the user, making the engine independent of input (keyboard, tracking, ...) and output (text, animation, ...) modalities. The interface module translates user interactions into semantic abstractions that the engine can work with. The user model stores static, as well as dynamic data, on the player. Static information includes age, gender and preferences of the user. Dynamic information is derived by processing user interaction and then concluding if the player is bored, entertained or overloaded by the material presented. The engine uses both kinds of data when choosing the next content to be shown. N. Szilas [11] has suggested a similar user model.

The author exerts direct influence on every part of the system except the story engine and user model. First, the author modifies the story model according to the set of stories that are to be told. Then, detailed descriptions of a number of scenes are created. Finally, the author designs the appearance of the interface and influences the way in which characters and scenes are rendered. Each scene has to correspond with a function in the story model and is annotated with information about its minimum and maximum duration, context requirements, characters, setting, levels of violence, etc., unless these factors are generic.

The scene engine plays scenes that the story engine has selected. User interaction is analyzed and mapped to a story act, which is handed back as a scene result to the story engine. In case of the prototype, scene content is displayed by text output only. Here, the player directly chooses the desired story act from a set of multiple choices.

Levels of abstraction

The story engine works with two levels of abstraction. At the upper level, a sequence of functions is selected in real-time. We use the term function in the same way as Propp does, as an abstraction from characters, setting and action while emphasizing the function's role in the surrounding plot. User interaction and other constraints can result in functions being skipped, as well as in the choice of a different variant of a specific function. At the lower level, a particular scene is executed for each function. They are either being generated or have been authored in advance.

We see functions as classes, and scenes as instances of those classes. A scene possesses unity of time, space and action, thus facilitating temporal, spatial and emotional immersion of the user. Between one scene and the next, leaps in time are possible and even desirable, since we do not want to bother the player with less exciting events.

Polymorphic functions

User interaction cannot change the morphological function of most scenes after their beginning. However, we have implemented a few polymorphic functions. Our conception of polymorphic functions was inspired by the notion of polymorphic beats, introduced by M. Mateas and A. Stern at a different level of detail. They refer to the most basic elements of action, which can have different outcomes depending on user interaction [3]. We are referring to scenes composed of a number of actions at a specific location. When the user enters a scene that corresponds to a polymorphic function, its outcome is not yet determined. It is important to note that by outcome, we do not mean the content of the scene (which we allow to be flexible in case of non-polymorphic functions as well), but rather its function for the overall story. Thus, user interaction and other dynamic factors influence which morphological variant is chosen for the scene after its execution.

We have implemented polymorphic functions for the outcome of attempts of villainy (function “A” in Propp's system) and for the reaction of the hero to riddles and tests (E). User interaction decides if these functions succeed or fail, which has direct consequences for the remaining plot. If we need these functions to succeed (as in case of villainy), we either repeat them with different scenes or choose a non-polymorphic variant with the desired outcome.

Scene Selection

Selecting the relevant parts and leaving out the boring ones is the essence of storytelling. In our case, we assume the author is mindful that every written scene is relevant. Therefore, the engine needs different criteria for selecting the scenes to follow at any given time.

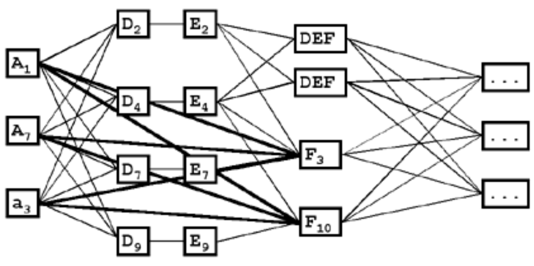

Figure 2: A section of the story space

First of all, some constraints are encoded with the functions that the scenes perform. Figure 2 shows a section of the story space. The section is traversed from left to right while each square represents a function. It is important to note that the connections between them are not fixed, but rule-based. Propp discovered that any function D can follow function A, but each D requires a specific E. Furthermore, D and E can be repeated in some cases or even skipped altogether. We intend to use this kind of visualization for the authoring environment. The squares could be filled with sketches of scenes fulfilling the function and be connected by the author in an intuitive way. Using the sketches, a variety of (linear) storyboards could be generated according to different user interactions.

Our second criterion is time. The user chooses a certain time frame for the overall experience that has to be met. If the player's pace of interaction is very slow, many functions will be skipped. User timing, therefore, has an indirect effect on the remaining plot. Before selecting a scene, the engine checks whether it can be played in the remaining time. If the function of the scene requires other functions to follow, the durations of their corresponding scenes have to be taken into account, as well. With each scene description, the author has to encode an interval of its shortest and longest possible duration.

Concerning our augmented reality scenario, the number of possible scenes is further reduced by the current location of the user in physical space (unless scenes can be generated for each setting from templates). The user will feel immersed in the story, because it keeps unfolding wherever (s)he goes.

Yet another criterion is the current context of the story. The author encodes a list of context requirements with each scene description. Scenes can create new context (i.e. if they introduce characters to the story). They can require context to be present (i.e. a certain type of misfortune) and they can remove context (i.e. if that misfortune is liquidated).

Furthermore, the user model's current state is taken into account. If the player is a kid, the engine will avoid showing violent scenes. If the user seems bored, the system will prefer scenes labeled as exciting. On the other hand, if the player seems overloaded by the material presented, the engine will select less demanding scenes. If the system is still left with a set of choices after processing these criteria, a random decision is made.

Implementation

Our current prototype is written in Prolog, which we have chosen due to its rapid prototyping capabilities. The story model is implemented as a meta-program and a set of rules. Morphological functions are executed as operations of the meta-program. A repeat-until instruction is supported as well. It can be used to ensure that the attempt of villainy eventually succeeds. Rules define the interrelationship between different functions, such as implication and exclusion.

The story engine consists of a meta-interpreter that processes the meta-program encoded in the story model. If the current instruction is a morphological function, the system checks if it can be played in the remaining time. Using a forward propagation algorithm, it takes into account the duration of each implied function as well. If enough time is left for the current function, all matching scenes are screened according to the other criteria described above. If no scene meets the requirements, the function is skipped and the interpreter proceeds to the next instruction of the meta-program. Otherwise the selection is handed over to the scene engine for execution. After the scene has been played, polymorphic functions are instantiated with the story act of the player. Then, the story engine updates dynamic context as well as a list of required functions in the database. Finally, the meta-interpreter steps to the next in-struction of the meta-program. A detailed description is given in [12].

Shortcomings and limitations

Our current prototype has a variety of limitations that we hope to overcome in the future. Several modules have not yet been implemented. However, the story engine can be tested using text in- and output. Unfortunately, the author has to write each scene by hand. It would be desirable to generate scenes on demand. Due to our split-level approach, this issue does not affect the overall design: It does not change the corresponding function if a scene like villainy(abduction, dragon, princess, castle) has been pre-authored or is generated from scratch.

Conclusions and future work

We consider high-level guidance of plot to be the primary concern of our design. Morphological functions provide us with means of abstraction that respect the story context. Our approach allows for authorial control at all levels while generating a large variety of plots. We have adapted Propp's model for interactive storytelling. This was achieved by introducing polymorphic functions, dynamic context and time management. Players evaluate the system's output as coherent, engaging and varied while being well adapted to their interaction. Future work will focus on the implementation of the remaining modules.

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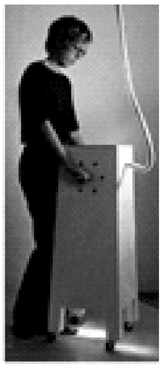


physical network - 4 projects

Mina Hagedorn,
MA RCA 'Computer related Design', minah@bigfoot.com

Abstract

As telecommunication becomes a more and more integral part of our daily lives and an ever-denser network of surveillance technology develops around us, I am interested in looking at different ways to deal with these issues. The main approaches are:

- a more ambient integration of telecommunication in our environment
- the use of sensors to react to the environment
- the use of surveillance technology to establish open systems in public

This aims at reestablishing a physical aspect in our relation to telecommunication, the idea of physical networks as opposed to purely screen-based ones. The following paper outlines the area of interest and describes 4 concepts, prototypes and an installation, which deal with these issues with shifting focus points.

Keywords: Reactive environments, remote presence, environmental infoscapes, tracking of physical and digital activity levels, surveillance

Project URL:
http://www.bigfoot.com/~minah/

Year the Work was created:
2000 Luggage Surveillance
1999 - 2000 Waiting Signals
1998 Information Bodies
1998 Transit

Project Partners:
Luggage Surveillance - Fernando Fonseca
Waiting Signals – Michael Fields and Heiko Hansen
Information Bodies - Heather Martin
Transit - Heather Martin

Introduction / Aims of Research

Representation of Information

I am interested in integrating the representation of digital information into environments, from engaging installations to much more subtle incorporations into everyday surroundings. This aims at a more suggestive transmission of information, which allows shifting between peripheral and focused perception.

Access to Information

Perception is an action in movement, not a passive reception. The physicality of the body is often denied when dealing with technology [we sit motionless for hours in front of a computer, looking at a small square]. I am not so much concerned with cyberspace and out-of-body experience but rather the opposite: involving the senses.

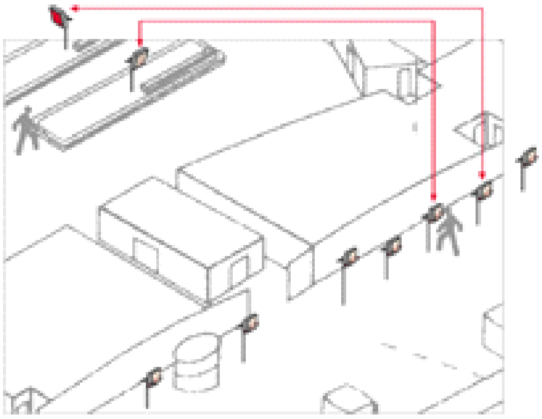
Location of Transmission

My focus is on shared spaces, such as public places and work environments: social spaces that hold the possibility of direct dialogue and interaction between people. Here I am looking at mixing telecommunication with direct, local communication.

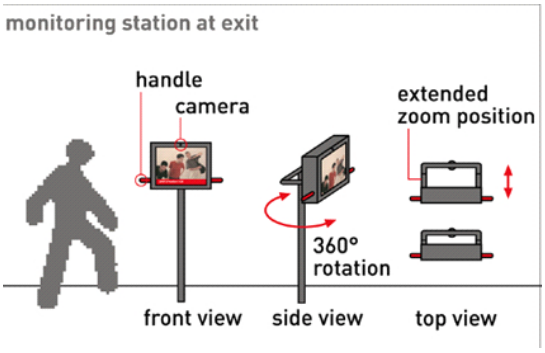
Project Descriptions

Luggage Surveillance

- Concept for a closed-circuit surveillance installation
- Workshop by 'Kunst und Technik' in Lisbon



A two-way surveillance system connects arriving passengers in the luggage area with people in the waiting area. As a starting point, the basic differentiation was made that people, who are waiting to pick someone up, have idle time on hand. Passengers arriving are preoccupied with getting their luggage, which affords less involvement. Therefore the concept looks at having one way control only but still to be a two-way monitoring system that allows seeing who is watching.



Each conveyer belt in the luggage area is linked via a monitoring station to the outside. The station outside allows people to remotely control a camera positioned in the center of a conveyer belt to turn and zoom in on passengers. Within the luggage claim area, displays next to each camera show who is controlling. The monitoring stations inside move exactly as the person controlling it outside is moving them. Therefore the movement will be irregular and more 'human' than being machine controlled.

Criticism

During the public discussion at the end of the workshop the criticism was voiced that control should be possible from both sides in order to create a democratic situation. The argument was that seeing on the monitor, who is watching, is not enough, as this is a too limited view of the outside.

Solution

To allow people from the inside to monitor the outside on a broader scale - without having to get actively involved - a solution would be to add a second surveillance circuit, that functions autonomously. It allows the passengers to scan the waiting area on a peripheral level, as they wait to pick up their luggage.

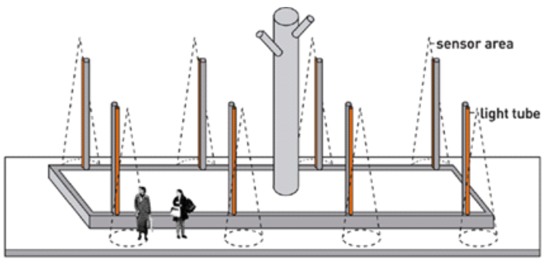
It consists of a monitor inside connected to a camera outside, which constantly scans the line of waiting people by moving up and down. The monitor would enact the same regular movement as the camera - thus clearly different from the people controlled cameras in the baggage belt areas and therefore revealing the automatic nature of its control.

Conclusion

This proposal touches on issues of surveillance, privacy and control. The way systems and behaviors of objects are designed, tell about - or try to disguise - their immanent power and control structures. This concept aims at making the control structures transparent via the visual feedback of the controller. The way the two proposed surveillance circuits behave different, aims at giving clues about the nature of their control - one human, the other automatic - again offering a degree of transparency.

Waitingsignals

- Reactive light architecture for a bus station
- EMAF Osnabrueck



Waitingsignals was a temporary light installation at the main station in Osnabrueck, commissioned by the LUX project and the European Media Art Festival. It ran for a year from June 2000 to June 2001.

The installation was designed for the newly built public space in front of the main station. The centerpiece of the architecture is a spacious oval roof for waiting passengers. Waitingsignals creates a temporary reactive light architecture, which works on top of the existing architecture to map the presence of passengers over time and across space.

Eight orange light units are attached to the columns that support the roof. Each unit consists of a sensor box with a sonic sensor and a microcontroller (stamp chip II). They work autonomously as well as connected to each other. Each light reacts to the presence of people by dimming subtly. The tubes are networked with each other. When a tube is activated over a longer period of time, it's own light-intensity changes, as well as that of its neighbor's. With few people around their behavior is controlled and rhythmic, with many people it becomes chaotic.

Real life

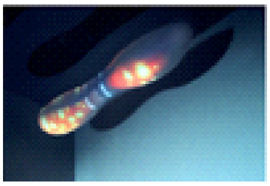
We got broad feedback from talking to people: generally there are 3 different ways people perceive the installation: A) people who are very focussed moving in public space just see it as a public light or even advertising. B) People who notice that they trigger something but can't be bothered or haven't got the time to find out what it is C) people who not only notice they trigger an event but also realize they interact with a behavioral installation, and actively do so, sometimes even as a group.

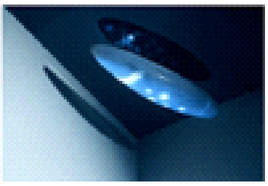
Conclusion

Generally it turned out, that the reaction of the light was so subtle - especially the chain reaction - that it didn't necessarily became clear to people they were triggering it. When we developed the installation, we emphasized on a design, which integrates in space and architecture. Initial approaches which included sound - either controlling atmospheric soundscapes or working with recording bits of conversation and replaying it - might have been more involving. Nonetheless, the installation was also well perceived as a 'pure' light installation, as it glowed in the night and gave the station a warm appearance.

Information Bodies

- Design studies for a physical Intranet
- Royal College of Art London





The project deals with remote presence and communication in the work environment. It aims at reinstating peripheral awareness and incorporating subtleties of social interaction into telecommunication.

We decided to take the 'Computer related Design' students and researchers as our user-group. This gave us the chance for regular feedback on the viability of our ideas. At the time the researchers had just moved to another building. Therefore we were very aware of the missing ambient information we used to have when sharing one floor with just a glass division. Physical clues to someone's presence, such as a jacket on a chair or a turned on computer, telling you that the person was in the office but not at the desk, suddenly weren't available anymore.

We aimed at establishing a link between the two spaces, that would incorporate into the environment as a physical presence rather than being screenbased.

Process

We showed our initial concepts in five video scenarios, which proved very effective in communicating the ideas and being a trigger for discussion. Initially we also addressed ideas of direct line communication but decided against it. Due to the proximity (i.e. chats in the canteen, researchers coming up to the studio) and existence of the phone system as well as email we felt that was not necessary. Instead we focused on giving peripheral awareness of each other space's activity level, something we used to have when we were on one floor but that is now lost due to the separate locations.

We decided it would not function as a calendar since this already exists on the web but maybe as a reminder when meetings start due to the specific rise of activity.

Solution

In the final proposal we presented a model of our studio as well as the research studio, showing our proposal simultaneously to the activity of the spaces.

The design consists of shapes hung on the ceiling in each space which convey via projection and controllable lights a sense of the live activity level in the other space.

Defining how to measure activity in spaces, we found there was a great concern for issues of privacy and surveillance. Especially in the light of today's more and more refined control at the workspace, we aimed at finding less intrusive measures for activity than for example keystrokes on the computer. Three sources are to give an impression of activity:

1. Making use of the internal network, computers that are turned on are represented in the projection as dots. This did raise the question in the final presentation whether this would be fixed, i.e. one could learn whether a specific person is in, or whether that is already too intrusive. A solution could be to leave this option to the users to configure.
2. The amount of people in the spaces is measured via sensors on both sides of the doors (to detect direction of movement). This is combined with a motion detector to allow the system to register when the space is empty, in order to correct the counter on a regular basis. The information is represented as changing brightness of the shapes.
3. The soundlevel is represented as stripes. It gives clues about the character of events. Especially when meetings or lectures occur in the main space, the noise level raises just before the event. The sound level in conjunction with the light wandering from one side to the other of the shape (the sides representing the work- and meeting space) could indicate to someone familiar with the schedule the start of a lecture.

Conclusion

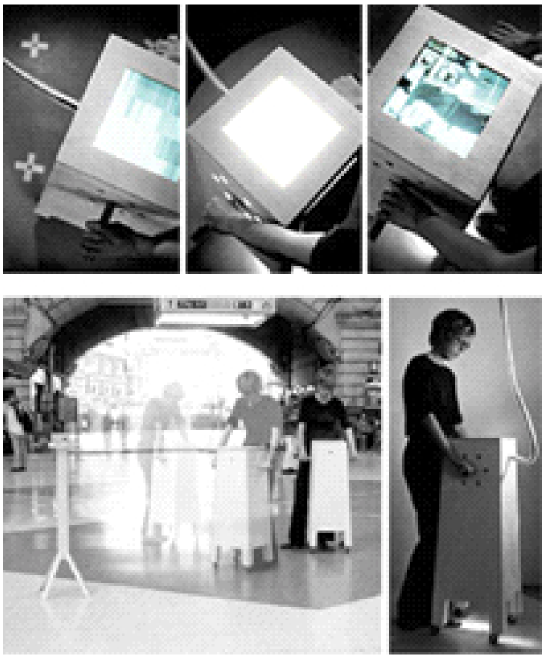
The final proposal was very well received with our user group. Initial doubts such as there not being enough value in only getting a 'rough impression' of each other's activity were suspended. There was very positive feedback to the idea of reinstating peripheral awareness in a nonobtrusive way. Even though this is still the fine line the project walks on: creating something evocative and marrying it to a function. I believe a sense of connectiveness is the main achievement of this proposal.

Further development

An interesting next step would be to combine the physical representation of activity with a screen-based tool for direct communication and shared data spaces that relates to it. Project work often demands people in different rooms, buildings or even countries to work together and be in contact on a very regular basis. This could happen in a more subtle and continuos way than standard telecommunication.

Transit

- Concept and Prototype of movable surveillance objects
- for public spaces | Royal College of Art London



Concept for a multi-user installation, that enables glimpses into remote public places via navigating objects. The project explores surveillance — public control as well as the private pleasures of people watching. Instead of the normal one-way system, this scenario describes an open system that connects public spaces via a live video network. This system would not include audio transmission, as public situations do not afford talking to strangers but rather watching them.

We envisage roaming stations placed in public locations such as train stations, airports, shopping malls, museums, government buildings etc. with the aim of connecting places that do not have any or little socio-geographic contact. Each station consists of a moveable object with a video output, a platform with marked positions on which the object resides and a camera to be positioned close by. Moving the object on a marked position activates the live video connection. Turning the object controls the angle of the remote camera. As each place is connected to all the other places, one can be watched while watching. If a second person logs into a camera which is already remote controlled, he or she sees the image as it is directed by the first person with a clear indication that it is already controlled.

Prototype

We constructed a working prototype to explore issues of interaction for the degree show 1998 at the Royal College of Art.

The technology used was a microcontroller (stamp II) to read a digital compass in the box and audiosignal transmitters as position sensors in the floor. This data was fed to a director application on a PC, which displayed the image. We simulated the live video link with still 360-degree images. The image was back-projected within the object.

While experimenting with different forms of transgressions between receiving and not receiving we ended up using a fairly strong light directed at the back-projection screen within the object to go from one state to the other. Also, while a video link is activated, the light would keep glowing in the lower part of the object and shine onto the floor in order to the selection. This subtle behavior added to the quality of the object.

Users very quickly learned how to navigate with the object, even though looking down onto a scene instead of straight, as it is not a direct mapping. But this position of the video output allows the user to keep an eye on the surrounding.

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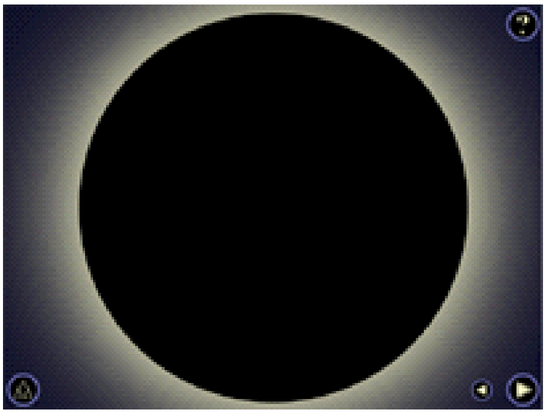
poster



hypermedia novel – hymn

a new storytelling paradigm

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Abstract:

In this paper we present a new storytelling approach, called Hypermedia Novel (HYMN), that extends the classical narration concept of a story. We develop an underlying modular concept – the narration module – that facilitates a new manner of reception as well as creation of a story. The HYMN focuses on the recipient and his role of consuming a story and a heterogeneous group of creative authors by providing narration modules and their interfaces without defining the granularity of the modules. Using several kinds of multimedia elements and a hyperlink structure, we present a first demonstrator that implements this new concept. We also discuss improvements, e.g. MPEG-4/7, that support both reception by the audience, and the process of creating the story by a dispersed team of authors.

Keywords: Nonlinear storytelling, distributed authoring, hypermedia applications.

Project URL:
http://hymn.inf.fh-bonn-rhein-sieg.de/

1. Introduction

The HYperMedia Novel (HYMN) can be seen as an extension to the established Graphic Novel. Multimedia elements and hyperlinks are added to the graphic and text elements.

One fundamental feature is the potential to always use the media that fits every single story element best – be it either text, still images, a graphic novel-like sequence of text/images, an animated clip, audio effects, or even an interactively explorable 3D environment. It is important to mention that this does not only mean adding supplemental features to an existing means of storytelling, e.g. the traditional "hyper novel". The latter usually presents different – usually text-based – chapters as separate documents, connected through hyperlinks that often offer the possibility to chose the further development of the story. It thus generates an intermediate between a fixed linear story and an interactive computer game. This is not the aim of the HYMN. It is rather expected to become a completely new narration concept – much like the graphic novel is essentially more than just an "illustrated epic".

We are currently witnessing an upcoming large variety of approaches to integrating several traditional media within a single narrative product, mostly combined with some more or less limited degree of interactivity. Let us give just a few examples:

- Publishers present eComics – Graphic Novels with partially animated elements [1].
- Authors of printed Comic Books offer intermediate scenes as Webisodes – 3D animated films – in the Internet [2].
- A group of artists from the Japanese Manga and Anime scene join in a project combining different media [3].
- 3D Adventure Games produce novel-like text pages of an overall story (with converging parallel story lines) after completion of distinct tasks – thereby introducing the concept of an Episodic Computer Game Novel TM in order to "restore the art of storytelling in computer games"[4].

- Music Bands produce albums based on a story (often of the fantasy genre) solely invented for this purpose, with the songs not only related to the story but actually expanding on it [5, 6]. (This concept, however, has already been introduced much earlier [7].)

Although most examples are of very recent origin, there have been earlier approaches leading into the HYMN direction. A first commercial application of an epic story told on a hypertext basis initiated non-linear storytelling [8]. The conception of Voomies (Virtual Movies) places interactive movies in a virtual environment [9]. An "accessible novel" [10] which started in 1995 as a text-based Hyper Novel and has evolved continuously now comes quite close to the Hypermedia Novel as defined in this article.

2. Basic Concepts

2.1 Narration Modules

The basic element of the HYMN is the Narration Module (NarMo). It represents a scene (or part of a scene) realized with a certain media type (e.g. text, animation, still image+audio, etc.). Any given scene consists of at least one NarMo. Parallel NarMos may tell a particular story element, e.g. from different viewpoints, in different levels of detail, by different media focusing on different aspects, etc. Sequential NarMos present the story line of a scene via different media – each one especially chosen to best transport the elementary content.

The narration modules can be seen as nodes of a directed graph with a well defined start and end point, cf. Figure 1.

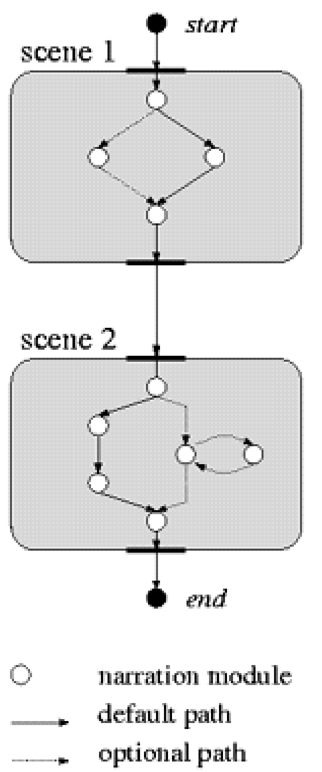

Figure 1 Graph structure of HYMN scenes and narration modules

It is important to the concept of the HYMN that the user can make a decision on how to traverse the story graph but does not need to do so because of the default path that leads through the full story.

2.2 Creation Concept

A lot of good ideas are never put into effect due to the lack of time or experience in the use of one or several tools required. It is also often difficult to get access to (or even knowledge of) usable multimedia material stored in wide-spread data bases. The modular concept of the HYMN, together with the almost endless community of creative and skilled people, each one an expert in one subject or another, seems almost ideal for the distributed generation of a complete document, as long as there is a concise and clear concept of interaction and interfaces.

It is one aim of this project to define such an interface concept of HYMN-generation as well as to apply it to an epic story and end up with a HYMN prototype actually telling the story in a way that demonstrates the potential and features of the underlying narration paradigm.

The exchange and integration of NarMos should be possible on a flexible basis in terms of hardware and software platform while leading to an integrated result with a homogeneous look-and-feel.

Several recent technical developments promise to offer facilities that support the generation as well as the reception of Hypermedia Novels.

2.3 Narration Concept

Many new concepts in storytelling focus on the active role of the user being personally involved in the story, often even empowered to influence its outcome. Many people, however, do not always want to be involved. Watching a scene from some expanded viewpoint, passively, has not lost its justification nor its excitement. Not being inside the scene as an active subject, the user can sit back, relaxed, sharing the viewpoints and thoughts of acting persons in the story from a different perspective. From the point of the storyteller, the content and message of the story can better be realized and brought to the recipient if the latter is not allowed to make his or her own decisions which might influence the story dramatically.

After all, the HYMN does include interactivity to an extent. The recipient is enabled to choose the level of detail, sometimes the media, potentially the aspect or viewpoint and, in particular the order of information presentation in a continuous story which eventually will lead to its inevitable conclusion.

2.4 Aspects of User Interaction

Interaction with digital media in storytelling is an important subject of current research [11, 12]. Particular attention has been paid to the interactivity aspect in the context of narrative intelligence [13], describing levels of user interactivity [14] or defining a dialogue-approach to an autonomous storytelling system [15].

While it usually makes sense to guide the recipient along a story line according to the rules of dramaturgy [16], the interest of different people in a particular narrative may vary widely. Some may be primarily interested in the basic idea of the story itself, not willing to spend much time on an elaborate epic. Others might just rejoice in viewing action scenes or in the exploration of majestic landscapes. And some recipients of a fictive story may be interested in gaining some knowledge of background facts related to the novel. The HYMN takes into account these different interests by offering a choice between alternative paths through the story, represented by separate narration modules. It also offers the possibility to visit local or external sources of non-fiction information related to the story via hyperlinks.

3. Technical Features

For future applications, tools supporting the HYMN creation process are to be developed, based on existing and emerging standards for multimedia data representation and retrieval.

3.1 MPEG-4

The MPEG-4 standard [17] allows for the spatial and temporal composition of a wide variety of media types. Using BIFS (BInary Format for Scenes) and Java, scenes can be described and manipulated at an abstract level.

The visual content incorporated into a scene can be arbitrarily shaped still images, video sequences encoded in a wide variety of formats, or 3D objects. MPEG-4 supports time-stamped events in order to allow for the exact synchronization between different media streams.

MPEG-4 does not specify the tools that are to be used in authoring content for the different media. This again allows for an easier cooperation between people, potentially using a variety of platforms.

The requirement of provisions for user interaction with the story as it unfolds is another reason for using MPEG-4. The standard offers mechanisms for user interaction in that it allows for the computation of various stages of character animations based on certain parameters. The dynamic properties of scenes are defined with the help of the BIFS, which makes it possible to encode the dynamic properties of individual hypermedia elements contained in a scene.

The incremental display of a given scene depending on the user's navigation or in the course of a NarMo is supported by the MPEG-4 delivery layer. The animation of faces and bodies is supported by the standard and in the case of face animation can be automatically controlled via speech synthesis algorithms.

The object-oriented approach of MPEG-4 to hypermedia scene graphs also supports the HYMN concept, simplifying the interactive exchange of modules actually displayed with all other context unchanged.

XML [18], SMIL [19], and Java (in particular the Java Media Framework) are other software tools well suited for the integration of different media.

3.2 MPEG-7

Unlike the preceding MPEG standards, MPEG-7 focuses on archival and retrieval facilities rather than compression and transmission of multimedia data [20]. The major aim is a context-based annotation of multimedia archives allowing for descriptive retrieval functionalities in multimedia data bases. This could prove extremely beneficial to the creation part of a HYMN, as authors could scan globally distributed resources for material to be integrated into the story. Such a scan procedure is much more content-driven than based on particularly defined concrete media elements, which fits perfectly to the MPEG-7 focus.

Principles of access to distributed multimedia data bases have been addressed in a project described earlier by one of the authors [21].

4. Demonstrator

The first approach to the HYMN that demonstrates the capabilities of this new narration concept is a student's project (cf. the project homepage). The aim of the demonstrator is to implement a story as a hyper-media novel based on the concept of narration modules. The modular approach that enables further extensions and the cooperation of different media types in a distributed environment (cf. [22]) shall be evaluated.

Every story has its own particular mood and usually a way of storytelling best suited to present it. Although many stories exist as text-based novel and movie, sometimes with a graphic novel adaptation or an aural-only version, these at least differ in some regards, e.g. focusing on some elements more than others, if not a minor or major modification of the story itself.

Introducing a new way of storytelling particularly requires a story that justifies this presentation. At the end, the recipient should be convinced that this story could best be told in exactly this manner. We find that the chosen story "Moonshadow's Gate" could well fulfil this requirement for the hypermedia novel.

"Moonshadow's Gate" is the story of a female student of Theology, called Sophie, whose work on a thesis leads her to recover the remains of an ancient order of magicians, renegades of the Spanish Inquisition. Continuing her research despite opposing forces, Sophie finds hints to the secret of a mighty dragon banned centuries ago, whose return is envisaged for the 1999 full solar eclipse which is just about to happen. Torn between her clerical background and a variety of clues that make the dragon not appear as evil as she first expected, Sophie has to make a momentous decision.

Realized as a student's project, the demonstrator represents both the receptive aspect of the Hypermedia Novel and its creation concept, bringing together a large number of people with different interests, capabilities, and access to different resources (all of them sharing the lack of time to elaborate on a complex story) to generate a concrete HYMN example, together with a documentation of the creation process.

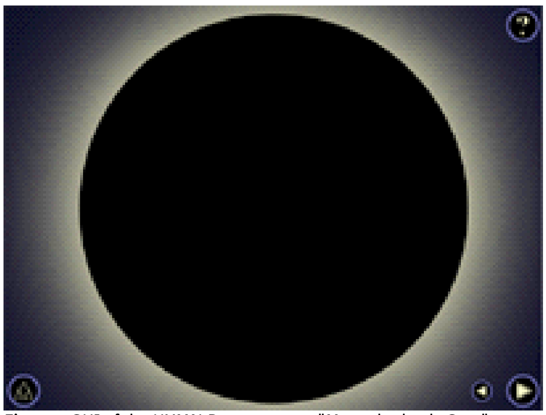
Figure 2 GUI of the HYMN Demonstrator "Moonshadow's Gate"

The GUI (cf. Figure 2) serves as a frame for the document, integrating the different scenes and narration modules while keeping itself to the background in order to focus attention on the story rather than the interface.

5. Conclusion and Outlook

A strong tendency towards the evolution of a new hypermedia storytelling paradigm is clearly visible. The Hypermedia Novel (HYMN) describes a concept of harmonic multimedia integration with limited interactivity that follows along this path. The required development framework integrating a variety of authoring systems is in the focus of current research, while a first demonstrator has been created (which will continually be enhanced and refined).

The usefulness of a pattern-based working process approach to distributed authoring will be evaluated in future research on the subject.

6 Acknowledgements

The authors like to thank the students of Applied Computer Science at FH Bonn-Rhein-Sieg contributing to the project "Hypermedia Novel Demonstrator".

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poster

expeditionberlin - die strasse als datenbank

reisen in den emotionalen raum

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Abstract

One morning I woke up feeling that something vital was missing in my life. Searching in virtual space for information was a fast and familiar approach for me, but in real space I did not know where to begin.

As a first step I made my disorientation public .I constructed a web site, posing the question „What shall I search for ?“. Users of my website responded with many notions to search for.

Instead of using a searchengine on the web, I wrote the given notions on a cardboard. Holding the searchquery sign in my hand I waited at streetcorners throughout the city; when somebody picked me up they too became searchers for the notions themselves and I could participate in their way of attaining the destination.

During a period of three month I hitchhiked through Berlin, using notions such as „happiness“, „meaning“ and „belief“ as the places for my emotional destination.

In a direct way, trying to be as neutral as possible I witnessed their spatial and intellectual movements.

The ways and conversations that took place can be seen on the ExpeditionBerlin website.

Keywords: search, data, hitchhiking, emotions, travel, car, berlin, street, tracing, agents, filter, space, interaction, emotional map, human_robot

Project URL:
http://www.tourist-research.de/ExpeditionBerlin

Year the Work was created: 2000

Einleitung

Der zentrale Aspekt des Projektes ist die Suche.

Jeder Mensch ist ein Suchender. Sind die Ziele im Grunde oft ähnlich, so sind die Wege diese zu erreichen unterschiedlich. Kreuzen sich die Wege, öffnet sich ein Interessensfeld, in dem die Suchenden gemeinsam agieren. Im Internet lassen sich diese Interessensfelder einfach lokalisieren (searchengines, newsgroups, userprofiles etc.) und Suchanfragen führen schnell zu Ergebnissen. Im realen Raum ist dieses schwieriger.

ExpeditionBerlin überträgt Suchmechanismen des WWW auf die Strassen der Stadt.

Projektbeschreibung

Ende 2000 unternahm ich per Anhalter zehn Expeditionen in den emotionalen Raums Berlins.
Ziel war nicht ein geographischer Ort, sondern ein Bedürfnis oder Gefühl.
Die zehn Expeditonen führten nach:

- Entspannung
- Respekt
- Erinnerung
- Glück
- Glaube
- Lust
- Geld
- Erfolg
- Sinn
- Freiheit

Der Ablauf gliedert sich in folgende Phasen:

1. Auforderung zur Suchworteingabe
2. Auswahl des Suchwortes, Festlegung des Startpunktes und der Startzeit
3. Ankündigung der Expedition
4. Durchführung der Expedition
5. Dokumentation der Expedition

Das Projekt bietet von Beginn an Möglichkeiten zur Interaktion.

a) Auforderung zur Suchworteingabe

Auf der ExpeditionsBerlin Website stelle ich die Frage "Was soll ich suchen ?".

b) Auswahl des Suchwortes, Festlegung des Startpunktes und der Startzeit

Ich wähle ein Suchwort nach meinem Interesse/Gefühl aus der Liste der mir zugesandten Begriffe.

Daraufhin lege ich Startort und -zeit fest.

Ich wähle den Startpunkt einer Expedition nahe des letztens Ausstiegspunktes.

c) Ankündigung der Expedition

Um Anderen die Möglichkeit zur Teilnahme zu geben, kündige ich Startzeit und-ort an.

Dies erfolgt über Emailings an die Sender der Begriffe und verschiedene Mailinglisten.

Beispiel einer Ankündigungsemail:

- ExpeditionBerlin
- 29.08.00
- 13.30h
- Reise nach: GLÜCK
- OberbaumStr./U-Bahn Schlesisches Tor - Berlin/Kreuzberg
- Richtung Süden
- http://www.tourist-research.de/ExpeditionBerlin

d) Durchführung der Expedition

Die Expedition folgt bestimmten Regeln.

Sobald ich am Startort eintreffe, definiere ich diesen mit einem Connecting-point Aufkleber, der mit dem Fahrtziel und der Startzeit beschriftet wird. Dadurch ergibt sich eine Spur durch die Stadt.

Auf der Expeditionskarte trage ich Parameter ein wie: Fahrtziel, Datum, Startort und -zeit, meine Stimmung, das Wetter, Anzahl der vorbeifahrenden Fahrzeuge, Kommentare, welches Fahrzeug mich mitnimmt etc.

Ich warte an der Strasse und trampe. Nimmt mich jemand mit, verzeichne ich den zurückgelegten Weg auf der Karte und schneide das Gespräch mit. Zur späteren Kontaktaufnahme erhält der/die Fahrer/in eine Fahrkarte, die mit meiner Emailadresse und der Url der ExpeditionBerlin Website beschriftet ist.

Wenn mich nach zwei Stunden niemand mitgenommen hat, kann ich den Ort wechseln oder einen neuen Begriff auf das Schild schreiben.

Das Ziel meiner Reisen war es von den Fahrern an den Ort gefahren zu werden, der für sie mit dem jeweiligen Begriff verbunden ist.

Ich wurde von verschiendensten Menschen mitgenommen, in Autos, LKWs, auf dem Fahrrad oder zu Fuß.

Ich begleitete sie so lange wie möglich und kam so zu ihren Freunden, auf die Arbeit oder in ihre Wohnungen.

Zwei Auszüge von der Expedition nach GLÜCK:

"....Glücklich sein heisst für mich das Gefühl zu haben man macht das Richtige, zur richtigen Zeit an der richtigen

Stelle. Momentan beschäftige ich mich nur. Im innersten kann es Monate, Jahre andauern glücklich zu sein. Äusserlich kann man dann auch traurig sein. Ein Ziel zu haben meine ich nicht, dann müsste man ja wissen wo man hin will, ich meine das Gefühl zu haben auf dem richtigen Weg zu sein...."

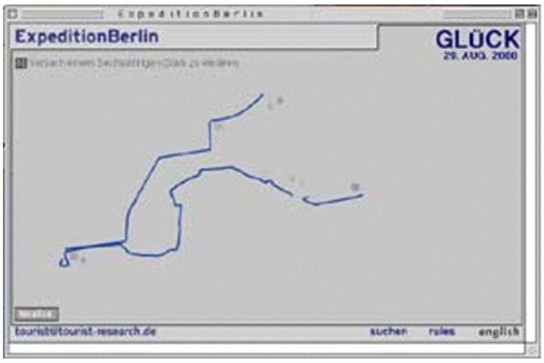
(mit einer Frau zwischen Kreuzberg und Schöneberg in einem Ford Fiesta)

"...Gestern war ich im Schwarzen Cafe und habe dieses Wort vor einem Mädchen gesagt. Sie sagt zu mir wenn du Glück haben willst, geh zu einem anderen Mädchen. Ich habe gesagt, ich bleibe bei dir, nicht nur in der Kneipe. Ich möchte mit dir reden und ein bisschen Glück haben. Dann hat sie gesagt, gib mal deine Telefonnummer und wenn ich Zeit habe rufe ich dich an. Ich sage O.K. Als sie ging habe ich gesehen dass sie den Zettel liegen gelassen hat..."

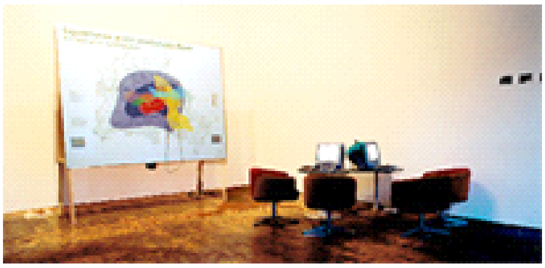
(Taxifahrer , während des Wartens am Alexanderplatz)

e) Dokumentation der Expedition

Die Erlebnisse und Gespräche, Wege und Orte sind auf der ExpeditionBerlin Website dokumentiert.



Die räumliche Installation vereint die Expeditionswege in einer Emotionskarte von Berlin. Die Wartepunkte sind durch Buchsen ersetzt. Dem Betrachter steht ein Steckerpaar zur Verfügung. Verknüpft er zwei Wartepunkte, wird ein Gesprächsmitschnitt hörbar.



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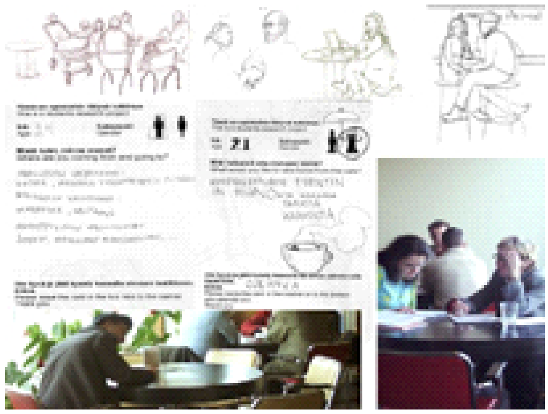

the screentray as augmented physical object in the cafe

concept design through observations, mocking-it-up and performing scenarios with people

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Abstract

This work reports of a multidisciplinary concept design aiming at exploring the use of mixed reality in a common environment like a Café. One of the concepts that resulted out of several user centered design activities, is the ScreenTray, used to carry food and beverage from the counter to the tables and augmented by an integrated touch screen and a "orientation-aware" pointing device. Through participatory design we validated use scenarios with café customers, and produced a mock-up and a virtual prototype.

Introduction

This work is part of the results of a five-month project financed by a telecom operator in Finland. The project was carried out within a university course by six students from different Universities (industrial design, computer science, business, and cognitive science). The customers of the project were the Cafés in an innovative media center called Lasipalatsi owned by the City of Helsinki. This functionalist palace, which was created in the 1930 with a spirit of modernity and openness, was renovated in 1998 and now brings with the same spirit new modern services close to people. The aim of the course was to develop a product or service concept based on bluetooth technology for the Lasipalatsi's Cafés based on observations and other user centered design activities.

1 Designing by and with people

We started our research observing closely two of the four cafés and the people visiting them to get a better understanding of the kind of situations there are and what people actually do. During the observations we also drew sketches of some of the situations and wrote imaginary stories around the people we were observing (see figure 1).

To gain information from a large base of people, we created postcards with questions, which we left on the tables. This activity, which was inspired by cultural probes [1], resulted in 150 filled in postcards (see Figure 1). This phase was followed by ten contextual inquiry sessions (twenty café customers) in order to find out more information and collect stories at a personal level.

We analyzed the large amount of material through Graphical User Profiles GUP [2] of people and situations and we collected the numerous stories told by people. We wrote comments on post-it notes that were then later used to make affinity diagrams from which we distilled nineteen phenomena that condensed the study results.

Once we had the needs and phenomena we organized a brainstorming session to come up with as many different product or service concepts as possible. We also organized two sessions of improvisational theater in one Café, which resulted in four video scenarios of about two minutes each. From 15 different concepts represented as videos or storyboards we selected two for further refinement through participatory activities: a game playing concept and a concept for a media tray called the ScreenTray for which we also developed a mock-up.

The ScreenTray concept was validated using a participatory activity called SPES Situated and Participative Enactment of Scenarios [3], which includes shadowing people and acting scenarios with mock-ups as interesting situations arise. After this validation and based on the feedback, we made improvements to the concepts and developed a virtual prototype of the screen functions of the ScreenTray to run on a personal computer. We concentrated on five situations: families, young couples, couple of young women, groups of friends and single café visitors. For each situation two contextual inquiries were carried out. Out of the nineteen phenomena we summarize some here along with some of the real stories that were gathered: People come to café to meet selected people. A 19-year-old boy and an 18-year-old girl came together to the café. The girl had suggested that they go to Café Lasipalatsi. They hoped to see other friends while sitting in the café. Another pair came to the café on a blind date. Their friends had arranged so that they meet in the café.

The café is a place for communicating and information seeking. A woman of 36 told he keeps in touch with his friends by using the Internet –terminals at the café. Two mothers with their children came to exchange the latest gossips. An 8-year-old boy used the Internet terminal while his mother was talking with her friend.

Figure 1: Research Material in sketches, post cards, and photographs of people in the Café

The café is a place for spying/observing. A 20-year-old girl had the habit to look at people in the café. She observed especially girls what they wear and as she is an aerobic dancer she observed bodies most of all. She did this observation in order to compare herself with others. She also liked listening to what people talk at other tables. Other used to look out of the large glass windows at people passing by.

The café is a place for killing time. A 25-year-old man was going to Tampere, but he missed his bus. Then he came to the café to wait for the next bus.

The café is a place for culture (music, reading, poetry). A 19-year-old student used to come to the café to read his own books. A 25-year-old man had also a book with him, but now he was reading a newspaper. A 19-year-old boy, an 18-year-old girl and two 30-year-old men would have liked to bring own music with them and listen to it at the café.

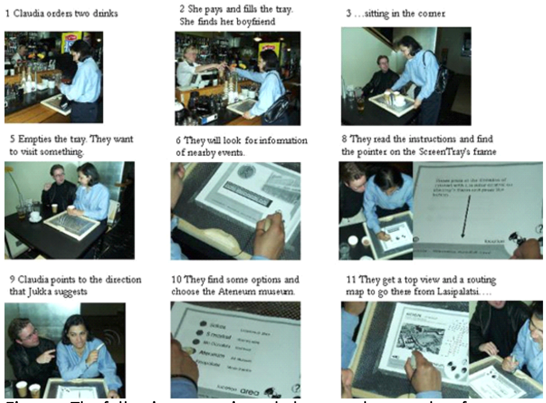

Figure 3 The following scenario and photographs are taken from one of the SPES sessions.

The café is a place in between (middle point). An 18-year-old girl came to the café from school because she had a free period. After few hours she went back to school. Two 30-year-old men were coming from the railway station and were on the way to the office. A 25-year-old man was coming from the bus station because he missed his bus to Tampere and he came to the café to wait for the next one.

A 19-year-old boy and an 18-year-old girl were coming from the library. From the café the girl was going to the hairdresser and the boy was going home. A mother was going to shopping and to the library after the café visit. Another mother was coming from home and going to a doctor's appointment from he café.

The café is a place for rewarding yourself. A boy of 19 came to café reward himself wit a cup of coffee and smoke after a job interview.

3 The ScreenTray

The ScreenTray is a usual café tray used to carry things to the table from the counter after purchase with an integrated touch screen and a pointing device. The concept of the ScreenTray binds the device itself tightly to the café experience. The Screentray is focused on the Café customers that find the Café as a middle point. Tourists in Helsinki are also target users according to their needs like orientation and information to locate places or to plan their activities after having a coffee or lunch break.

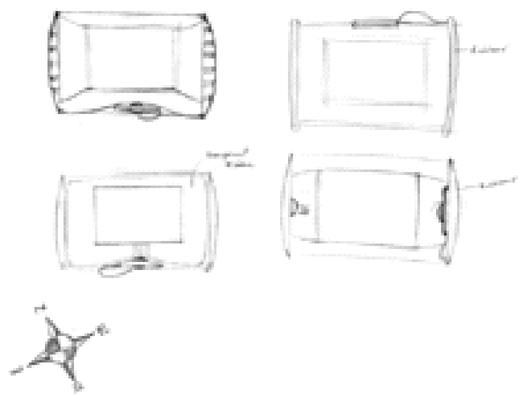

Figure 2: Sketches of the ScreenTray

The concept augments an artifact, which is already present in the environment and is currently used. A touch screen with Internet access is already provided at some of the tables. For this particular function the ScreenTray provides the advantage of being more flexible in group use, as it can be positioned and moved around easily. Moreover, sometime people seat at the Internet table without using it, whereas the ScreenTray could be given only to the interested customers.

The brainstorming and scenario development ended up in the actual screen tray mock up. It was developed by sketching the tray with different shapes and interactive design analysis. This concept was supporting several other ideas such as e-books, e-newspapers, location, games, information network services.

The Screentray is composed by three parts: the frame that works as a tray itself, the touch screen interface and an "orientation aware" pointer that works as an electronic compass to offer visual and written information on the screen to locate places around Lasipalatsi. (See Figure 3 for one of the scenarios as acted out in the SPES Sessions)

A virtual prototype was developed and offers the possibility to navigate in three main languages used in Finland: Finnish, Swedish and English and find different screen pages related with Lasipalatsi and its surroundings. There is a buttons menu on the lower right hand corner of the display where people can choose a function regarding locations, topics or help. The ScreenTray is able to read the direction of the pointer and gives information accordingly.

This concept addresses several of the found phenomena: 1 The café is a place in between (middle point). 2 The café is a place for communicating and information seeking. 3 The café is a place for killing time. 4 The café is a place for culture. 5 The café is a place for working. The validation was carried out with café customers through SPES [3] sessions, which included a closing interview. The SPES session was organized in the Café. The designers showed the concept to the participants explaining some example scenarios, and handed over the mock-up of the ScreenTray. Subsequently the participants would continue their visit at the Café as usual. They would proceed to buy at the counter beverage and food and would find a place in one of the tables. During these usual activities the participants, helped by the designer, would act out scenarios of use of the ScreenTray. Three different sessions were organized with seven different people. Some of the contributions and feedback from the participants is summarized in the following:

The feedback was generally positive. People recognized that the tray is addressing some need especially for people who don not know Helsinki. Lasipalatsi is in a central place in Helsinki a middle point, for this reason the exploring the surroundings from the café makes sense.

The pointing device seemed to be a natural way to interact as at least two of the participants instantly figured out its use. However, the feedback on the interaction mode and mockup was not without skepticism. For some the pointer might be confusing and would need good instructions. An interesting idea came from one participants who would have preferred a map that helps her put the magnetic North in its right place or a map that orientates itself correctly when the tray is turned. The size of the ScreenTray was also a debated problem. The table space might not be enough for both the tray and the bought things.

Other ideas from café customers included combining the ScreenTray with games, for instance to play chess with a companion. The business perspective was also discussed some participants asserted that they would pay extra for the tray only in need, not just to pass time. So that the price should be better included in the price of the coffee. One scenario is game playing, where café customers engage in multiplayer games anonymously or with friends using the ScreenTray. This scenario is connected to several phenomena: 1 The café is a place for killing time, 2 The café is a place for having a break, 3 People come to café to stimulate their senses (music, smells, lightning) and 4 The café is a place in between (middle point).

4 Conclusions

Compared to the existing Internet touch screen which integrated into the routable tables, the ScreenTray offers a more flexible solution. The pointer feature of the ScreenTray to explore the surroundings is an original interaction mode, which differs from current location aware applications, which use a map. If on one hand the interaction might be entertaining and playful, on the other hand participants suggested more effective interaction modes, for example a map that orientates itself correctly when the tray is turned. Lasipalatsi seems to be the right place for such a service, as it is located right in the center of Helsinki and near to bus and train stations.

The ScreenTray came out of a contextual and participatory study and addresses several phenomena found in the study. Moreover, it integrates itself well in the café environment as it does not introduce new physical objects or devices but it augments existing ones. The chosen collection of methods for user study gave a good and thorough picture of the typical café visitors. However, as cafés are an established tradition and host well-established practices, the café experience itself has integrated all the required components and formed a solid whole. Because of this, it is hard to offer any new added value concepts to the environment.

Acknowledgements

We would like to thank Elisa Communications for financing the course and Anu Mäkelä for her help during the project and for organizing the course at the Helsinki University of Technology in cooperation with the University of Art and Design and the University of Helsinki.

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poster

multimedia in education

encounter of theatre and technology and discursive learning

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Abstract:

The CD-ROM "Interfaces - Interaktion - Performance. Zur Anwendung digitaler Technik im Theater" ("Interfaces - Interaction - Performance. About the use of digital technology in theatre"), part of the publication "Maschinen, Medien, Performances. Theater an der Schnittstelle zu digitalen Welten" ("Machines, Media, Performances. Theatre as interface to digital worlds") offers an introduction in frequently used interface systems as well as the different discourses linked to the field of theatre/performance and digital technology based on the use of interactive interfaces. Different artistic examples visualise the aesthetic operationalization of specific technologies in relation to the intentions of artists and to the different discourses, in which they are embedded.

Keywords: Interfaces, performance, interactivity, performativity, mediality, discourse, discursive fields, learning software

Year the Work was created: 2000/2001

Project Partners: Europäische Werkstatt für Kunst und Kultur Hellerau e.V., transARTES Berlin, Academy for Live Arts, Media and Culture, German Federal Ministry for Education and Science

Introduction

The publication "Maschinen, Medien, Performances. Theater an der Schnittstelle zu digitalen Welten", edited by Martina Leeker, published by Alexander Verlag Berlin, 2001, documents the results of a summer academy "Theater und Neuen Medien. Interaktionsformen und Wirklichkeit" ("Theater and New Media. Forms of interaction and realities"), which took place in Dresden Hellerau (Germany) in 1999 (artistic direction: Martina Leeker). The publication consists of the book and the CD-ROM.

The CD-ROM documents on the one hand the practical work of three ateliers during the summer academy. On the other hand it presents different positions concerning questions related to the field “theatre with media” versus “theatre as a medium” found in the articles of media and theatre theorists in the book. This is done in a special structure, which allows the user to take different points of view on the presented examples of media-installations and performances.

Aims of Research

The aims of the CD-ROM are:

1. to give the user an overview and introduction in the technology of interfaces used in theatre/performances and performative media-installations.
2. To document and visualise the process and the results of the practical work in the summer academy.

3. To give an introduction in the relevant discourses concerning theatre/performance and new media and their connections to a technical history of man.

4. To research formats and methods of CD-ROM as a learning software

Concerning the CD-ROM as learning software its intention is not to give an hierarchical curriculum, in which a fixed amount of knowledge should be distributed to the user. On the contrary the CD-ROM wants to open a space for questions and own reflections of the user without the possibility to discover predefined answers. This aim should be reached by confronting the technological predetermination of interfaces and software with the different intentions in their artistic use in installations and performances, embedding both in the contradictory field of discourses concerning theatre and new media.

Project Description

1.1 Structure

The interface design of the CD-ROM was developed by Christian Ziegler. (Originally it was designed for the CD-ROM "Media Art Interaction. The 1980s and 1990s in Germany" from Rudolf Frieling and Dieter Daniels, produced on behalf by Goethe Institut and ZKM | Zentrum für Kunst und Medientechnologie Karlsruhe.) It offers a non-hierarchical structure for the presentation of contents in different contexts.

The interface consists of three horizontal navigation bars with different keywords and the presentation windows, which is divided into two parts, the text-window on the left and the selection-window on the right side. Clicking a keyword will show different icons in the selection-window. Each icon leads to a presentation.

Figure1 screenshot of the user interface

Each of the three navigation bars refers to different levels, which are important in dealing with the field of theatre/performance and digital media. The navigation bar on the bottom of the monitor presents different artists with examples of their work in this field. The artists represented are not only those, who collaborated within the summer academy, but also artists, who created paradigmatic works in terms of development of technology and its performative use.

The second navigation bar, placed directly under the selection window, offers a technological approach to the research field. Here, the user can find overviews over technological concepts, which form the basis of interfaces, as well as introductions in different software programmes, which are used to build interactive interface systems. The artistic examples are presented in order to give an idea about the possible artistic uses of this technologies and show the different intentions and aims, specific programmes are used for.

The third navigation bar on the top of the interface has three tasks. It

1. presents a selection of esthetical and philosophical discourses related to the field of theatre/performance and new media,

2. documents the work of the ateliers of the summer academy and

3. shows specific historical examples concerning the field "theatre with media/theatre as a medium".

The keywords on this navigation bar represent different fields of discourses. For each keyword, there will appear an introduction in such a field. The introductions bring together different statements of the authors of the book, representing the bandwidth of points of view to specific themes. By grouping the different positions in a so called "discursive field" the different approaches will become clearer and questions will arise. The presentation of the artistic examples for the discursive field follows also this dramaturgy of "grouping". This grouping of different approaches and of practical and theoretical work has the following intention: on the one hand it should enable a reference to question the theoretical discourses by the help of practical, artistic works. On the other hand the practical work itself may be questioned by the theoretical viewpoints. It should be possible to show by this confrontation the relativity of theoretical and practical discourses and make obvious at the same time that and how they are responsible for the constitution of physic and digital realities.

1.2 Example

The atelier "interactive performance" with Thomas Gerwin (Germany), Robert O'Kane (USA, Germany), Daniel Aschwanden (Switzerland, Austria), Claudia Bosse (Germany, Austria) and Harald Begusch (Austria) worked on the topic of "distribution of information". Basis was a text of Aischylos' Orestie, where Klytaimnestra describes in detail, how a fire signal passes several stations to give her the information of the victory in the war of Troya. The participants of the workshop structured their action space with "sight axis" and developed systems of distributing information via speech and bodily actions. One part of the work was the use of BigEye, a video based interface system, which was "filled" with spoken words of the speech of Klytaimnestra. The words could be triggered by a red object - in this case a red cloth was used.

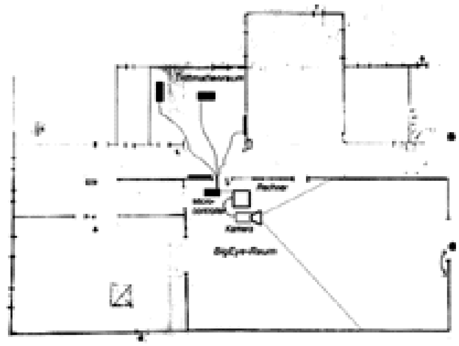

Figure2 plan of the action space

The presentation of the work can be found within three keywords: On the "technological" navigation bar, it is places at the keyword BigEye. On the highest navigation bar, it will be found twice: at the keyword Hellerauer ateliers, where the work of all ateliers is presented and at the keyword "Performativität - Medialität" ("performativity - mediality"). This presentation documents the intentions and the work process with BigEye and discusses the main questions in these different experiments, which are "who is interacting with whom"? Performers with other performers using the interface or performers with the interface or performers with performers within an interface which organises its output via the actions of the performers?

Regarding the different contexts the presentation is shown in, the user might create different points of views onto the work. With the technological approach, it might be interesting, how the environment was created and what would be the difference in intentions to the other presented artistic work as for example Secret of the group half/angel, which used BigEye in a totally different setting and with almost contrary intentions. In the context of the presentation of all the ateliers in the summer academy, the concentration of a reader may focus on the different research the ateliers where working on. In this context the atelier "interactive performance" was clearly researching on the performative use of interfaces within a theatrical situation of improvisation work. The last occurrence of the presentation takes places at the horizon of the question, if performativity and mediality are contradictions or similar formats: is mediality performativity and can performativity be seen as a form of mediality?

The discourses about mediality and performativity regarding the field of theatre often focus on the counterpart of "live-performance" and performance using media. The "live-performance" is characterised by the co-presence of actor and audience, which generates a non-mediated situation. Following the discourse about mediality, the term focuses on the question, how something, that appears in a medium is structured through this medium and therefore causes certain standards of perception and reflection. So it is not just mediating something which would be an independent content, but the medium produces something, in which it is inscribed as a trace (Krämer 1998a).

Regarding the discourses about performativity, it is a category of analyse which focuses on the moment of the irritation of fixed denotations. Following Sybille Krämer (Krämer 1998b), performativity can be defined as the process of acting in which the intentionality of the doing is dissolved. In this meaning, performativity implies mediality as it aims on the part of acting, which crosses the intentionality of the actor.

Figure3 Interactive Performance with BigEye

Regarding the work of the atelier "interactive performance" in this context, one can re-interpret the relationship between performers and the media environment: It would not be analysed as a modus of interaction between intentional subjects and machine. In contrary, there were two systems of rules, the one of BigEye as an archive and the "distribution system" of the performers, which intersect as the performers act in BigEye. There were no longer subjects seen, which would act intentionally regarding some kind of personality but the performers and their actions would be the intersection points of two different systems of rules.

Conclusion

The theoretical and practical research during the summer academy "Theatre and New Media. Forms of interaction and realities" showed the requirement to ask for the interferences between the technology predetermination of interfaces and software, its artistic use and the different fields of discourses concerning theatre and new media. The CD-ROM reflects and structures these conjunctions in its interface and dramaturgy. It presents different approaches through the navigation bars and confronts different points of view in its dramaturgy of grouping. Doing so it opens a space for questions and own reflections of the user.

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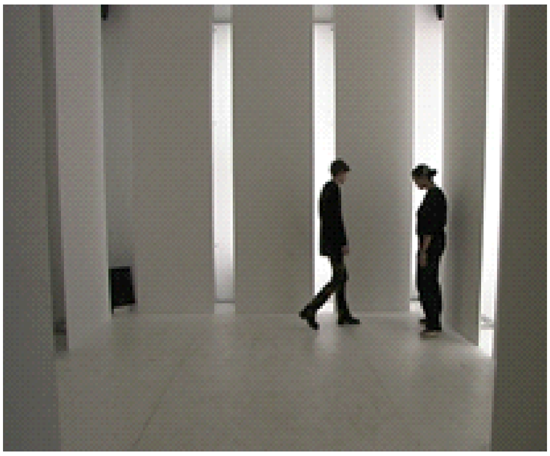
poster



noise ratio

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Abstract

Noise radio is a white space-object, with an indirect light-source of daylight-neon and furnished with a speaker-system. The movements of the spectator are tracked and they influence the noise, the installation is producing. The noises of this installation are white, white noises.

Keywords: Rauschen, Korrelation, Reduktion, Selektion, Form

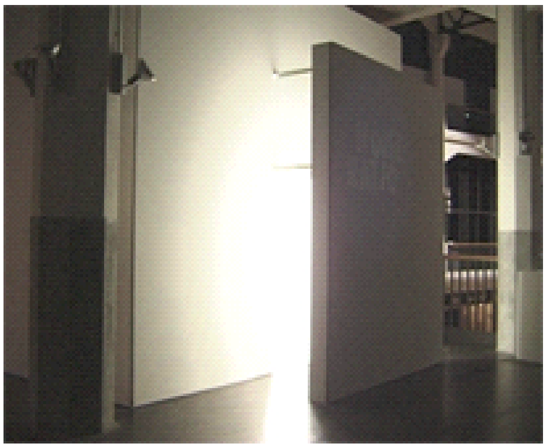
Project URL:
http://www.hfg-karlsruhe.de/~aniemetz/noiseratio

Year the Work was created:
Noise Ratio wurde erstmals vom 8.12.99 bis zum 2.1.00 im Forum HfG im ZKM Karlsruhe gezeigt. Die zweite, überarbeitete Version der Installation wurde im Montevideo Institut Amsterdam vom 8.4.00 bis zum 6.5.00 präsentiert.

Project Partners:
Betreuung: Prof. Michael Saup
Programmierung: Louis Philipe Demers
Sound: Pino Grzybowsky, Philipp Fiess, Andreas Lorenschat
Licht: Dominik Rinnhofer
Dank an: Prof. Uwe Laysiepen, Michael Truxa, Philip von Winterfeldt, David Schäfer, Markus Vögele, Matthias Gommel

Einleitung

Noise Ratio
Interaktive Raum- Klang- Lichtinstallation
Gleichmäßiges Rauschen und weisses Licht.



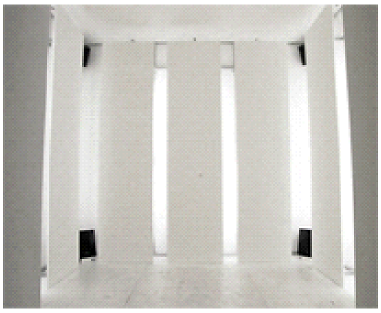
Der Besucher betritt den Raum - das Rauschen verstummt. Der Körper bewegt sich, Noise Ratio reagiert. Rhythmisch zischelnd umspielt ihn der Klang, vorsichtig verfolgt ihn das Licht. Nun begreift sich der Besucher als Auslöser der visuellen und akustischen Veränderung, er untersucht die Reaktionen auf seine Bewegung und experimentiert mit dem formgebenden Prozess: Das klangliche Rohmaterial wird gefiltert und korreliert, das Licht variiert seine Position und Geschwindigkeit.

Ähnlich dem psychologischen Phänomen, bei dem das Ohr im Rauschen den Ton hört, das Auge im Rauschen ein Bild erkennt, weicht hier das akustische Rauschen der selektierten Frequenz, die Ganzheit des Lichts weicht dem Muster. Das Alles wird aufgespalten, um einzelne, begreifbare Teile zu präsentieren.

Doch kann der Auslöser diesen Prozess nur im begrenzten Maß steuern, denn Noise Ratio lässt mit sich spielen, entzieht sich jedoch schnell der Kontrolle. Schnelligkeit, Richtung und Dauer der Bewegung veranlassen das System zu einer kooperativen oder eher eigenwilligen Interaktion. Die Reaktion des Raumes kann vom zart-rhythmischen Umspielen der eigenen Sinne bis hin zum aggressiven Angriff auf diese empfunden werden.

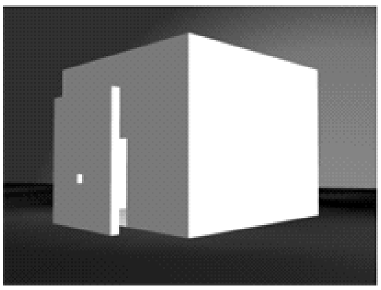
Verlässt der Besucher den Raum, verflüchtigt sich alle Unruhe, Noise Ratio vergisst die Störung und das Rauschen kehrt zurück.

Forschungsziele



Ziel der Arbeit ist es, dem Rauschen einen eigenen Raum zu geben, aus dem Rauschen allein ein möglichst vielschichtiges und abwechslungsreiches Klangerlebnis zu schaffen, und eine Interaktion zu erzeugen, die der (Un-)Berechenbarkeit der Interaktion zwischen Lebewesen nahe kommt.

Projektbeschreibung



Der Raum: ein weißer Kubus, fünf mal fünf Meter Bodenfläche, vier Meter hoch, ausgestattet mit zwölf an den Wänden befestigten Paneelen, an deren Rückseite Leuchtstofflampen angebracht sind.

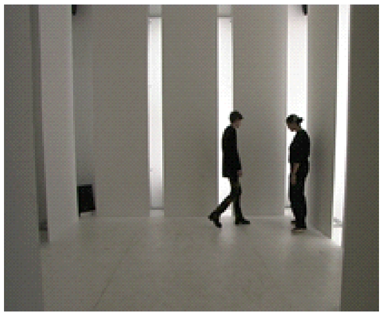
Das Licht: durch die indirekte Beleuchtung von insgesamt 46 Tageslicht-Leuchtstoffröhren (elf Paneele mit jeweils vier Lampen, ein Paneel über dem Eingang mit zwei Lampen) wird der Raum mit einem gleichmäßigem, grellem Licht durchflutet. Jedes Paneel kann von der Lichtsteuerung einzeln an- und ausgeschalten werden. Es gibt Zustände, in denen das Licht den Besucher „verfolgt", also von einem Paneel zum anderen wandert, oder Muster bildet, wie z.B. eine Kreisbewegung, und Zustände, in denen die Paneele in verschieden Frequenzen synchron ein- und ausgeschalten werden und so einen Stroboskop-Effekt ermöglichen.

Der Klang: Acht Lautsprecher und ein Subwoofer ermöglichen eine gleichmäßige Beschallung sowie eine Positionierung des Klanges im Raum. Ein alle hörbaren Frequenzen umfassendes Rauschen wird durch Filter und Effekte in Echtzeit verändert und über eine Matrix auf die Lautsprecher verteilt. Ähnlich der Steuerung der Lichtpaneele gibt es Zustände, in denen der Klang im Raum wandert, Kreisbewegungen macht, von einem Lautsprecher zum anderen springt oder in unterschiedlichen Frequenzen oszilliert.

Die Interaktion: Das Trackingsystem besteht aus einer an der Decke befestigten Kamera und zwei Infrarot-Scheinwerfern, die eine Betrachtung des Kamerabildes ohne nennenswerten Einfluss der momentanen Lichtsituation durch die Leuchtstofflampen möglich machen. Anzahl der Objekte im Raum, deren Position, Richtungsvektor und Geschwindigkeit werden vom Trackingprogramm an das Auswertungsprogramm der Installation weitergeleitet. Dieses beobachtet die Bewegung in der Zeit und entscheidet daraufhin, in welchen Gesamtzustand sich die Installation als nächstes begibt.

Der Gesamtzustand der Installation definiert die Art und Weise, wie die Bewegungsdaten in Klang- und Lichtparameter umgesetzt werden, also inwiefern direkte Interaktion zwischen dem Agierenden und der Installation stattfindet. So gibt es z.B. Zustände, in denen sich der Klang und das Licht nachvollziehbar analog zu der Bewegung des Besuchers verhalten, und Zustände, in denen die Installation eigens generierte Programme durchführt und wenige Bewegungsdaten einsetzt.

Der Grundzustand der Installation, reines Rauschen und gleichmäßig helles Licht, besteht nur, wenn sich keine Person im Raum aufhält, oder wenn sich ein Betrachter über einen längeren Zeitraum nicht bewegt.



Noise.

"[Rauschen:] Ein Geräusch, das [...] gekennzeichnet ist [...durch] ein nur noch statistisch zu beschreibendes Frequenzspektrum. [...] In Analogie zum optischen Eindruck des weißen Lichts, das alle Wellenlängen der Spektralfarben enthält, spricht man vom Weißen Rauschen (engl.: white noise), wenn alle Frequenzen gleichmäßig über den gesamten hörbaren Frequenzbereich verteilt sind [...] ."

{Zit. aus: Enders, Lexikon Musikelektronik, Mainz 1985)

"-" [Leerstelle zwischen "Rausch" und "Rauschenberg"] (Zit. aus: Harenberg Kompaktlexikon, Dortmund 1996)

Ratio.

"Verhältnis." (Zit. aus: Langenscheidts Taschenwörterbuch Englisch-Deutsch, Berlin/München 1982)

"(lat.) I) Vernunft. 2) Ursache, Grund." (Zit. aus: Der Volks-Brockhaus - Jubiläumsausgabe, Wiesbaden 1956)

"Rechnung, Berechnung, Rechenschaft, Denken, Denkvermögen, [...] Gesetzmäßigkeit, Ordnung, Methode, Prinzip." (Zit. aus: Etymologisches Wörterbuch des Deutschen, München 1995)

Wer die interaktive Licht-Klang-Rauminstallation "Noise Ratio" betreten könnte, ohne die interaktive Licht-Klang-Rauminstallation "Noise Ratio" zu betreten, der würde sich umflutet finden von Rauschen und von Licht - von einem fast reinen weißen Rauschen und von einem nahezu idealen weißen Licht. Als Beobachter außen vor - im wörtlichen Sinn wie Konjunktiv - kann dies jeder/jede leicht durchspielen. Nicht aber in der realen Situation: Wer sich diesem Raum aussetzt, tut dies mit seinem Körper. Und auf diesen Körper reagiert der Raum - nicht (nur) umgekehrt: Das Licht beginnt, seine Schattenseiten zur Schau zu stellen, und das Rauschen fängt an, sich zu artikulieren.

Interaktion? Kommunikation? Im Hirn dessen, der sich aussetzt, hervorgerufen durch die Bewegungen, die der Körper ausführt, in dem dieses Hirn sitzt? Oder im Computer, wo ein Programm abläuft, das des Störfaktors bedarf, den der menschliche Körper darstellt - um solche Veränderungen der sinnlichen Reize im Raum zu generieren, die das Hirn, das in jedem Körper steckt, glauben machen, es finde Kommunikation statt?

Rauschen ist, stets. Das ist die Ansicht der Naturwissenschaft; die Entdeckung des schwachen thermischen Rauschens der kosmischen Hintergrundstrahlung wurde beispielsweise mit dem Nobelpreis ausgezeichnet (1987). Was aber wäre, wenn kein Rauschen wäre?

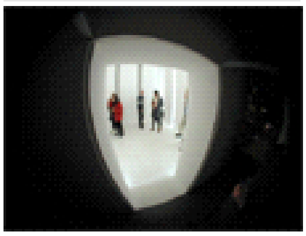
Anne Niemetz findet mit ihrer Arbeit einen bemerkenswerten Ausdruck für das vielleicht letzte Relikt metaphysischer Unruhe: "Warum ist überhaupt etwas?" - und zwar nicht nur als intellektuelle Form, sondern als sensorische Herausforderung (der Technik? des Menschen?). Mit ihren Worten: "Rauschen ist das Geräusch, das man hört, wenn die Welt sich dreht."

Markus Vögele









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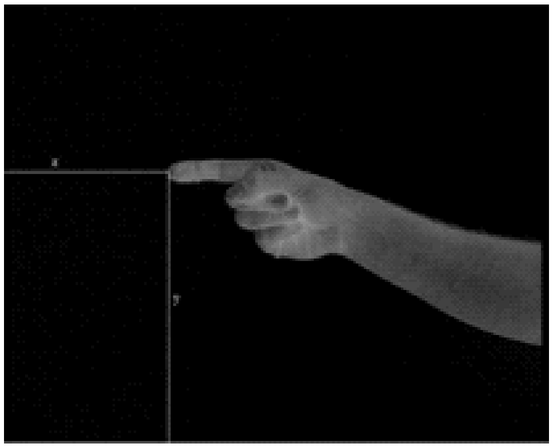

go2 - a game platform for interacting with mixed realities

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Abstract

Goal of the GO2 project is to develop an intuitive human-machine interface between real and virtual world, i.e. contact free data input based on hand gestures without using any additional devices. Furthermore, it should permit interactions with computer-generated objects in virtual environments. The user operates in a "projected" virtual world, which is computed and subsequently projected.

The user is positioned in the projector's beam and his actions in front of the projected background are captured by a video camera. The captured datas are analysed and the recognized hand gesture may cause a particular action in the virtual environment. The procedure is demonstrated by example of the Chinese board game GO. Two players can play against each other or against a virtual GO client.

Keywords: Hand gesture recognition, computer vision

1 Introduction

The aim of the project is to develop an intuitive human-machine interface. This interface should be designed so that even untrained users can interact contact-free and without any further devices with a virtual environment. This is realized by using hand gestures only. Furthermore, simple hand gestures are used to manipulate the computer-generated objects.

Figure 1 shows the experimental setup consisting of a computer, a video camera, and a video projector with a projection screen.

The virtual environment is generated by a workstation and projected onto a screen. The user interacts with this projection (cf. fig. 1) by pointing to the projected objects, e.g. with the index finger. The hand gesture is captured by a video camera and transmitted to the workstation. The optical axis of the camera is perpendicular to the projection screen, thus “seeing” the projected image as well as the user's hand gesture.

The captured image is processed with the help of an image segmentation algorithm. Subsequently the hand gesture is interpreted and if necessary, the position of the finger is determined. The interpreted gesture may trigger an appropriate internal message to the application, e.g. setting a stone on the projected board.

The general underlying goal is to detect any hand gestures as well as to implement an image analysis framework such that the process supplies dependable results under non-restricted conditions. Different conditions are e.g. fast movements of the "gesture" as well as unfavorable illumination conditions. Furthermore, the image analysis process should distinguish between specific and non-specific hand gestures. The main scope of this project is the methodical analysis of hand gestures for interaction with virtual environments.

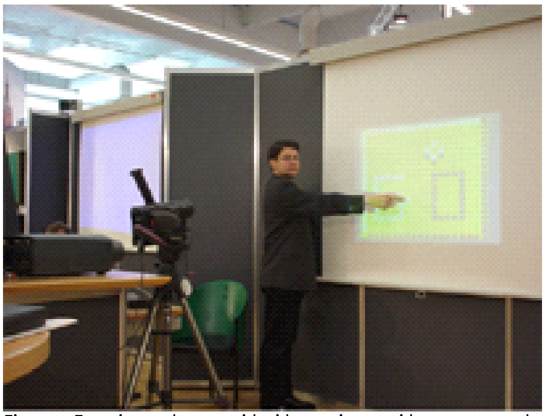

Figure 1. Experimental setup with video projector, video camera, and projection screen

1.1 Hardware

The project is implemented on a Silicon Graphics workstation (O2) (cf. Fig. 2). A projector and a commercial, monocular video camera (PAL CIR 750x576, 50Hz field) are attached to the SGI. The projector and the camera are installed one over another to minimize distortions.

2 System description

A possible application is the implementation of the classical board game GO. GO is perfectly suitable as object for a feasibility study due to its small number of rules. As the players point to the desired position, they can place and remove tokens. Depending on the direction from which the pointing object is inserted into the game board, the different gestures are assigned to one of the two players.

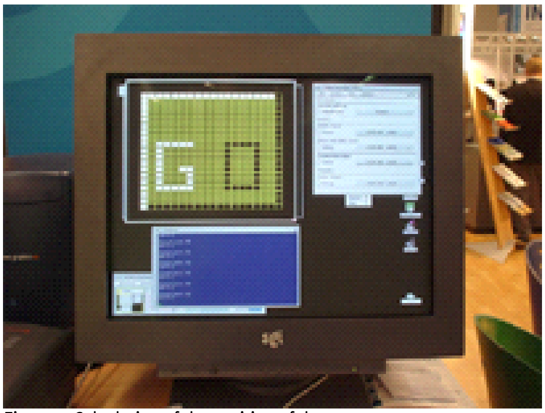

Figure 2. Calculation of the position of the new stone

2.1 Calibration

A transformation between the coordinate system of the real and the virtual world has to be performed for every input in order to determine the exact position of the hand gesture of a player. For this transformation the system needs some calibration points acquired during a calibration process that is to be performed upon system startup (cf. fig. 3). For this at least two points of reference have to be determined automatically or interactively. The automatic calibration process determines the points of reference using an algorithm to find the corners of the projected game board. During the interactive calibration, on the other hand, a player points at two diametrically opposed corner points of the projected game board and the system determines the position of the fingertips. In both cases the calibration factors can be calculated from the points of reference. Furthermore, distortions of the projected game board can be compensated. Distortions occur when the video camera and the projector are not aligned exactly.

A general prerequisite of the approach is that the hand gestures are made close to the projection screen in order to avoid perspective ambiguities and shadows.

2.2 Image difference algorithm

For the segmentation of a hand gesture in front of a well-known background an image difference algorithm is applied. A reference image is captured, and compared to all subsequent images recorded by the camera.

2.2.1 Acquisition of the reference image

For the generation of a reference image the projected game board without any intruding object is recorded, pre-processed and converted to a grey scale image. The resulting image is stored as the reference image. Using the reference image any object can be segmented from the background by calculating the pixel-wise difference between the two images. The resulting difference map contains only those locations where the newly acquired image differs from the reference image, i.e. where the intruding object is located.

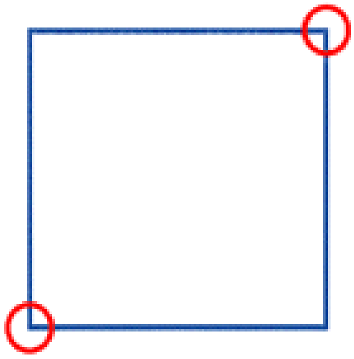

Figure 3. System callibration using two points of reference

By using an image difference algorithm the system can reliably detect hand gestures even under different lighting conditions. Moreover the performance of the method shows that the method itself is independent of the application presented here. The approach using a reference image can applied to any projected content using a planar projection surface.

2.2.2 Processing of hand gestures

The player points with his hand to the desired position on the projected game board (see fig. 4). An image from the video camera is captured and converted to a grey scale image. Then the grey scale image is compared with the reference image in order to isolate the intruding object. It has to be assumed that the hand gesture is held at the desired position for a minimum period of time in order to differentiate it from other events, such as motion and noise. This is implemented by applying cyclic buffers, which store a number of consecutive frames. Again difference maps are calculated from these frames and evaluated. If this suggests a constant and reliable hand gesture, then the identification of the gesture is started. The related reliability threshold is individually scalable. Without such a threshold it would be impossible to move the hand to the desired position on the projected board because at all intermediate steps a hand gesture would be detected. Since the GO game demonstrates only one possible example of an application of the developed hand gesture detection system also a faster or real-time version of the detection method without any delay is possible in general. In that case each movement of a user is detected and interpreted directly by the system.

If a considerable hand movement is detected the interpretation of the hand gesture is started. The position of the fingertip of the stretched finger is determined in order to calculate the exact position of the pointing finger. For the GO game application presented here a token is set or removed based on the computed position.

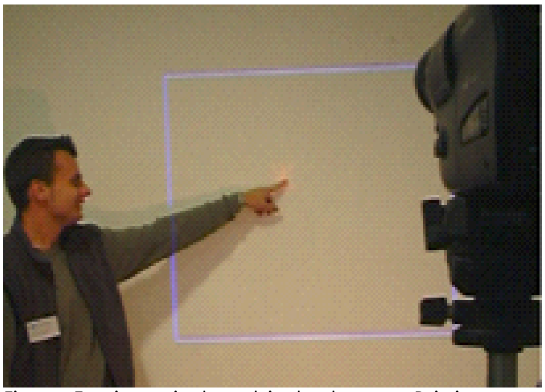

Figure 4. Easy interaction by applying hand gestures. Pointing to a particular position in mixed realities.

2.2.3 Detection of the fingertip

For segmenting the fingertip two images are necessary: the reference image, which is computed during the calibration and the actual captured image. These two images are subtracted pixel-wise from each other in order to calculate a difference map. In the difference map the hand without the surrounding game board is visible. Since this image can contain noisy data from different sources, the difference map is filtered before further processing is started. After this pre-processing step the exact position of the fingertip is computed.

The final position of the fingertip is calculated by applying a special search procedure. First, the origin of the player's arm is determined by evaluating the edges of the projected difference map of the game board (cf. fig. 5). The system runs a systematic search method to find the fingertip, starting from the opposite direction. The first value above a given threshold is used as the final position of the fingertip. Therefore, it is not significant which finger is used for pointing or whether a pen or any other instrument is used.

The coordinates of the detected fingertip are processed further and an appropriate action is initiated.

2.3 Computation of the action

As soon as the normalized coordinates of a detected hand gesture have been computed, they are transmitted to the subsystem responsible for updating the game board. There, the intended action is evaluated depending on the context. After determining the legality of the intended action the internal status of the game model is updated, the action is executed. Subsequently the game board display is refreshed and a new reference image is captured.

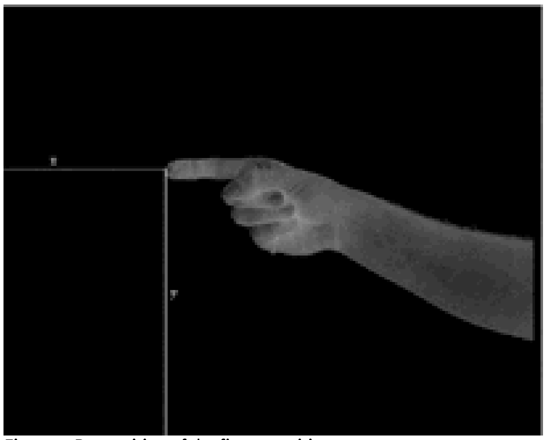

Figure 5. Recognition of the finger position

3 Summary and future work

It is shown that a system for the analysis of natural hand gestures in a virtual environment can be realised. The example of the GO game, which was presented here, serves only as one possible application. In the future we intend to enhance the GO2 system with a game logic. A further goal is the improvement of the hand gesture recognition, followed by an encapsulation of the different processing steps in order to realise a universally applicable user interface. We believe that such an intuitive control tool could be used as a mouse-driver, thus enabling the operation of many applications through the use of hand gestures. Finally, the analysis of other hand gestures is planned in order to expand the functionality of hand gestures as an input device.

4 References

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[4] Nebojsa Jojic, et al.: Detection and Estimation of Pointing Gestures in Dense Disparity Maps, in Proc. Fourth International Conference on Automatic Face and Gesture Recognition, Grenoble, France. pp. 468, 2000.

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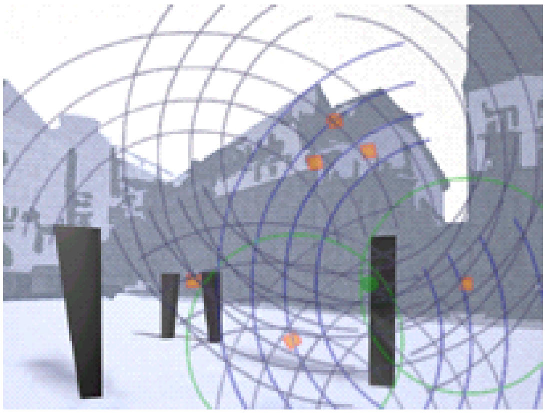

zone_01

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Summary:

The sound installation “zone_01” is designed for realization in public space. In the course of progressing technification, public space is losing its significance as space for communication. Instead it is primarily used as space for movement. Public squares are experienced as interruptions within paths of travel. “zone_01” simulates communicative processes and translates them into sound. The movement oriented use of the location is transformed into a sonorous simulation of the communicative function of such a public square and leads to changes within the system of sound.

Keywords: public space, sound sculpture, interactivity

Project URL:
http://www.ezaic.de/zone_01

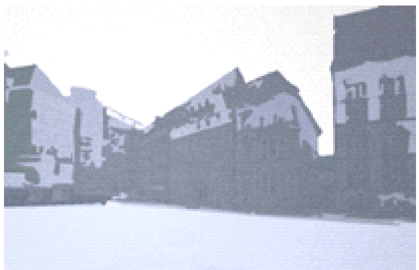
Year of Creation: 2001

Project Description

Public Spaces in the Urban Context

In accordance with the ancient paragon of the Greek Polis, the public squares in cities are intended to serve the communicative exchange among people. However, these spaces have not been a location for meeting, discussion and the exchange of news for a long time. They are temporarily used as market places on one or two mornings a week or as fairgrounds a few times a year. Their primary use today is that of a transitory space [1]. In conjunction with the other public spaces of a city, such as streets, they are experienced as interruptions within paths of travel.

One influence on this development can be seen in the continually growing medialization of the society and the spread of telecommunicative technology. These increasingly lead to a translocation of communication into private or semi-public spaces, which may be both real as well as virtual.



Communication and Potential

The installation zone_01 is a composition and interactive space for one of these temporarily functional public squares. It consists of eight differently grouped sound emitting objects which can be positioned in accordance with the characteristics of the specific location. Through the interaction of individuals or several users the sound structure experiences change. The sounds and rhythms generated by the installation in real time are synonymous for speech and verbal communication.

The basis sound is generated from white noise, which contains all frequencies and thus refers to the potential for communication. The rhythms and volume envelopes of the basis sound are not differentiated; they contain neither patterns nor periodicity.

In contrast to this is actual communication, which is represented by pitched sound of few frequencies. This pitched sound is generated from the basis sound. Its characteristics of rhythm and dynamics, however, resemble the periodicity and phrase oriented structure of speech and thus make reference to verbal communication.

The spectrum of possibilities between potential and actual communication are made audible through the interaction of passers-by on the square. The distance of an individual or of several people to the sound sources determines the degree of sonority and the differentiation of rhythmic and dynamic structures. The closer a person stands to the sound sources, the less noisy, and thus the more sonorous, differentiated and periodic the sound becomes. This transformation is audibly experienced as a seamless, gradual metamorphosis. In this regard, communication is experienced as segment of the possible, as well as the individual in contrast to the general.

In comparison to other installations, in which the spatial and sonorous characteristics of a given location are implemented into the work, for example through the composition of sound spaces in order to draw out the specific essence of the location [2], or through the transformation of the sound characteristics of the given location as an ordering principle [3], or by utilizing these means with the intention of offering the viewer and listener a new perception of these spaces, the objects and sound events spatially integrated into the given location in zone_01 are to serve the transformation of the transitory function of this location into a simulation of a communicative function of the same location and thus of a current potential for communication.

Composition and Fluidic Form

If one does not consider the concept of composition in the self-evident context of music but instead betakes oneself to another realm of thought, the principle upon which zone_01 rests becomes clearer.

When one observes architectonic approaches in cyberspace, such as in the work of Marcos Novak and Stephen Perrella, who formulate concepts such as “liquid architecture” or “hypersurface architecture” [4], a significantly different approach can be seen to that of the interventions into real space commonly considered architecture. The structures are bound to time. The laws of static are lifted, and form, subjected to a continuous flux, presents itself as a temporally limited condition. The composition is determined by the various parameters which constitute the flexibility of the form.

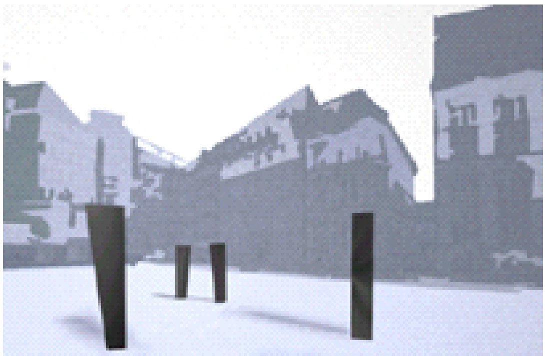
zone_01 is an experiment in the retransfer of a “liquid architecture” into the urban context. Thus, the integration of space in the project is not an attempt to remove sound from time and place it into space, in the sense of the work of Max Neuhaus [5]. Instead sounds, which are of their nature 4-dimensionally perceptible, are utilized as material for construction. Their temporal elements form a fundamental component of the compositional concept.

In accordance with this, the composition does not arise through the means of pre-programmed sound which follows a determined course. Although the eight sound sources have the same initial sound as their departure material, this sound assumes an individual character for each individual sound source through pitch transposition performed prior to the installation and the transformations influenced by the users.

Within the spatial field in which the installation is influenced by the users, every possible location is connected with a spectrum of pre-determined probability as to how noisy or sonorous the sound will be and how long and periodic the rhythmic phrases can be.

Even if the observer and listener remains at the same position over a certain period of time, he or she will not experience the repetition of a singular sound, but rather will experience a continually changing series of similar sound events. In the same way, if the observer walks towards the sound source and then back along the same path, he or she will not merely hear the same sounds in reversed order. In this case, the connection of the position to a probability results in an increase in the frequency of perceivable phrases and pitched sonority as the sound source is approached. The specific sound events will thus never repeat themselves although the condition and atmosphere remains the same.

The composition arises from the determination of the individual parameters that allow for a specific overall atmosphere and a limited number of combinations. They form the framework for a temporally open form which contains non-repeating rhythmic and phrase oriented structures and which emerges in real time through the interaction with the passers-by. The composition is thus not formless, but rather components of the form may be influenced in time, corresponding to the concepts of a “liquid architecture”.

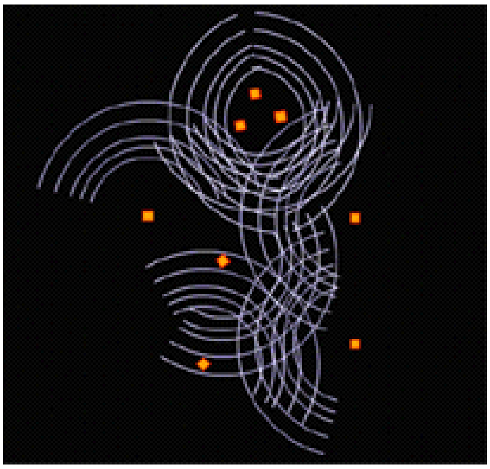


Technical Description

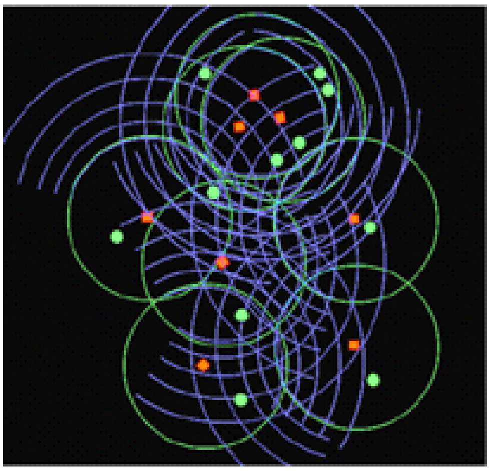
The installation consists of eight objects (approx. 25 x 25-40 x 200 cm), which are each equipped with a loudspeaker and a radar sensor to determine the location of the people on the square. The power supply occurs by means of integrated lead batteries. A computer with an 8-channel sound card can be housed in a building in the vicinity of the installation. The transmission between the sensors, the computer and the loudspeakers will prospectively occur by means of a radio network.

Examples of the Sound Events

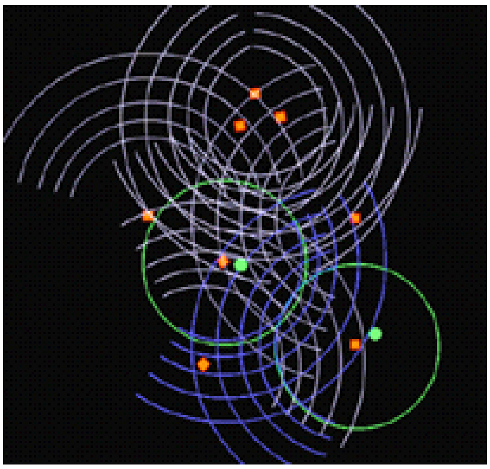
The following images are taken from the documentation of the installation at the above named website. The website also contains animations with the corresponding sounds from the examples presented here. The red squares represent the sound objects. Pale violet representations of the sound indicate impulses of white noise with non differentiated rhythmic structures and dynamic envelopes, dark blue, semi-circular waves represent sound in the spectrum between periodic, pitched sonority and non-differentiated white noise. The green circles show the region which is registered by the sensor located within the individual object. People are indicated by green dots.



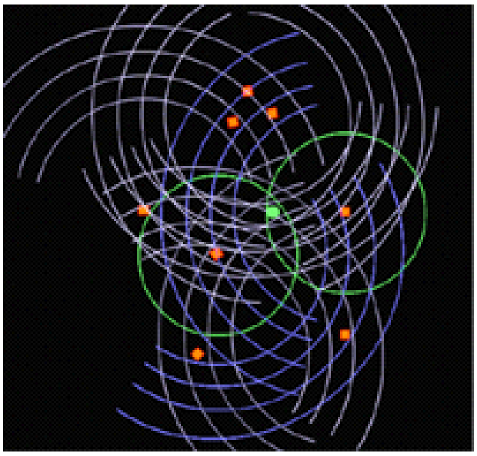
This figure shows a public square and the system without interacting persons. All objects emit impulses of white noise with non-differentiated rhythms and volumes.



This diagram shows the public square when it is occupied by many people. All objects are activated. The sound spectrum is predominantly sonorous. Through volume envelopes and differentiated rhythms, the tones are structured in groupings which resemble phrasing of speech. These are separated by rests of varying lengths. The parameters of the installation are defined such that a unified sound atmosphere and related rhythmic structures arise.



The above image shows two people, each within the sensor fields of one sound source. In this example the direct proximity of the people to the objects bring about pitched, phrase oriented sounds. The other objects emit impulses of white noise.



The last figure shows one person in the outer range of two sensor fields. Both objects emit sounds which are partially pitched, partially noisy and their rhythmic and dynamic qualities consist of occasionally phrased and periodic differentiations. The remaining objects emit noisy, dynamic, non-differentiated impulses.

References

[1] cf. Bart Lootsma “Public Space in Transition” in “Daidalos” 67/1998, Bertelsmann Fachzeitschriften GmbH, Gütersloh, p.116-123

[2] cf. Matthias Osterwold “Klangsuche“ in “Christina Kubisch - Orte der Zeit”, catalog from the exhibition of the same name, Kunstraum München, Städtische Galerie am Markt, Schwäbisch Hall, 1989, p.26-28

[3] cf. Achim Wollscheid “Performative Orders” in Selected Works - Achim Wollscheid, 2001, Selektion, Frankfurt a.M., p.7-8

[4] Peter Zellner Hybrid Space – New Forms of Digi-tal Architecture, 1999, Thames & Hudson Ltd., Lon-don, p.44-53 and p.126-135

[5] Max Neuhaus Place – Sound Works Volume III, 1994, Cantz Verlag, Ostfildern, p.5

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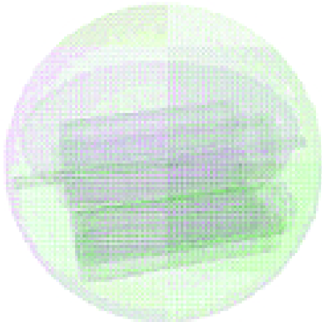

lab III for art-, media studies and computer science

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Abstract

Lab III at the Academy of Media Arts Cologne is an experimental space in the key area Art and Media Studies, especially Computer Science. The Lab educates and experiments with fully mobile computing facilities in open workshop situations and is regenerative in relation to its content.

Keywords: It hosts guests, fellows and special projects. Current topics of interest include: Interface technologies, Simulated Interfaces, Live Code Performances, Robotics Games, Self Modifying Media, Technovisionary Media, Neuronal Networks

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Project URL:
http://interface.khm.de/

Lab III productions:

His Master´s Voice
Volker Morawe/ Roman Kirschner

Good tone

His Master's Voice is a board game. The figures used in the game are semi-autonomous spherical robots that are sensitive to singing.

Encoding

The players have to sing to the various robots, and each robot reacts to a different pitch. When one of the figures detects the vibration for which it is encoded, it begins moving and can take part in the game.

The playing board

The robotic balls roll into position on a corrugated 9x9 grid. The playing board constitutes the communication area and serves as both a man-man and a man-machine interface.

Visionary.apparatus
Axel Roch

The visionary apparatus neither tool nor machine provides the individual observer the process of contemplation as an experimental and subjective sketch. The spectator experiences intensively and temporal a dynamical, flowing image.

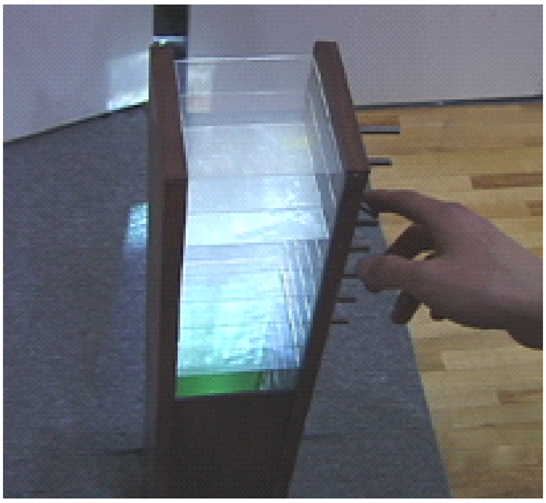
The interface between the subject and the object is an eye/gaze- tracking system that performs the selective and generative gazes of the observer into a subjective moment of looking. The gaze regulates in a meta-dynamical way the image not as data but the conditions of the permanent regenerative image systems itself. Here, the spectator does not appear in the image, he creates the process of seeing individually.

The touch between the gaze and the object, the movement of the eye as the observer's body are imprinted and expressed in fluid codes. The algorithms of technical visionariness adapt the history of the spectator dynamical in and through the process of looking. Here, subjectivity appears as cybernetical emergence.

Installation, 2001

Steirischer Herbst, Graz www.medienturm.at

poster



eight viewpoints

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Abstract

This work simultaneously recorded various activities which took place on the street. The images were captured over a wide range of space; it was approximately 50-meters. Within this space, activities such as people talking, shopping, people on their bicycles and so on, were recorded from eight different viewpoints. We compressed this recorded space and shut it into the small box. An actual distance has disappeared in the box. If you look into the box, you will be able to see various activities in everywhere easily. This is not only a vicarious experience.

Keywords: viewpoint, compressed space, simultaneity

Project UR:
http://www.iamas.ac.jp/~tomo2000/8viewpoints.ram

Year the Work was created: 2001

Introduction

"Eight Viewpoints" is a freer form of encountering the world of images. In this work, we have created a new method of recording and reproducing an actual, "real" situation. We placed eight digital video cameras in a straight line, and then filmed street life with all eight cameras simultaneously. In our piece, these images are stacked in layers at 3-centimeter intervals, and have been displayed in the same order as the cameras which photographed them. While the viewer is watching the images of recorded street life, he/she can change any or all of the eight viewpoints as he/she chooses, simply by touching one of eight touch-sensors located near each film.

This work resembles "See Banff !" in that, scene is continuously recorded along a way, and time and space appear compressed[1]. In "See Banff !", time and space correspond one to one. That is, once the viewer experiences it, he/she can see all scenes. On the other hand, in this work, the combination of time and space exist enormously. Therefore, the viewer will see new sequence of scenes whenever he/she experiences this work.

Aims of Research

Our aim in this work is to provide an experience not possible in the real world.

Project Description

1.1 System

This work is composed of a stack of eight UMU-FILMs and touch sensors at 3-centimeter intervals, a PC, projector and so on. Each touch sensor corresponds to an UMU-FILM. When the viewer touches the sensor, the UMU-FILM on the same level becomes translucent for as long as the viewer touches it. (When the viewer is not touching a sensor, all eight UMU-FILMs become transparent.) Simultaneously, an electrical signal is sent by way of the A/D converter to the PC, the PC outputs the image and sound that corresponds with the position of the sensor being touched. The image is reflected by a mirror and passes through the UMU-FILMs that are transparent, and is projected onto the UMU-FILM that is translucent. The images and the sounds that correspond with each level are replayed simultaneously, and are synchronized whether they are projected or not.

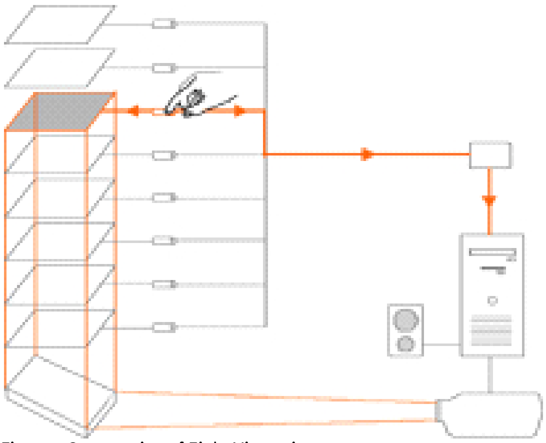


Figure 1 Construction of Eight Viewpoints.

1.2 The method of capturing images

The projected images were filmed at a local shopping street in Japan. We placed eight digital video cameras in a straight line at 5-meter intervals, and filmed street life simultaneously for four minutes. Each digital video camera corresponds to a different layer. The image projected on the first layer was filmed by camera A in Figure 2, and the image projected on the second layer was filmed by camera B. Thus, the images of the eight cameras correspond to the eight layers.

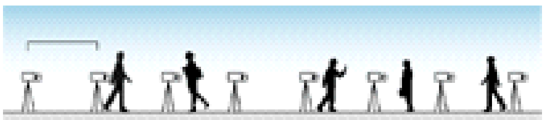


Figure 2 Arrangement of eight video cameras.

1.3 Section plan

The body of the work is put on the floor. A projector is placed horizontally on a floor, the images are reflected from a mirror and are projected onto each UMU-FILM, which is translucent. A projector, PC, and speakers are put in a space which is divided by fabric. The images are projected between the floor and the fabric.

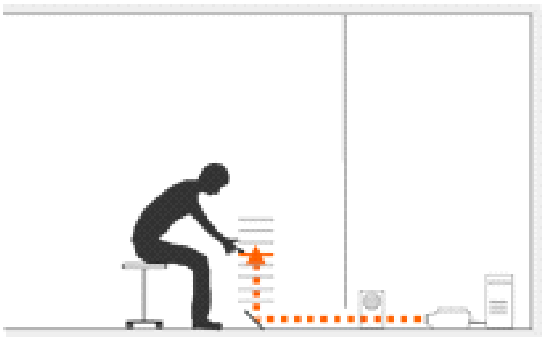


Figure 3 Section plan

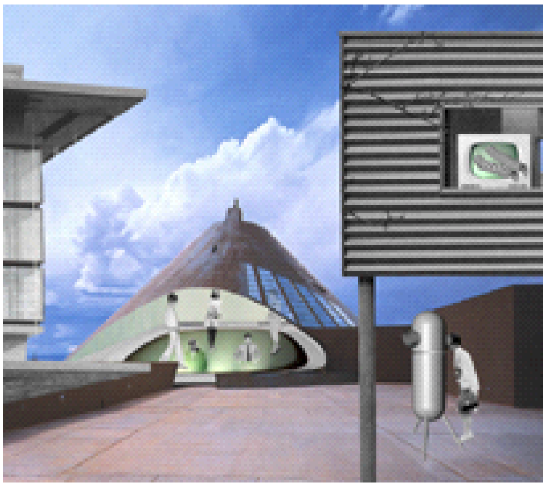
1.4 Conclusion

We consider the new method of experiencing the space recorded by the method used with this work. First of all, there is a problem which we have to solve at the present stage. It is the problem of a focus. In this work, the focus of a projector is fixed although a projection screen moves. Therefore the projected images go a bit out of focus partially. We are going to enable it to adjust a focus according to the position of a projection screen.

Reference

[1] Michael Naimark, "See Banff !"
http://www.naimark.net/projects/banff.html

poster



spaceinva.de

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Abstract

Spaceinva.de is a new format for exhibitions. Its primary goal is that people meet each other in different exhibition spaces online. They can influence through their position the installation in this space.

Keywords: Ausstellungsplattform

Projekt URL: http://www.spaceinva.de

Entstehungsjahr: 2001

Projektpartner: Diplomarbeit an der Bauhausuniversität Weimar, Prof. Wentscher / Prof. Sattler / Prof. Bauer-Wabnegg

Einleitung

»Denn welchen Zweck hätten sonst all die Kabelnetze und die künstliche Intelligenz, wenn nicht den, uns aus der Entfremdung heraus- und einander näher zu bringen.« Vilém Flusser

Das Teleportieren von Menschen ist ein alter Menschheitstraum. In einer Zeit, in der mittlerweile mit großer Selbstverständlichkeit Bilder, Töne und Texte gebeamt werden, wird die Umsetzung dieses Traums vorstellbar. Dieser Traum liegt unserem Entwurf zugrunde.

Wir wollten Räume schaffen, die - mit massenhaft verfügbaren Mitteln unserer Zeit - überall von überall zu betreten sind. Wir beamen dabei allerdings nicht den Körper, sondern seine Fähigkeit, in Interaktion mit seiner Umwelt zu treten.

Forschungsziele

Museen oder Ausstellungen nutzen das Internet fast ausschließlich als Informations- oder Archivierungsmedium. Wird das Internet dann als Ausstellungsmittel eingesetzt, wird auf den Besuch im architektonischen Raum vollkommen verzichtet (Netzkunst).

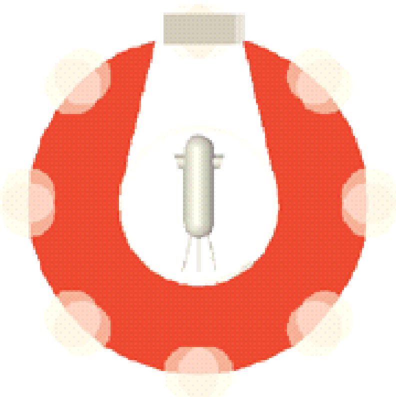
»(...) deshalb kommt es zu dem ironischen Anachronismus, dass wie noch im 19.Jahrhundert der Kunstbetrachter zum Reisenden werden muss, um die Orte der Kunst bei Festivals und Medienausstellungen aufzusuchen, wenn er ihre interaktive Qualität erfahren will.« (Dieter Daniels, www.hgb-leipzig.de)

Ziel bei uns war es, dem Internetbesucher eine wirkliche Präsenz im Ausstellungsraum und damit eine direkte Teilnahme an einer Installation zu ermöglichen.

Besonders wichtig war uns, dies mit so einfachen Mitteln wie nur möglich zu erreichen, weil vor allem Personen spaceinva.de zum Ausstellen nutzen sollen, die bisher nur komplizierte Technik kennengelernt haben und dadurch abgeschreckt wurden.

Projektbeschreibung

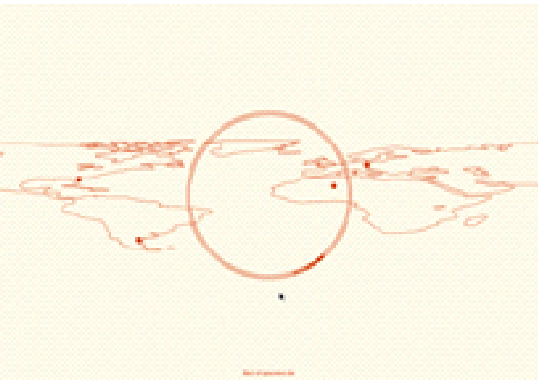
spaceinva.de ist eine Ausstellungsplattform. Bei Bedarf können einzelne Ausstellungsräume angeschlossen werden.

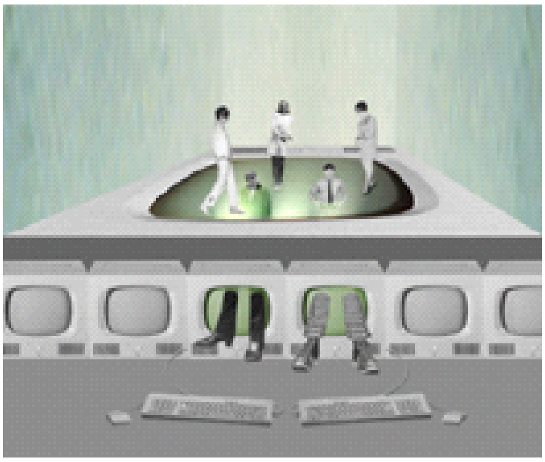


Das Fernrohr

Das zentrale und verbindende Element ist ein Fernrohr, da sich das Bild des Fernrohrs besonders gut als Metapher für die Überwindung der Ferne eignet.

Das Fernrohr findet sich auf beiden Zugangsebenen wieder - als Internetportal und als real existierendes Objekt. Es bietet auf beiden Ebenen Einblick in die verschiedenen Ausstellungsräume.





Die Ausstellungsräume

Über Räume befragt, antwortete Flusser in einem Artikel in der Arch+, dass in unserem Lebensraum der kubische Raum keine Bedeutung hätte: »Wir wissen nicht wieviel Kubikmeter unser Haus hat. Im Lebensraum ist das Interessante das Quadrat. Wir wissen, unser Haus hat soundsoviel Quadratmeter.«

In den Ausstellungsräumen nehmen deshalb anwesende Personen eine Position auf der Grundfläche des Raumes ein. Auf der Webseite ist diese Grundfläche der Bildschirm, im realen Ausstellungsraum ist diese Grundfläche der Boden.

Die Überlagerung dieser beiden Flächen ergibt einen Ausstellungsraum unserer Plattform.

Alle Personen, die nicht körperlich anwesend sind, erhalten einen Platzhalter. Zum Beispiel durch die Darstellung von Fußabdrücken werden die Positionen der Internetbesucher im realen Ausstellungsraum wieder wahrnehmbar.

Technik

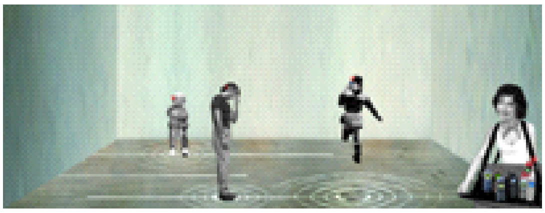
Momentan sind die Anforderungen an Mensch und Technik sehr hoch, um Telepräsenz mit körperlicher Anwesenheit zusammenzubringen. Wir versuchen diese Anforderungen an das Know-how und an die Kosten zur Nutzung der Technik zu minimieren.

Die Technik der Ausstellungsräume ist ein montierfähiges System, das gestellt wird und leicht aufzubauen ist. Personen – die keine Lust haben, sich mit der Technik auseinanderzusetzen. oder keinen Zugang zu solcher Technik haben – soll es leicht und schmackhaft gemacht werden, in und mit einem Raum zu arbeiten, der körperliche wie körperlose Anwesenheit kennt. Um den Internetzugang zu gestalten, bedarf es des Programms Director von Macromedia. Das Programm ist weit verbreitet und – trotz sehr offener Struktur – relativ einfach zu lernen und zu beherrschen. Außerdem gibt es eine große Anzahl von Personen, die sich mit dem Programm auskennen, so dass es jederzeit möglich ist, sich Hilfe von Spezialisten zu holen, oder die Programmierung abzugeben. Im realen Ausstellungsraum erkennt eine handelsübliche Webcam die Personen, ein Beamer projeziert die Platzhalter (z.B. Fußabdrücke) der Netzbesucher auf den Boden.

Installationen

In der Ausstellungsplattform sollen Ausstellungsstücke gezeigt werden, welche bestimmte Voraussetzungen erfüllen. Sie müssen den Möglichkeiten des speziellen Raumes entsprechen, d.h. auf dem Bildschirm wie im physischen Raum eine Form erhalten können. Sie sollen mit der Anwesenheit der Personen arbeiten und sich dafür interessieren, sich einem Publikum zu öffnen, welches den physischen Ausstellungsort nicht körperlich besuchen kann.

Callcenter



›callcenter‹ ist eine interaktive Klangcollage. Vor der Teilnahme an der Installation wird jeder Besucher von unserem freundlichen Handygirl Melanie eingewiesen und mit einem Handtelefon (Hand/tele/fon: Synonym für mobiles Telefon oder ›Handy‹) der neuesten Bauart (LED-Standard) ausgestattet. Der LED-Standard ist eine technische Weiterentwicklung des UMTS-Standards, bei dem im wesentlichen die komplizierte Technik durch eine LED ersetzt wurde. Der Besitz eines solchen Handtelefons ist sehr viel billiger und es fallen keine Gesprächskosten an, weil nicht mehr über den Umweg der Sprache, sondern direkt über Aktion kommuniziert wird. Das Gerät konzentriert sich auf seine primäre Aufgabe – dem Aussenden von Klingeltönen im öffentlichen Raum. Jedes Handy ist von der ›Callcenter-Creativity-Crew‹ (CCC) vorher individuell auf höchstem künstlerischen Niveau gestaltet worden.

Die Netzbesucher können sich ein Handtelefon als Platzhalter aussuchen und die Realbesucher werden anhand der Handtelefonattrappen, die mit einer Leuchtdiode ausgestattet sind, vom Kamerasystem erfaßt.

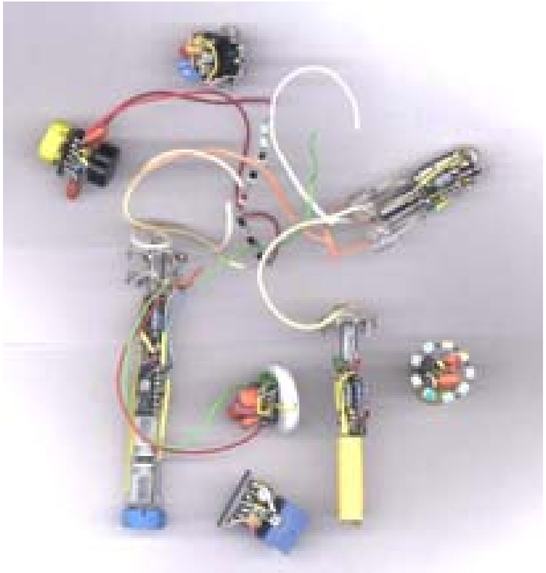
Das Handy wird in dieser Installation seiner Fähigkeit zur Sprachübermittlung beraubt und damit seinem Grundnutzen - eine verbale Kommunikation zwischen Menschen zu ermöglichen. Was übrigbleibt ist die Hülle (ein Schmuckstück) und bestimmte Zeichen und Gesten, die jedoch durch das Fehlen ihres ursprünglichen Nutzens, verstärkt wahrgenommen werden und komisch erscheinen. Und doch wird eine neue Kommunikation aufgebaut, indem die Personen zusammen das Raumsystem steuern. Aus einer privaten, wird eine öffentliche Kommunikation. Es interagiert nicht mehr eine Person mit einer anderen Person, sondern alle Anwesenden interagieren zusammen.

Worte und Wellen als Auslöser

Schallwellen und Funkwellen im Mikrowellenbereich sind das Medium mit dem in der mobilen Telefonie übertragen wird, so auch bei Callcenter. Im Interaktionsraum werden Worte auf den Boden projeziert. Sobald ein Besucher an eins dieser bewegten Worte stößt, sendet er eine Welle aus – er ruft sozusagen jemanden an. Wenn die Welle wiederum einen anderen Besucher trifft, wird ein Handyklingelton ausgelöst.

Unsere Ausstellungsplattform ist eine Erweiterung der bestehenden Ausstellungslandschaft. Sie ist kein Ersatz für herkömmliche Museen oder Galerien, weder soll sie als herkömmliche Internetseite für diese Institutionen dienen. Die Plattform schafft Räume für Ausstellungen, die keinen Unterschied machen zwischen anwesenden und teleanwesenden Besuchern.

poster



living particles

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Abstract

Living particles / Living systems is an installation that consist of many different electronic particles, which are suspended from elastic bands and together form a living system. The individual components receive their whole energy from solar cells with the size of lentils, which are connected in series. The electronic connections imitate a nervous network with positive and negative feedback that is rhythmically intensified. There are three different types of particles in the system. One creates quit, variable sounds, the other move. Special particles combine these two, create connecting points and feed their energies back. The amount of movement of the individual particles is dependent on the intensity of light and the level of agitation of the neighbouring particle. A change in position changes the intensity of the light and consequently the sounds that are being created.

The distance between the sounding particles are such that under perfect conditions (relative silence and enough light) they develop a fragile net of quit ever changing sounds.

Entstehungsjahr: 2000/2001

Keywords: Living Particles, Solarroboter, Nervous Networks , Mark Tilden, BEAM (biology ,electronics, aesthetics, mechanics), Artificial Live

Project Partners: academy of media arts cologne

Einleitung

Seit ca. 1 1/2 Jahren arbeite ich mit nur zwei einfachen elektronischen Schaltungen, der Suneaterschaltung und der Solarsoundmodulschaltung. Die Suneaterschaltung wurde von Mark Tilden Mitte der 90 Jahre beim MIT entwickelt, und erlaubt es kleine Motoren gepulst mit Energie von Solarzellen anzusteuern. Die andere Schaltung, das Solarsoundmodul, habe ich selber 1996 entworfen, sie generiert mit minimalem Energieaufwand leise sich ständig verändernde Töne. Diese Schaltung imitiert wird dabei dabei ein Nervous Network und basiert auf einer Verschaltung von drei Oszillatoren, die permanent um die verfügbare geringe Energie konkurrieren.

Erst durch die Mangelversorgung (das elektrische Potential entspricht dabei dem in biologischen Systemen) bilden sich positive und negative Rückkoppelungen, die sich rhythmisch und chaotisch verdichten. Mit den variablen, leisen Geräusche assoziiert man unwillkürlich Insekten- oder Vögelgeräusche, das Solarsoundmodul ist somit ein Fakeorganismus, der den Rezipienten vor die Frage nach Möglichkeit und Machbarkeit im Hinblick auf neue

Technologien, und dem Verschwimmen der Grenzen zwischen biologischer Realität und Vision stellt. Mit diesen zwei Schaltungen habe ich verschiedene Miniaturroboterfelder gebaut, die sich von anderen Solarrobotern dahingehend unterscheiden, dass sie neben der Bewegung auch minimale Geräusche produzieren und dadurch permanent präsent sind. Neben den Roboterfeldern habe ich die Schaltungen auch in anderen Bereichen untersucht, so habe ich diverse Workshops angeboten, Solarroboter im urbanen und privaten Raum ausgesetzt/installiert und Anbindungen an reale Pflanzen versucht.

Folgende Projekte sind entstanden: Projektbeschreibung

Entstanden sind verschiedene Roboterfelder, als Beispiel eine Beschreibung des letzten Feldes:

Living Particles / Living Systems 2001

Ist eine Installation aus vielen kleinen verschiedenen elektronischen Partikeln (ca. 40 Stück), die an farbigen Gummischnüren hängen und zusammen ein "Lebendiges System" bilden. Die gesamte Energie beziehen die einzelnen Komponenten aus linsengroßen Solarzellen, die zu Ketten verschaltet sind. Die elektronischen Schaltungen imitieren ein Nervous Network, in dem sich positive und negative Rückkopplungen bilden und sich rhythmisch verdichten. Im System gibt es drei verschiedene Partikeltypen, die einen erzeugen leise variable Sounds, die anderen bewegen sich. Spezielle Partikel verbinden diese zwei Typen, bilden Knüpfpunkte und rückkoppeln deren Energien.

Die Bewegungshäufigkeit der einzelnen Partikel im System ist abhängig von der Lichtintensität, und dem Erregungszustand der benachbarten Knüpfpartikel, wobei sich mit jeder Positionsänderung minimal die Lichteinwirkung und damit auch die erzeugten Töne verändern. Die Abstände der Klang erzeugenden Partikel untereinander sind so gewählt, das sich unter optimalen Bedingungen (relative Ruhe + ausreichend verfügbares Licht) ein fragiles Netz aus leisen sich permanent verschiebenden Tönen entwickelt.

Workshops

In den Workshops, die ich seit November 2000 unterstützt von Miki Yui anbiete, können die Besucher selber Solarroboter bauen und mit nach Hause nehmen. Da die Teilnehmer die Sounds selber, durch experimentelles Testen, einstellen können, kommunizieren sie in den Workshop eben auch über diese minimalen Klänge, der Klangcharakter spiegelt auch einen Teil der Persönlichkeit des/r Erbauers/in.

Interessant ist, dass diese Entsprechung mittels einer Nervous Network - Schaltung passiert, es gibt eine nonverbale Kommunikation über Maschinen und eine verbale über diese selbst.

Da die Schaltungen die definitiv einfachsten klang erzeugenden Schaltungen sind, ist die geführte Kommunikation eine der einfachsten und rigidesten mit und über ein elektronisches Medium.

Urbaner Raum

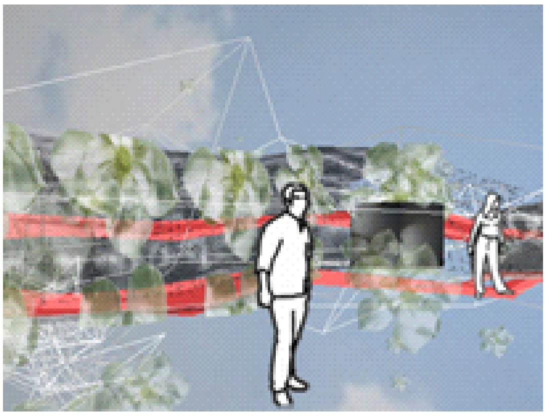
Seit Anfang 2000 habe ich angefangen einzelne Solarsoundmodule und Solarroboter im urbanen Raum auszusetzen, vorwiegend in beruhigten, kaum frequentierten Randzonen (Bahndämme, Grünflächen- bis heute 26 Stück). Diese Miniaturroboter sind besonders laut (akustische Reichweite bis zu 20 m) oder funktionieren erst nach Sonnenuntergang, und treten dadurch in Konkurrenz zu nachtaktiven Insekten. Untersucht habe bei regelmäßigen Besuchen, Funktionalität, Haltbarkeit und Reaktionen von Tieren (Vögeln + Insekten).

Conclusio

Die Solarroboter sind für mich nunmehr sehr spezielle Maschinen, weil sie mit minimalen Mitteln schnell gebaut werden können, dann aber sehr lange (mehrere Jahrzehnte) agieren und einen bestimmten Platz, einen akustischen und auch realen Ort beanspruchen, d.h. ein gewisser Raum ist mit diesen zu teilen.

Obwohl die Solarroboter/Felder sehr spielerisch wirken, artikulieren sie existentielle Fragen nach den Schnittstellen und Brüchen zwischen Mensch und Maschine. Auf den ersten Blick unspektakulär fungieren die Miniaturroboter dabei als Referenzmaschinen, die gerade soviel Aktion und Eigensinn zeigen, um im alltäglichen Lebensraum präsent zu sein. Die Arbeiten stellen somit auch die Frage ob Surrogate das sog. Erhabene, Sublime - das sonst nur der lebendigen Welt zugestanden wird- letztendlich ersetzen können.

poster



recombinant realities:

the design of a multi-user environment in cyberspace

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vdmoere@arch.ethz.ch, patrick@fabric.ch

Abstract:

The combination of the field of architecture and currently available multi-user technology could be considered as an ideal testbed for designing the vision of shared cyberspaces. A concrete CAAD course is described to demonstrate how architectural knowledge is used to create a virtual exhibition inside an online, three-dimensional, avatar-based environment. Furthermore, the theme 'Recombinant Realities' is proposed by fabric | ch [1] as an imaginative layer that tries to connect and elaborate the various ideas proposed by the different student groups. This concept represents a hybrid and mutated reality, as it suggests that real and virtual environments can be ultimately connected and mixed. Additionally, some issues dealing with the technical implementation and the remote collaboration process involved are explained. As a result, the created electronic world itself proves how both artistic and academic domains can merge their conceptual ideas into a creative and educational course.

Keywords: multi-user environment, collaborative media space, interactive environment, virtual exhibition, cyberspace

Project URLs:
http://caad.arch.ethz.ch/teaching/praxis/ss00/
http://www.fabric.ch/La_Fabrique01/

Year the Work was created: 2000

1. Introduction

'Recombinant Realities' is the name of a series of online exhibitions, featuring the creative works of different groups of artists and architects. Their digital creations are set inside a virtual, three-dimensional environment, which is enriched with a set of interactive multi-user features.

The entire event, called 'La_Fabrique', was originally initiated and organized by fabric | ch [1], an electronic architecture firm based in Lausanne, Switzerland. The Chair of Architecture and CAAD at the ETH-Zurich was kindly invited to take part as the second collaborating group in the event's structure of four successive phases. Senior students and teachers of the elective CAAD praxis course were offered the opportunity to create digital art/architecture installations inside various pre-defined, virtual rooms. These spaces acted as metaphorical containers that enclose the borders of the design concepts and inherit at the same time the dynamic community life generated inside the whole surrounding exhibition environment itself.

The title 'Recombinant Realities' provided a common conceptual thread among the various installations in the exhibition. Even more, this imaginative phenomenon of co-existing and interwoven experienced realities was proposed as a possible theoretical framework to understand and design cyberspaces.

In the final stage, the resulting digital collection of files were hosted and thus opened to the public on the '2nd World' [2] website of Canal+, a large French subscription-based television channel consortium.

2. Places in cyber-'space'

Places in cyberspace are mostly software constructions, creating artificial environments of interaction, virtual realms that humans can enter. Basic examples of this point of view can be surprisingly simple and well known, like a one-dimensional place in the text window of a word processor, a two-dimensional desktop surface, a three-dimensional virtual room, or even a N-dimensional place in an abstract data structure. Just like architectural and urban places, all these manifestations have characteristic appearances, and the interactions within are controlled by pre-defined rules.

Since the cyberspace description of 'Neuromancer' [3], the connection between electronic places and the field of architecture can be linked to some interesting visionary thoughts. For instance, Michael Benedikt [4] is convinced that scientifically and poetically minded architects, schooled in computer science, programming and abstract design, should start to design by first creating 'crude' and 'fragile' 'cyberspaces' with a limited number of users, out of which the most essential design and interaction lessons can be learned. For William Mitchell, the notion of 'human habitat' is being reinvented, as “the new urban design task is ... writing computer code and deploying software objects to create virtual places and electronics between them. Within these places, social contacts will be made” [5]. Dace Campbell [6] in turn is convinced that the design of virtual architecture will require the expertise of traditional three-dimensional designers. Finally, many of the projects presented by the Chair for Architecture and CAAD of ETH-Zurich [7] try to demonstrate how architecture and cyberspace can enrich each other in a continuous creative relationship.

Already at the early conception of the term ‘cyberspace’, the analogy of the city was used to illustrate the hybrid structure of the electronic realm. Nowadays, many online virtual worlds such as Cybertown [8] and Activeworlds [9], demonstrate large-scale, graphical and shared environments in which different forms of interaction are possible, but design and theory do not play an important role. In this project, however, we brought the concept of ‘Recombinant Realities’ together with the Chair’s multimedia background, to introduce a possible approach to design engaging electronic spaces.

3. The design process

3.1 Collaboration

Most of the course was driven forward by a process of distant collaboration, demonstrating a new way of organizing electronic exhibitions through private work galleries. Several videoconferences were organized so the authors could discuss their design ideas and technical difficulties with the exhibition curators. To support the work process, a course website offered the authors various useful pointers to time and assignment plans, sources, texts, tutorials and FTP-accounts. Additionally, all the participants had access to more classical tools, such as a mailing list and a multi-user chat room within the given pre-built environment. This gave the opportunity for the different partners to directly meet and discuss inside the virtual structure.

3.2 Learning process

In a unique collaboration with the external exhibition curators, students had to react upon a ‘real’ assignment that in the end would be extensively used by a wide audience. The exhibition authors had to be technically capable to express their creativity and ideas inside a digital, three-dimensional reality. Therefore, they were introduced to some of the software packages and multimedia techniques that are commonly used for three-dimensional online publishing. These essential tools included a modeling program (3DStudio Max), a video editor (QuickEditor), and a VRML (Virtual Reality Modeling Language) authoring application (CosmoWorlds), next to some hand-written VRML programming.

Divided into small teams, the participants were challenged to use their architectural knowledge to design a new kind of virtual environment, meanwhile dealing with the concept of 'Recombinant Realities'. In the initial process, mainly small experimental prototypes were being programmed, so the authors got the chance to get accustomed to the collection of newly learned tools. At the same time, new insights were discovered, learned, discussed and studied in the context of the whole group.

3.3 Technical issues

Essentially, the project coordinators provided the authors with a small set of interlinked files that had to be 'filled' with meaningful and conceptual content. In this course, the three-dimensional environments were being built based upon VRML technology. By using this well-known standardized programming language, the students were offered a wide palette of powerful tools, such as a low-level scene graph, animation, scripting, sensors, sound and light nodes. Together with VRML’s high degree of interactivity, user control and the simultaneous blending of two- and three-dimensional objects and multimedia effects, these features give virtual architects the ability to design interactive and dynamic virtual worlds.

The appearance of the avatars inside the environment was chosen to be variable. Online users could be represented by floating IP numbers, flat humanoid billboards, or dynamically animated, three-dimensional human look-a-like actors, depending on the used Internet browser plug-ins, such as blaxxun [10] or rhizoreality.mu [11]. Furthermore, in order to be easy accessible for ordinary Internet users, each of the installations was allowed a maximum of 250 kilobytes of compressed storage space, including sounds, video, images and VRML code. This strict constraint proved to be an important design guideline throughout the project.

4. Recombinant Realities

4.1 Concept

Defined by fabric | ch, the concept of 'Recombinant Realities' is a thematic playground that is supposed to be used and shared among the different creators involved in the whole exhibition event. The overall project is understood as a 'crash test' environment for new ideas shared along the working process, as the pre-defined digital environment can actually be totally modified by the participating authors.

Conceptually, 'recombinant’ is a word most often used in a biological context, to describe a genetically modified organism or cell. Here, the idea of Recombinant Realities consists of the network, the electro-waves and the digital spaces, that all represent the emergence of an extended reality that adds itself to the already existing environment. This augmented reality is a deformed expression, an accelerated evolution of society with which our physical world constantly interacts. Following P. Theilard de Chardin [12], this could be described as a new layer of information, the so-called ‘noosphere’, which adds itself to the already existing ‘biosphere’. Being in a continuous relation to each other, they enter a process of information exchanges (energy, order, ideas,...), out of which new landscapes and territories are emerging. New architectures, social relations and forms of communication that we can call 'recombinant' are emerging as well. For instance, the quality of space, of the air (electromagnetic waves) has been changed. Our physical body, our individual identity and the relations we have with the outside world as human beings, and other things are modified and altered.

Similarities can be discovered with the basics of information theory by Claude Shannon [13], and also Norbert Wieners' writings on cybernetics [14]. These theories describe physical and energy relations between nature and machine, man and machine, and in particular, man and computer, considering everything as information/entropy, even mankind.

4.2 Space exclusion

As a unique feature of this environment, the virtual exhibition rooms were essentially interpreted as a collection of electronic files. These files can thus be shared, but posses no fixed 'place' inside the world coordinate system of the virtual space. Subsequently, this concept allows several avatars to see and interact with each other within certain commonly distinguishable space boundaries, although these users could possibly perceive a different room surrounding them. It should be noted that this feature is in clear violation of Benedikt's 'Principle of Exclusion', which states "you cannot have two things in the same place at the same time"[4]. Own research [15] proved that this restriction could nevertheless be an interesting 'quality' of electronic worlds that, according to Marcos Novak, "allows a poetic merging of objects into evocative space"[16].

As no one is really sure what the others are looking at or interacting with, different realities become 'recombined'. Consequently, the project reached some paradoxes regarding the typology of possible future cross-relations between virtual and real spaces, their architecture as well as the type of relations they maintain: one can see different spaces while being at the same virtual place, but one can also have his body and mind immerged in a virtual room while being physically present in another real room. As real and virtual realities become both (re)mixed spaces, their architectures should take this new paradigm also into account.

5. La_Fabrique

The gallery/file system environment, called 'La_Fabrique', is made out of four different and distinct areas. Textures and sounds were taken from a recording trip during ten seconds inside the apartment of the designer. The main access file uses switch nodes on top of stairs/arrows to go directly into the separate galleries or files. Two galleries enclose the temporary rooms that are displaying the works of the individual participants and other unpredicted content. A URL gallery possesses the links to thematic works and other relevant online references.

Visitors were able to 'jump' from one room to another by walking through fixed, texture-mapped boxes that represented digital doors. Furthermore, a console revealing the faces of the artists offered users a more direct way to choose the separate installations.


Figure 1 La_Fabrique

Most of the works contained highly interactive features. Various dynamic sounds and events, triggered by certain user actions, augmented the experience of immersion. Ultimately, it can be concluded that the careful use of different kinds of multimedia proved to be essential for the quality of the individual works.

Cyberspace was seen as a truly conceptual space, capable to be 'filled' with context and content that links to, and re-uses, reality. For instance, one author saw the virtual space as a living organism with its own unique wishes and desires, to which the user's avatar had to react and got rewarded (Fig. 2).

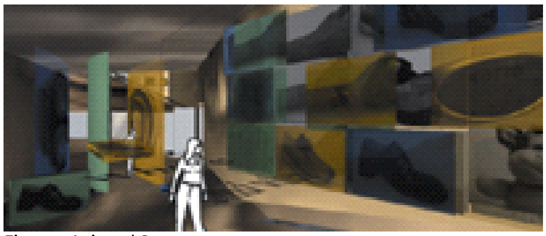
Figure 2 Agitated Space

More poetic concepts that touched on the dreams and concerns of everyday life treated the pre-existing spaces as contextual borders that enclosed their personal possessions, as a private gallery of their minds (Fig. 3).

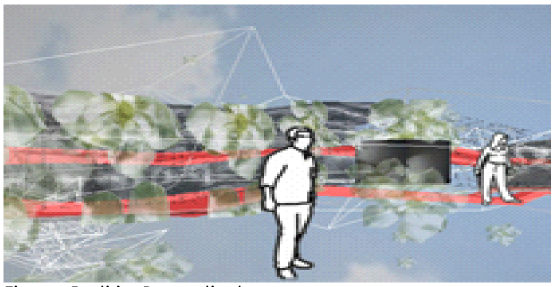
Figure 3 Realities Personalized

The lack of gravity, for example, inspired some students to interactively alter and rotate the entire environment in a dramatic way, so that the drastic changes in space-perception could be explored (Fig. 4).


Figure 4 Dynamic Labyrinth

One participant understood cyberspace as a metaphorical space in which a spatial timeline and a set of personal sounds guided the users through her current curriculum vitae (Fig. 5).

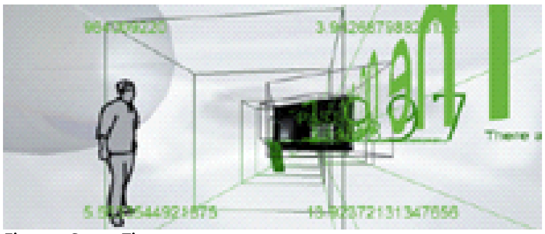

Figure 5 Space-Time

6. Conclusion

The participants learned to collaborate with artistic minded partners from outside the academic world using various communication means. Furthermore, they worked with new technical multimedia tools to design content-rich three-dimensional virtual worlds. The authors also dealt with the concept of Recombinant Realities, a rich playground in which many metaphorical relations could creatively be brought forward. By providing them with this framework, they stepped away from architectural simulations, instead considering cyberspace as a phenomenon that deserves its own design language and theoretical background ideas.

Conceptually, the architectural students differed with the other participating groups of the event in the way they were concerned about the quality of the modified space itself, as they concentrated more on some of the yet unexplored architectonic aspects of digital, shared spaces.

It could also be remarked that the educational strategy was based upon the successful implementation of the online exhibition, which was meant to be seen by the wide public. Consequently, the students were highly motivated and felt responsible for the technical, conceptual and aesthetical qualities of the whole work. Many discussions within the group and between the partners of the project, consisting of people of different professional and cultural backgrounds, proved to be inspiring and instructive. As a result, the created electronic world itself proves how both artistic and academic domains can merge their conceptual ideas into a creative and educational course.

7. Acknowledgements

We would like to thank the students for their creative work and Maia Engeli, the professor of this course, for her valuable comments on this paper. We like to mention Christian Babski and Christophe Guignard, both of fabric | ch, for their valuable help and support.

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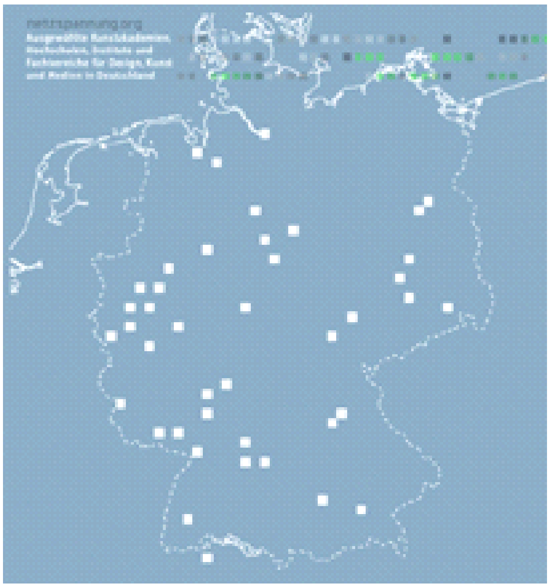


digital sparks

a cartography of innovative media projects at german-language higher education institutions

>digital sparks< is a publication and support project for the most interesting student projects each year at German-language institutions of higher education in the fields of media art and design and media information technology.

Goals

With digital sparks, netzspannung.org aims to give a structured insight into the work of young German-speaking artists in media art and design and media information technology.

digital sparks aims to show the potential that lies in the training of scientists and artists in the field of media, and the importance of training of this kind.

An annual virtual exhibition is to make the diverse students' projects accessible to the general public.

The interplay of artistic and design-related, social and technological skills is becoming increasingly significant in the development of the new media. One prerequisite for this is interdisciplinary exchange of experience. In order to promote exchange of this kind, the students' work will be placed on the Internet platform netzspannung.org into an environment that reflects current media-related issues in art and technology.

Content

The students' projects are to demonstrate how professors and their students reflect and experiment on design, the transmission of meanings and on specific approaches in the use of digital technologies.

Participation

The invitation to submit projects online to >digital sparks 2001< was aimed at professors and students at 60 different institutions of higher education in Germany and Switzerland. The focus lay on interactive, experimental work based on networks and/or showing innovative use of media technologies.

52 projects were entered. Following internal inspection, each project was evaluated by two experts. Of the 23 projects that were categorised as "very good", an independent panel of judges selected three as "excellent". All 53 project entries will be presented at cast01 in the form of a virtual exhibition on the netzspannung.org platform. The three winners will be introduced and presented with prizes.

workkshop / digital sparks 2001

After the conference, the three prizewinners will be invited to a workshop at Schloss Birlinghoven. This will give them the opportunity to develop a new concept.

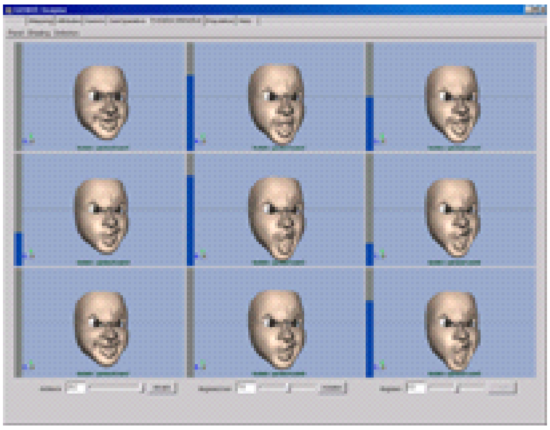
The most interesting of the three new concepts is then to be implemented with the support of the Fraunhofer Institute for Media Communication.

digital sparks 2002

In order to ensure that the projects submitted are to a greater extent in the hands of the students, from 2002 onwards any student of media art, media design or media information technology can submit a project via the “Netzkollektor” of netzspannung.org, if a supervising lecturer in higher education writes a brief statement on the project and the area of study in which it was developed.

Ulricke Boecking

digital sparks awards 2001 – „GENIUS Bodybuilder - a tool for the avaLUTION of EVOtars“



Martin Schneider und Fabian Härle, Institut für Medientechnik der Technischen Universität-Ilmenau, - Prof. Dr. Karl-Heinz Brandenburger, Postfach 10 05 65, 98684 Ilmenau,

martin.schneider@rz.tu-ilmenau.de

GENIUS Bodybuilder is a tool for the evolutionary design of arbitrary closed surface objects in 3d space. Its main field of application is the creation of avatars and virtual characters. Genius supports both userguided interactive evolution and automatic evolution using physical and optical sensor modules. The current implementation " Genius Sculptor " is used to create individual avatars out of prototypes by shape blending and free form deformation. The next step " Genius Creator " will be concerned with the creation of arbitrary forms using embryology, L-Systems and Cellular Automata.

http://www.rz.tu-ilmenau.de/~marsu/genius/

Judges comments

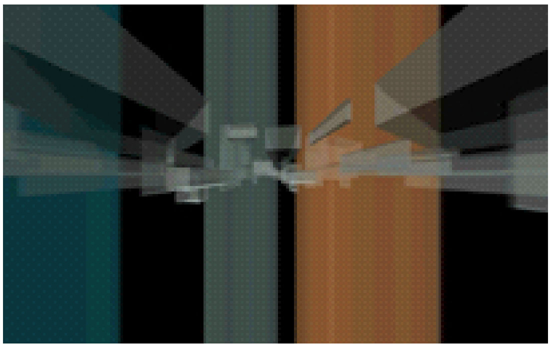
"GENIUS Bodybilder" - a tool for the avaLUTION of EVOtars,

is a plug-in for "maya" graphics software for the development of closed, random 3d surfaces on the basis of algorithms that can be influenced using evolution. Its main area of application is in the development of avatars and virtual characters. "GENIUS Bodybilder" was developed by Martin Schneider and Fabian Härle in 2001 as a seminar project at the Media Technology Institute at Ilmenau Technical University, under the supervision of Professor Dr. Karl-Heinz Brandenburger.

The pane of judges recognises "GENIUS Bodybilder" as a seminar project of astonishing maturity, as the use of evolutionary programming principles has been developed as a plug-in for a standard software, right up to finding a practical application. This software means that individual modelling is no longer necessary for the design of avatars and virtual characters.

Figures can now developed by combining and selecting "evolutionary" design parameters, such as pairing and mutation. The goal of the basic research associated with the project, to derive "basic genetic structures" for software development from existing 3d forms, is promising.

digital sparks awards 2001 – "STADTWIRKLICHKEIT"



Sascha Kempe und Michael Wolf , Fachbereich Design der Fachhochschule Köln Prof. Gui Bonsiepe, Ubierring 40, 50678 Köln,

kempe@infoterror.de

"STADTWIRKLICHKEIT" is a platform for the design of artificial worlds. The installation uses metaphors from Italo Calvino's "Invisible Cities". Visitors to the website are requested to use their imagination to design reality models.

http://www.ds.fh-koeln.de/~sascha/stadtwirklichkeit/

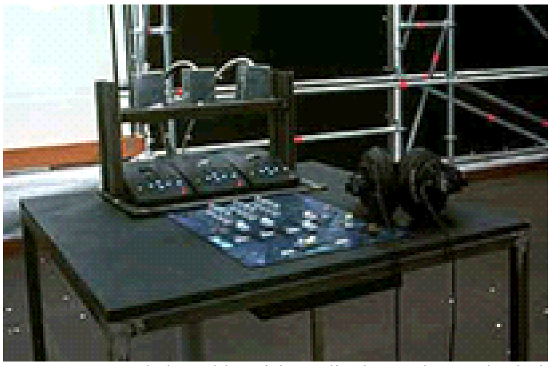
Judges comments

"STADTWIRKLICHKEIT" is a platform for the design of artificial worlds. The 3d animation conceived for the Internet uses metaphors from Italo Calvino's "Invisible Cities". "CITY REALITY" was implemented in the summer semester of 2001 by Sascha Kempe and Michael Wolf as a seminar project in the department for Design at Cologne *Fachhochschule* under Professor Gui Bonsiepe.

Going beyond the aesthetically successful transmission of the literary model into an interactive 3D environment, “STADTWIRKLICHKEIT” can be interpreted as a metaphor for the city. The virtual space is configured as a public space for collaborative action, where Internet users can contribute their own ideas and images of the city. The visual form of this virtual world is, however, not only the result of the additive input from users, but results from the social process of evaluating contributed input.

When the concept of "city development" has been implemented, which at the time when the panel of judges met had not yet taken place, the result will be a collaborative hyper-fiction on the subject of the city, which will take place in a public space and will take shape as a result of social processes and be subject to permanent changes. The judges were impressed by the multiple layers of the navigable and conceptual space.

digital sparks awards 2001 – „DIALTONE - teleinteractive net audio installation“



Tamas Szakal, Fachbereich Medienkunst der Hochschule für Grafik und Buchkunst Leipzig Prof. Helmut Mark, Wächterstr. 11, 04107 Leipzig,

tone@contour.net

DIALTONE is a net audio installation that makes recordings on both the physical and the virtual space of the Internet and attempts to open up this hybrid space to sounds using simple telecommunication instruments (telephones and answering machines).

http://dial.tone.hu

Judges comments

DIALTONE - teleinteractive net audio installation is a net audio installation that makes recordings in physical space and on the Internet and attempts to open up this hybrid space for sounds using simple telecommunication instruments such as telephones, answering machines and the Internet.

DIALTONE is a seminar project that was developed in the year 2000 in the Media Art department at the *Hochschule für Grafik und Buchkunst Leipzig* under Professor Helmut Mark.

DIALTONE by Tamas Szakal impressed the judges by means of a simple yet intelligent link between everyday communications equipment and an interactive electronic "sound sculpture". Without any guidelines, participants supply acoustic contributions via telephone and answering machine to a sound mixing control desk, which links up remote locations into a single sound space using a streaming camera. Unlike in the 70s, however, the participative input only offers the material for sampling. Chance and the low sound quality of the equipment results a sound experience that at times verges on the unreasonable.

A further reason for awarding a prize to this project, was to point to the relevance of sound for media art work.

Committee

Jury chairs

- Monika Fleischmann, FhG. IMK,
- Dr. Wilfried Matanovic bmb+f, Bonn

Jury

- Bernhard Foos / SWR TV, Internationaler Medienkunstpreis, Baden-Baden
- Prof. Dr. Dr. Lydia Hartl / Kulturreferentin der Stadt München
- Prof. Dr. Joachim-Felix Leonhard / Generalsekretär Goethe Institut, München
- Dr. Sabine Rollberg / ARTE- Beauftragte, WDR Fernsehdirektion, Köln
- Prof. Hans Peter Schwarz / Rektor, Hochschule für Gestaltung und Kunst Zürich
- Regina Wyrwoll / Generalsekretärin, Stiftung Kunst und Kultur NRW, Essen

Reviewer

- Prof. Dr. Bernd Freisleben / Universität, Gesamthochschule Siegen, Angewandte Informatik/ Medieninformatik
- Prof. Dr. Heinrich Müller / Universität Dortmund, Fachbereich Informatik / Medieninformatik
- Prof. Tanja Diezmann / Hochschule Anhalt, Fachbereich Design, Dessau / Mediengestaltung
- Dr. Andreas Broeckmann / Festival Transmediale, Berlin/ Mediengestaltung & Medienkunst
- Alfred Rotert / Europäisches Media Arts Festival - EMAF, Osnabrück / Mediengestaltung & Medienkunst
- Gerfried Stocker / AEC, Ars Electronica Center Linz / Mediengestaltung, & Medienkunst
- Prof. Eku Wand / Hochschule für Bildende Künste, Braunschweig / Mediengestaltung & Animation
- Anna Anders / Kunsthochschule für Medien, Köln / Medienkunst
- Joachim Blank / Hochschule für Grafik und Buchkunst, Leipzig / Medienkunst
- Thea Brejzek / Universität Wien, Regisseurin / Medienkunst
- Christin Lahr / Kunsthochschule für Medien Köln, Fachbereich Medienkunst / Medienkunst
- Prof. KP Ludwig John / Fachhochschule Augsburg, Fachbereich Gestaltung / Medienkunst
- Prof. Maria Vedder / Hochschule der Künste Berlin / Medienkunst

Consultive staff:

- Gabriele Blome, FhG. IMK
- Wolfgang Strauss, FhG. IMK

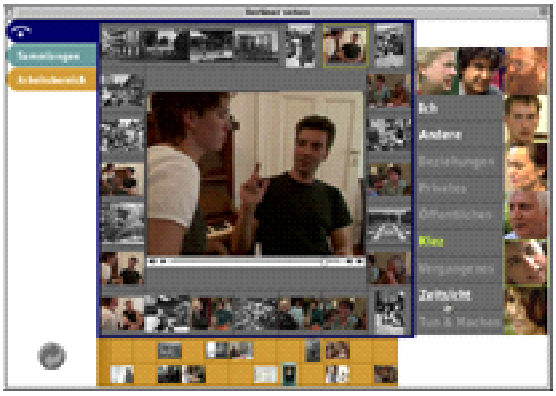
Project Management:

- Ulrike Boecking

screenings

In the poster part already included are contributions by:

screenings



comparative media studies

a new graduate program at massachusetts institute of technology

Kurt E. Fendt
Massachusetts Institute of Technology, fendt@mit.edu

Abstract

COMPARATIVE MEDIA STUDIES is the humanistic and social scientific examination of media technologies and their cultural, social, aesthetic, political, ethical, legal, and economic implications. Graduates are trained to respond to real world problems, identifying the forces shaping the information and entertainment industries and mastering key conceptual frameworks drawn from the humanities and social sciences. The goal is to take what we know as humanists and apply it pragmatically to challenges confronting industry, journalism, education, and government.

Comparative Media Studies research themes cross academic disciplines and involve both traditional and emerging communications media, establishing a focus for public presentations, research agendas, and curricular initiatives. Through its projects, symposia, outreach programs, and research projects, the program explores the social, economic and cultural impact of digital technologies and their analog forbearers.

Besides a description of the graduate program, the presentation will also include examples of interactive media projects developed by graduate students and faculty.

Keywords: Media Studies, Graduate Program, interactive media projects, student projects

Project URL:
http://web.mit.edu/cms/

Year the Work was created: 1999

screenings

steadicam

video installation (2001)

Wiebke Grösch/Frank Metzger
wf@groeschmetzger.de

Abstract

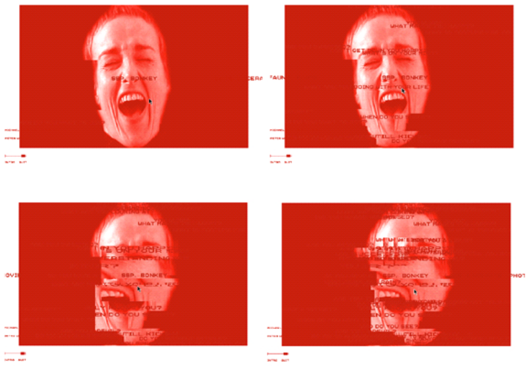
"Steadicam" is a video animation based on picture and sound quotations that addresses the issues of the subjective camera, the change of perspective from observer to player and vice versa, and observing and being observed. The source materials used for "Steadicam" were photographs of a Noh stage based on designs by the Japanese architect Kengo Kuma in Toyama/Japan, and sound material from the German dubbed version of David Lynch's "Lost Highway" (USA, 1996).

Keywords: Video Installation, Observation, Photographie

Year the work was created: 2001

Project Url:
http://www.groeschmetzger.de

screenings



s/he'll survive

cd-rom journey through art and destruction

Pepe Jürgens, Daniel Sauter
info@weltformat.de

Abstract

The CD-Rom “s/He'll survive” is on one hand a personal work of art, and, on the other hand a presentation of works from the Staatliche Hochschule für Gestaltung Karlsruhe from the exhibition at the Netherlands Media Art Institute, Montevideo, Amsterdam 2000. More than mere documentation the representation of the exhibition is a work of it's own.

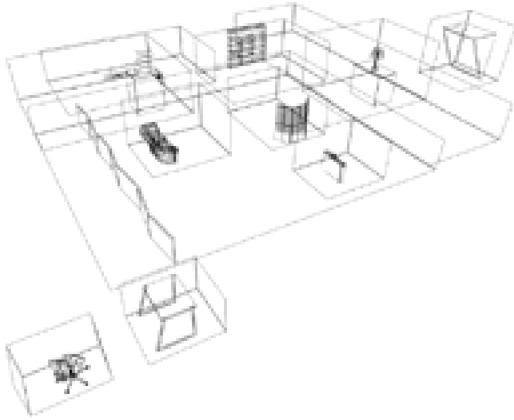
Keywords: CD-Rom, Art Documentation Embedded in an Independent Project, Interaction Surface Manipulation, Fragmentation, Time-Phased Use

Project Url:
http://www.weltformat.de/survive/

Year the Work was created: Puplished in January, 2001

Project Partners: Concept, Design, Programming: Pepe Jürgens and Daniel Sauter, Soundsamples: Tomio Tremmel; Publisher, Staatliche Hochschule für Gestaltung Karlsruhe, Curators: Prof. Uwe Laysiepen and Prof. Michael Saup

screenings



walking an impossible building

guest house cd-rom

Paul Clarke and Thomas Keller
Uninvited Guests (Bristol, UK and Frankfurt am Main, Germany)
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Abstract

The Guest House CD-ROM is both a new digital project and an innovative approach to performance documentation. You become the player in an interactive 3D guest-house, wandering freely through an 'impossible building', composed of rooms and events drawn from other peoples' memories, triggering sound, video clips, text and computer animations.

The CD-ROM can be viewed as a screen-based work on a standard PC or MAC. In addition a special version for gallery exhibition can be made available and the company has also developed a performative presentation of the CD-ROM.

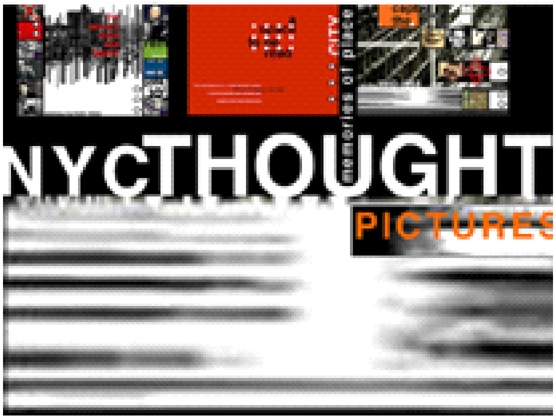
Keywords: re-staging a performance project as interactive CD-ROM; architectural walk-through; VRML; Quicktime.

Project URLS:
http://www.da2.org.uk/guesthouse
http://www.uninvited-guests.net

Year the Work was created: 2000

Project Partners: The Digital Arts Development Agency, Bristol, UK. Digital Summer, Manchester, UK. ZKM, Karlsruhe, Germany.

screenings



nyc thought pictures

memories of place

Russet Lederman
spud@interport.net

Abstract

NYC Thought Pictures is an interactive CD-ROM which presents a personal and eclectic view of New York, as experienced and remembered by several diverse individuals.

At the core of NYC Thought Pictures is a fascination with the power of "seemingly" ordinary events and places, which ultimately turn out to be monumental within the schema of an individual's life. For me, the personal and idiosyncratic hold the power. Therefore, as the basis for this interactive work, I have chosen to interview several diverse individuals about their New York "place" stories. These stories along with "visual" quotes from Walter Benjamin and Graeme Gilloch (a Benjamin scholar) form the theoretical and visual armature of this work. Benjamin's writings on Berlin, Moscow, Paris and Naples provide the theoretical underpinnings for developing an investigation of the four central themes in NYC Thought Pictures, i.e. "Memory", "Time", "Fragmentation" and "City Experience". The fragmentary writing style and sometimes open-ended conclusions in Benjamin's work is well suited to my visual style and theoretical viewpoint. Loosely following Benjamin's model, this work is constructed from fragments of private and public images, audio, ephemera and text of and about the city. As a totality, these images aid in revealing the "micro" tales of specific places and neighbourhoods within the larger view of New York City.

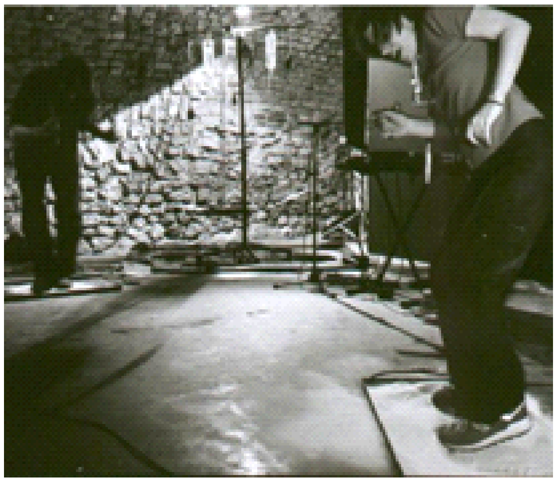
Inherent in this project, and specific to the digital medium, in which I am working, is a strong random navigational structure. My goal has been to create a structure that allows the viewer to be aware of his/her place or location within the work, yet limits his/her ability to control the path taken. If, in the end, the viewer is asking more questions and is challenged to re-evaluate their own sense of "place", then I have been successful. For me, the investigation of place is ongoing, without any finite conclusions.

Keywords: CD-ROM exploring Awareness, Memory Space and Knowledge Discovery

ProjecteURL:
http://users.rcn/spud.interport/nyc

Year the Work was created: 1999

screenings



trans.u 4/01

Elke Utermöhlen / Martin Slawig
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Abstract

trans.u 4/01 is a performance that uses a hanging steel sheet equipped with sensors and a structure-borne sound microphone for controlling sound and images. A video camera is trained onto the installation and transmits images to a computer, which processes them in real time. The image is projected back directly. The performer, the shadow, the object and the processed image interact directly with each other. The object serves as the only source of sound for the performance: the sound produced by actions with the object is further developed using realtime sound processing and mixed into the original sound. As a result of the permanent superposition and shift of emphasis between acoustic and digital sound, the boundaries between the different levels are blurred. The stage space shows a mixed-reality situation consisting of overlapping image and sound structures.

Performance: Elke Utermöhlen, programming: Martin Slawig

Keywords: Performance; Live-Processing Software; Image/Ine, LiSa (Steim) ; Perception; Irritation

Project URL:
http://www.blackhole.cymes.net

Year the work was created: 2001

Project Partners: LOT – Theater Braunschweig, Land Niedersachsen

Die Performance

Das Sound- und Videosystem auf der Bühne befindet sich in einem Zustand prekären Gleichgewichts. Ohne äußere Einwirkungen spielt der Raum selbsttätig: Die Eigengeräusche des Soundsystems beeinflussen die Projektion, die sich verändernden Bilder haben Einfluss auf die Klangstrukturen. Eine Person, die in dieses Spiel-Feld hineintritt, verändert das Gleichgewicht und ruft mit jeder Handlung Reaktionen im System hervor. Die Umgebung auf der Bühne ist nicht so gestaltet, wie sie auf den ersten Blick zu sein scheint. Bewegungen erzeugen Bilderfolgen, die ähnlich wie ein Spiegel die Handlung des Akteurs zeigen. Dann aber verändern sich die Bilder durch weitere Aktionen, werden verfremdet, vervielfältigt, zerschnitten. Zentraler Punkt der Bühne ist ein von der Decke hängendes Stahlblech, das in der Projektionsfläche hängt und so gleichzeitig zum Bild-Träger wird. Die Performance zeigt einen Dialog zwischen Mensch und Objekt. Jede Handlung auf der Bühne, jede Berührung des Objektes hat vielschichtige Auswirkungen. Aktionen mit dem Blech erzeugen Töne, komplexe Klangstrukturen, Rhythmen. Die Projektion reagiert auf die Sounds, folgt den Rhythmen oder antwortet mit unterschiedlichen Verfremdungen des Originalbildes. Wird das Objekt in Bewegung versetzt, scheint der gesamte Raum zu schwanken, auseinander zu fallen, sich neu zu formen. Die Performerin vermischt sich mit ihren Abbildern in der Projektion, sie tritt hinter das Objekt, in das Bild hinein. Abbild, Fragmente, Vervielfätigungen des Abbilds und im Raum anwesende Performerin sind so dicht miteinander verbunden, dass sie vom Betrachter zeitweise miteinander verwechselt werden. Dem visuellen Aspekt entsprechend vervollständigt die Mischung vom akustischem und bearbeitetem Sound gekoppelt an das Bild die Komplexität der Performance.

trans.u 4/01 läßt eine mixed reality Situation entstehen, die durch vielfältige Irritationen mit gewohnten Wahrnehmungsmustern spielt. In der Vermischung der verschiedenen Materialien und Wahrnehmungsebenen entstehen Atmosphären von großer emotionaler Dichte, melodiöse Miniaturen und kontemplative Strukturen.

Live-Dates: 28.-30.9. LOT-Theater, Barunschweig

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netzspannung.org/journal/special

Friday, September 21, 2001, 10.00 – 19.30

Opening Speeches
Keynote: Bill Buxton
Theme 1: Understanding Mixed Reality? Spaces of emergent Communication
Keynote: Hiroshi Ishii
Theme 2: The Information Society Landscape New Formats of Expression
Theme 3: Networked Living / Connected Citizens
Keynote: Natalie Jeremijenko
Theme 4: netzspannung.org From Digital Archives to Mobile Units

Saturday, September 22, 2001, 10.00 – 19.00

Keynote: Roy Ascott
Theme 5: Tools and Strategies for Intermedia Production
Theme 6: Performative Perception The Body as Instrument
Keynote: Manfred Faßler
Theme 7: Media Art Education Teaching New Media
Digital Sparks and New Media Curricula / Awards

Sunday, September 23, 2001, 11.00 – 12.30

Resumee: Phoebe Sengers & Maia Engeli
Auditorium Kunstmuseum Bonn
Friedrich-Ebert-Allee 2
53113 Bonn
Open to the Public

Host:
MARS – Exploratory Media Lab
Fraunhofer – Institut Medienkommunikation
http://imk.fraunhofer.de/mars

IMK Fraunhofer Institut Medienkommunikation

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