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## The art of the thinking space—a space filled with data

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### ABSTRACT

Interactive media art is an art form that ‘transforms digital information and translates it into aesthetics of participative processes.’ In their artistic investigations, the artists and architects Fleischmann and Strauss focus on the concept of the ‘thinking space’ [Denkraum]. Following Aby Warburg’s ‘space of thought’ (1929), they define the thinking space of interactive media art as a ‘space filled with data’ (Strauss, W., and M. Fleischmann. 2001). The artists’ thinking space is the artistic exploration of an architecture of interactivity that ‘evokes’ communication ‘in a culture of simulation’ (Turkle, S. 2004), by involving people in a performative way. This article presents three of their projects, all based on the metaphor of the thinking space: ‘Semantic Map’, ‘Media Flow’ and ‘Energy Passages’ illustrate strategies of interactivity using artificial intelligence to ‘reinforce human intelligence’. The question is not whether machines can think, but whether people can still think when everything is automated.

### KEYWORDS

Media art; interactivity;  
participation; performativity

### The concept of the thinking space [Denkraum]

What space does thinking need? According to psychoanalyst Wilfred Bion, ‘You need thoughts and a space for thoughts.’ (Bion 1992). ‘Thinking space’ [Denkraum] and the term ‘metaphor’ play an important role in the philosopher Hannah Arendt’s writings. In her ‘Thinking Diary’ [Denktagebuch] of 1969 she notes: ‘Thought and poetry are connected by metaphor. What is called a term in philosophy, is called a metaphor in poetry. Thinking creates its terms from the visible in order to name the invisible.’ (cf. Arendt 2002). The cultural scientist Aby Warburg understands the thinking space in an ambiguous definition both as a

spatial and a temporal dimension. In the 1920s, Warburg developed his ‘Mnemosyne-Atlas’, which has become a basic programme of image science. These wooden panels with pictures and short texts are not intended to hang in a fixed order, but rather to evoke new knowledge by arranging and rearranging the documents on the panels.

The ‘Media Flow’ by Fleischmann and Strauss is concerned with the accessibility of information and moves in a thinking space similar to Warburg. The art historian Daniel Becker compares the thinking space of Media Flow with that of the Mnemosyne-Atlas:

The work is similar to the picture atlas, both in contexts and in links they lead to a genealogical

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process of knowledge formation. In both works, the user is assigned a crucial position: he can build his own new relationships. Instead of a static presentation that immediately links all possible data, the point is not to find known information, but to search for and browse new contexts. Here, the Warburg devotional or thought room receives its digital update via the database interface, since the process of linking or surfing by the user becomes relevant in a kind of digital contemplation. (cf. Becker 2017)

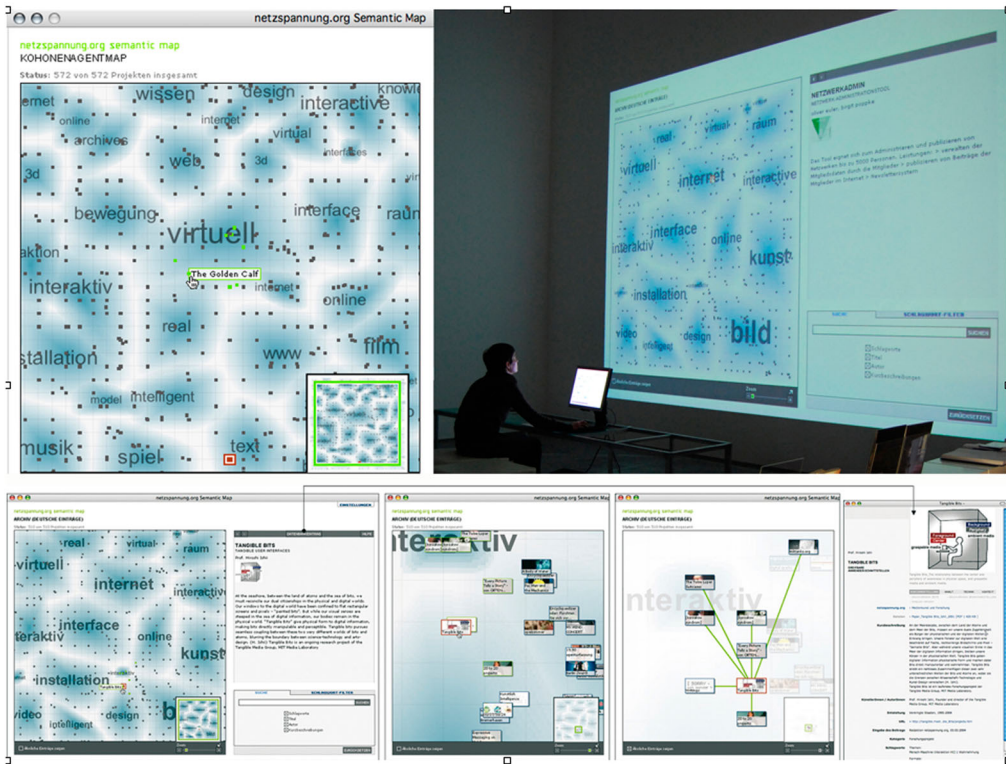
Instead of Warburg's picture panels, there are two flows of information in the Media Flow that move across the projection screen. The viewer can select individual images or words and creates new coherent links from them again and again. As soon as the viewer makes a selection, the data flow stops and the viewer's attention increases. (cf. Fleischmann and Strauss 2015). With this spatial access to a database, Fleischmann and Strauss are not only following in the tradition of Warburg's Mnemosyne, but with Giulio Camillo's 'Memory Theatre' [Gedächtnistheater] they are also taking up the concept of the spatial staging of encyclopaedic knowledge, as this Italian philosopher of the 16th century did with his physical version of a memory palace. Camillo was concerned not only with the ordering of knowledge (Dispositio), but also with the invention of knowledge (Inventio). The viewer on stage sees the world knowledge in images on the ranks of his memory theatre. Camillo 'wanted images that put the visitors in a state of inner activity', media theorist Peter Matussek explains. His goal was 'to find an arrangement that the intellect takes up attentively and shakes the memory' (Matussek 2001). Aby Warburg's 'space of thought' has pursued a similar objective to Camillo's method of inventing knowledge. Media scientist Martin Warnke compares it with the thematic grouping and regrouping of images as principles of Warburg's art of memory. (Warnke 2000). In contrast to the historical examples, the concept of the artist's 'thinking space' is a spatial interface based on algorithmic operations.

The work of Fleischmann and Strauss thus enriches the discourse around collections of knowledge, because here it is not about - like a classic archive search, which is connected with previous knowledge - about targeted searching, but about browsing and finding. This affirmation of media-savvy "surfing" in the data pool of an online database is inscribed in a long history of concepts for storing, archiving and collecting data. (cf. Becker 2017)

### Semantic map and media flow—two faces of the online archive

How can I search for something I know nothing about? The difficulty of orientation in online archives is due to the fact that the contents are usually unknown and distributed over hundreds of individual web pages. There is no overall view and the flow of thoughts is constantly interrupted by clicking back and forth. This forced guidance tires the body and mind. Furthermore a digital archive makes little sense that, like a classic archive, is nothing more than an index box with individual data sheets (Fleischmann and Strauss 2011a, 282). Instead, the database of the media art archive 'netzspannung.org' (Fleischmann and Strauss 2001), set up by the artists, is calculated on the basis of a neural network resulting in self-organizing knowledge maps (cf. Kohonen 1995) such as the Semantic Map (Strauss and Fleischmann 2006). Here, each individual database record appears as a node in a network of thoughts, concepts and practices, presenting each individual document in the archive as an event of relationships. Thus, the database is displayed as an interconnected network that can take on interface formats that differ from conventional listings (Fleischmann and Strauss 2005, 162) (Figure 1).

The special feature of Media Flow is that the entire content of the archive is easy to grasp. The metaphor of the title stands for thoughts in the flow. In Media Flow parallel data streams of images and words move across the screen. As soon as visitors select an image or term such as author or keyword, semantically rendered



**Figure 1.** Semantic Map (2001–04) Browser and Installation © Fleischmann & Strauss.

documents with related content are visually highlighted. Image and text flow initiate a reading process that moves between the periphery and the centre of the interface. Stopping the flow of data is associated with an interruption in perception and leads to increased attention (Figure 2).

The simultaneous display of overview and detail enables navigation that combines the classic approach—search using terms—with visual orientation. The database takes a narrative position. Similar to Warburg, but algorithmically controlled, the flowing interface enables the arrangement and rearrangement and thus begins a dialogue between the viewer and the content. This method explicitly allows romping around and running in the train of thought. The digital archive becomes a space for thought movements (Fleischmann and Strauss 2011a, 282) (Figure 3).

Part of the concept of the ‘Wissensarchiv’ [knowledge archives] exhibition by Fleischmann

and Strauss, was to use the Media Flow interface for teaching and learning. Between the large installation screens, there were intimate research locations in the exhibition space, which were set up like workplaces for archivists. Students with their teachers visited the installation to deepen their knowledge of contemporary media art and theories. They browsed the Media Flow, got to know comparative works and gained an insight into media art, which they discovered discursively. Here, the learner experiences knowledge through differentiation and becomes a producer of meaning (Figure 4).

### Energy passages—reading and writing the city

The second example is a thinking space in the middle of the city. Behind this lies the artists’ interest in connecting people and bringing them into conversation. The four-week site-





Figure 2. Media Flow installation (2008) © Fleischmann & Strauss.

specific work Energy Passages [Energie Passagen 2004] is an interactive visualization of daily news in public space. The daily newspaper—reduced to nouns by semantic mapping—appears as a

huge audiovisual flow of information on the square in front of the House of Literature in Munich, Germany. (Strauss and Fleischmann 2004a). In November 2004 visitors find

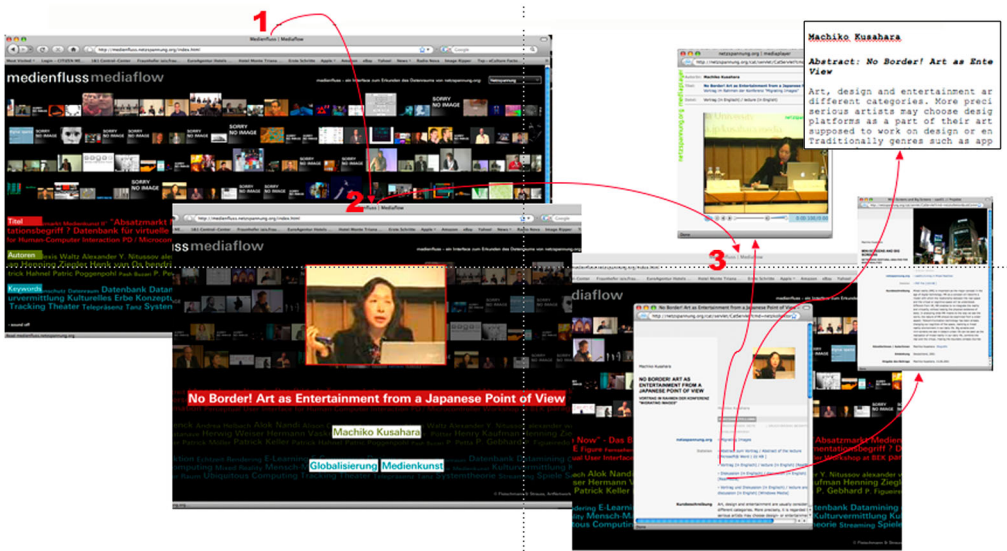


Figure 3. Media Flow information levels © Fleischmann & Strauss.



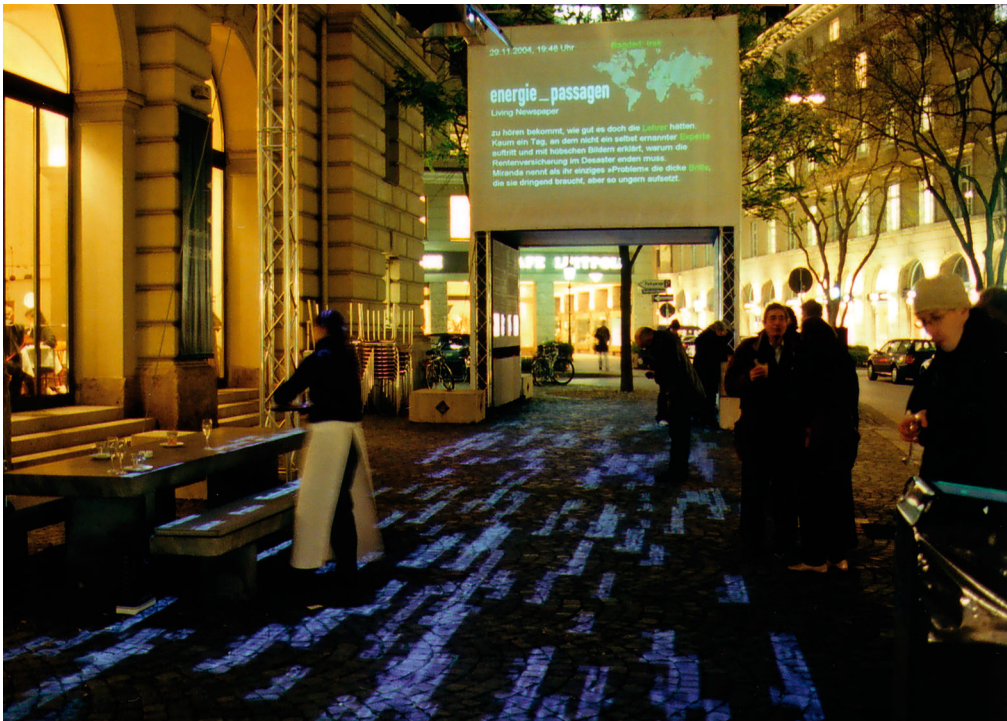
**Figure 4.** Media Flow (2008) The archive as a work space ©Fleischmann & Strauss.

themselves unexpectedly within the interactive happening of a Language Play [Sprachspiel]. The Salvatorplatz is superimposed by a large light and acoustic projection. Words stream across the ground in front of the building. Keywords of the latest news are displayed in the flow of words. Artificial voices read out single words. The installation transforms the newspaper into a walk-in data stream of daily news. Visitors can select individual terms, set up the Sprachspiel with the flow of messages. Some try to understand the meaning and correlation behind the words; others literally throw words around, as in scenic dialogues. The participants become performers of the language play and the data become ‘evocative’ objects. (Fleischmann and Strauss 2008, 266–281) (Figure 5).

### Artistic concept, influencers and techniques

The title Energy Passages is derived from the understanding of language as mental energy.

Fleischmann and Strauss refer to Vilém Flusser’s concept of the passage as a journey as well as to Walter Benjamin’s ‘Passagen-Werk’ [Arcades Project] (Benjamin 1982) as a method of montage (Strauss and Fleischmann 2004b). Flusser defines the term passage as a journey in which individual elements are traversed as fragments of a larger context in order to merge individual impressions as parts of a whole into a tangible image (Findeisen 2004). Adorno notes that Benjamin tries ‘to dispense with any kind of obvious interpretation and to reveal meanings exclusively through a shock-provoking material montage.’ (Adorno 1970). Similarly in the Energy Passages, newspaper articles are fragmented by the code and presented as a new montage of a language play through the intervention of the participating visitors (Fleischmann and Strauss 2015, 301). The notion of the Language Play, which the philosopher Ludwig Wittgenstein uses as a method in various complex contexts, is summarized by himself: ‘Lying is a language play that needs to



**Figure 5.** Energy Passages in front of the House of Literature, Munich 2004 © Fleischmann & Strauss.

be learned’ (Wittgenstein 1953, 249). This means that ‘action and language have always been connected’ and it is therefore necessary ‘to distinguish between an internal process of thinking and perceiving as opposed to an external object that is thought and seen’ (Buchheister and Steuer 1992, 73). Long before the rise of fake news, a motive of Energy Passages is to investigate the language of the news. It is a language that often means something other than what is said. The language play here means rehearsing a reading between the lines.

### The making of energy passages

Embedded in urban space, five elements form this thinking space: (1) The horizontal floor projection of the message flow. (2) The semantic network of next neighbours. (3) The vertical screen of the text montage created live by the visitors. (4) The panoramic audiosphere. (5) The touchscreen and microphone interfaces.

In 2004 there is no public data connection in Munich. Because the entire computer system is located outdoors in the wild, the ISDN connection of the Literaturhaus was tapped. The artists had subscribed to the newspaper’s RSS channel (Rich Site Summary file format) in order to receive the newspaper’s full text every day. With the help of a semantic text analysis, the 30,000 words of the daily newspaper are calculated to 500 most frequently used keywords. Their semantic relations are rendered by using the synonym dictionary of partners of the University of Leipzig. The semantic calculation of the complete data body of the news and the calculation of the keywords takes place on site. Each day, the 500 keywords of the day are fed into the system. Due to the imaging mechanism of the C++ real-time graphics, the individual keywords appear as a projected word flow on the floor in different sizes and speeds depending on frequency. The sonification of the data by means of artificial voices extends the visual



perception on the auditory level. A text-to-speech method converts the words to a sound-panorama that surrounds visitors and supplements the movement of the flowing words complementary.

Visitors can select a term of their preference from these 500 keywords using a touch screen or microphone. Therefore, a speech recognition module for processing natural speech has been integrated. Once selected, the visitors' search term is extended by a small semantic network, a circle of five 'befriended' words (Strauss and Fleischmann 2004c). While the search terms flow across the floor, the corresponding text passages of the selected terms appear on the vertical screen of a kind of media newspaper stand reminiscent to the multimedia exhibition stand designed by Herbert Bayer at the Bauhaus in 1924. The horizontal and vertical projection form lines of sight and create a feeling of space in a dimension of 50 m long, 8 m wide and 8 m high (Figure 6).

The Energy Passages web format corresponds to the architectural drawing, which shows the various levels of information at a glance: (1) The flow of messages. (2) The order of interaction. (3) The context. (4) The geographical origin. (5) The content rubrics. The adaptation to the urban scale and the spatial distribution of these levels create the interactive urban environment of the installation.

### Superimposing real and virtual space

The claim of overlapping real and virtual space was treated by the artists according to architectural design criteria. The installation is naturally integrated into the city space and adapted to existing lines of pedestrians movement. On their way through the city, passers-by come across Salvatorplatz and are intuitively drawn into the situation. The light from the projection beams is refracted many times and appears to glitter above the ground of natural stone paving, which adds to the poetic atmosphere. This could be called the defining moment of entry

into the staging. Visitors are wondering, pause or walk through the field of light. Even on their way into the building, visitors enter the flow of words and coincidentally deal with it. Other visitors move along the bank of the 50-metre-long flow of words or use the stone benches in the forecourt to sit down and enjoy the show. The described integration into the urban space casually solves the problem of entering an interactive situation. It is the flow of words that intuitively draws visitors in. (cf. Fleischmann and Strauss 2013)

### The interaction process

The light field, the flowing movement, the murmuring words stimulate the audience and encourage participation. The four stages of interactivity are: (1) The entry. (2) The estimation of a possible participation. (3) The active participation in the process. (4) The adaptation and leaving the situation. Here, the rules of interaction are not explained in written form as is usually the case. The visitors should find out for themselves how they can participate. It is not about a prescribed stimulus-response pattern. Obviously, the only way to find out what is happening is to choose a term from the touchscreen. Once a term is selected, a network of five 'befriended' words appears arranged around the original search term. Highlighted in chromatic green this small network remains visible for some time in the foreground of the word flow. Usually, in this moment thinking is evoked with a question: What do these words have in common? The 'intelligent' system delegates then the task to the human being to think about it. The performative act is initiated from being an observer to becoming an intervening participant and finally a data performer. (cf. Fleischmann and Strauss 2011b).

Media scientist and curator Ryszard Kluszczyński notes:

As a consequence, viewers become integral elements of these works, as if intelligently



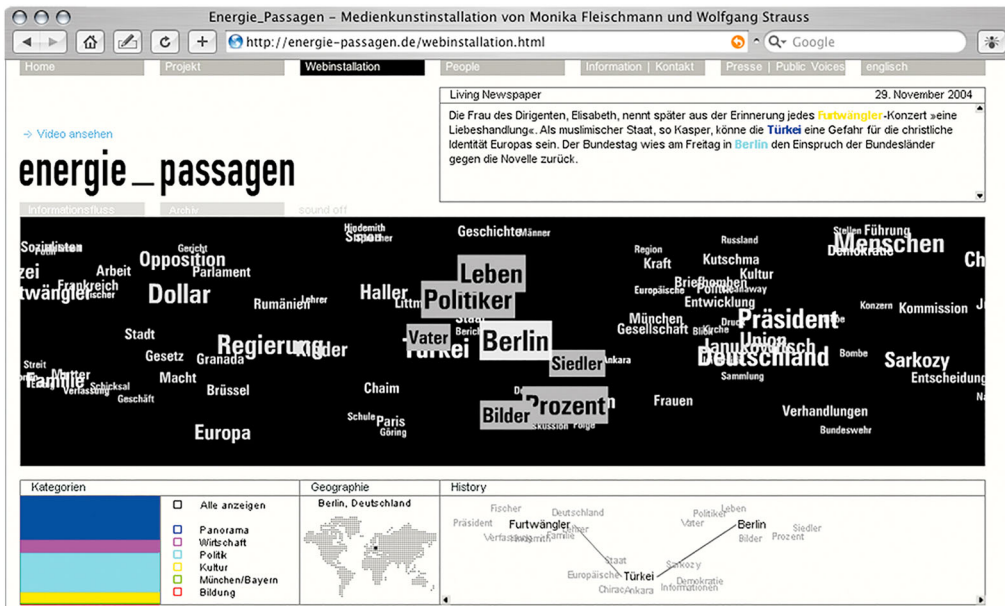


Figure 6. Energy Passages (2004) <http://energiepassagen.de/webinstallation.html> © Fleischmann & Strauss.

working components. As a result, the experience of perception of Fleischmann's and Strauss' installations becomes transgressive; it is an activity undertaken in one environment but bringing effects in another, and the results are fed back to the operating interactors, building a developing context of interactions, motivating their further behaviours and co-creating the structure of an interactive work-event in this way. (Kluszczyński 2011)

Due to the theoretical billions of combinations based on the 'urn model' calculation (cf. Johnson 1977), the interaction process is unlimited and its duration is determined only by the participants' desire to engage in this language play.

### Evaluation principles of energy passages

When installing media art in public space, it is difficult to conduct so-called user studies. For this reason, according to Fleischmann and Strauss the following artistic analysis strategy has been applied.

(a) As part of the installation, students of the art academy were cast and trained as

guides, especially to explain the AI aspects of the installation such as the semantic relation of the terms or the natural language processing of the microphone interface. Their main task was to be unobtrusively present and to intervene in an explanatory manner when questions arose. They also counted the number of visitors and reported regularly to the artists about the reactions and comments of the audience.

- (b) An inherent valuation method is in the nature of the digital. The selection of terms by visitors is recorded over the duration of the installation and compared with the most common words used by editors in the ranking.
- (c) International experts involved in media art were invited to observe the activities via streaming and provided their impressions as a statement. In this way curator Christiane Paul and scientists Sherry Turkle and Peter Matussek accompanied the project during the exhibition, contributing to objectification and reflection. Extracts of

the comments and observations of the invited experts as well as of other artists and spectators can be read under 'Public Voices' in the press section of the *energiepassagen.de* website (Strauss and Fleischmann 2004d).

- (d) Via the streaming signal online and discussions on site, the artists observe the behaviour and interaction of the visitors for their own analyses. The findings are described in the following observations.

### Observations 01: performative reading processes

The installation provides a reading and writing technique, which creates a particular imaginativeness. Therefore, it is not just simply about seeking and finding information, but rather about composing own thoughts in dialogue with the information but also with the others. The interactive staging initiates a reading movement from keyword to keyword. In the reading process along the individual words, the visitors reveal semantic connections, which they supplement and interpret with their own thoughts. The literary scientist Wolfgang Iser defines reading as a process in which the meaning of texts is generated in the first place. He states the following effects of reading: (1) Meaning is created as a product of interaction between text and reader. (2) With regard to a collective reading process, a common experience of what has been read results from interaction and participation (cf Iser 1994) (Figure 7).

Neuropsychologists distinguish between two different processes to identify the meaning of words that are stored in the brain and that are activated in different contexts. When reading ordinary text, the act of reading appears light and effortless. We don't have to think about single words. But as soon as we have to pay attention to certain words or phrases, we are forced to think about the meaning implied by

the text, and the reading process loses its automatism. Therefore, this delay in reading attracts attention. (cf. Dehaene 2009).

Everything in this Language Play depends on what happens at a given time. The interactivity in Energy Passages turns out to be a kind of search with an open end, in which new findings are discovered again and again.

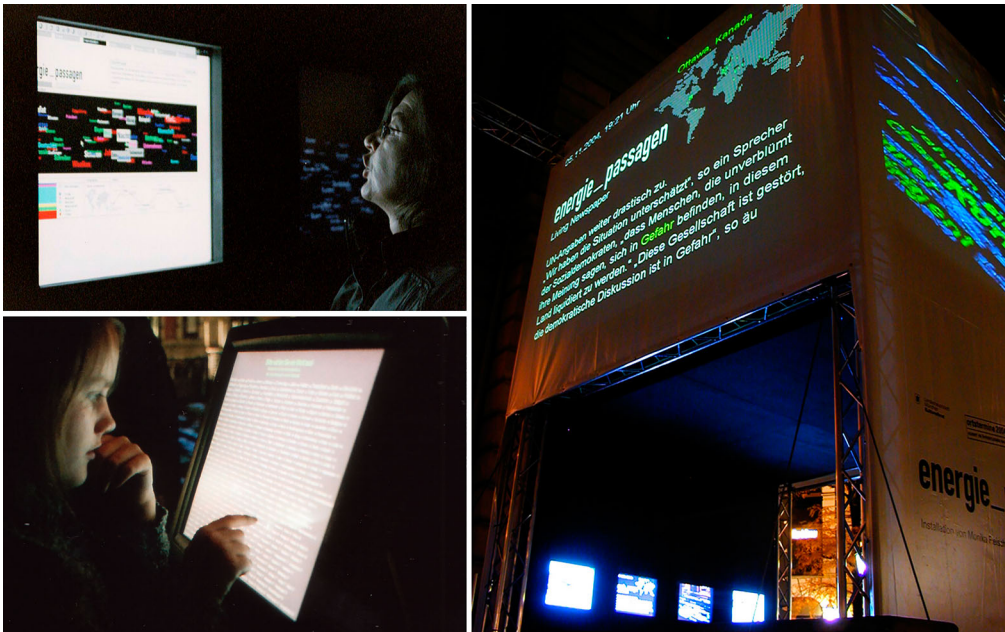
Freed from context and syntax of the original texts, the isolated words open up room for associations and speculations. Kaspar Spinner, an expert on language didactics, describes operative procedures like permutation or omitting as cognition fostering when reading and interpreting texts (cf. Spinner 2001).

Media theorist Peter Matussek points out that the Energy Passages resemble a performative reading in which text and reader are both involved:

It is not about throwing around technoid text fragments like what the hypertext cult celebrated excessively, but filling the remaining gaps using in an odd way smoothly operating automatisms. ... In this way of staging life is emphatically breathed into scripture. It becomes vivid not just because of the bare motion of pictures itself, but because of its media practice to stage performative readings in which text and reader equally participate in a constructive way. This is exactly what the installation makes the visitors sensitively experience. (Matussek 2004) (Figure 8)

### Observations 02: news streams running through ourselves

The spatially staged sound, the flowing movement and the choice of terms create a poetic atmosphere of continuous change. The performing visitors orient themselves according to the echo of these medial elements, thus creating a form of echolocation. While one word is still being uttered, it is already heard and while it is being heard, inner images evolve. The hearing and imagination mutually reinforce each other. The sound scientist Holger Schulze describes the simultaneity of image,



**Figure 7.** Energy Passages (2004) Touch screen interfaces and the news montage from intervening participants. ©Fleischmann & Strauss.

sound and motion as ‘the orchestration of sensual and perceptual media and news streams’ which has an impact on the human body. Schulze notes that ‘we could have the impression all the current newsstreams were running through ourselves’ (Schulze 2005, 7). Words literally flow through the body and make the audience perceive the place sensitized. The astonishing compatibility arises because audiovisual perception and digital narrative

create an imaginary space that can be physically felt.

### Observations 03: the energy passages as an object of reflection

During the day one could only hear murmuring voices. The visitors came at dusk and stayed late into the night. Guides observed that more and more visitors returned several times. They



**Figure 8.** Energy Passages (2004) Performative language plays and verbal exchange between participants ©Fleischmann & Strauss.

brought their friends with them and explained to them the installation and what they had already learned.

At first it's the people who work in the city centre, the night owls come later. They meet others or get to know new people and often discuss at length about the installation and the animation of the public space. They test the installation like a different kind of game by 'throwing' words at each other. When visitors felt unobserved, they sang words, strolled through the Energy Passages and let themselves be immersed in the light projection. A group of young women singing out loud and emotionally: 'Energy! Energy!' and walk happily through the projected words, taking a bath of light. Other passers-by intervene in the production by selecting words of their own interest, which in turn stimulates new activities. It is an interconnection of perception and reflection. The people of Munich were glad that they didn't have to go to a museum, but that media art was coming into public space.

Sociologist Sherry Turkle analyses Energy Passages as an evocative medium that, through the way it is staged, generates increased attention for its own environment and thus becomes an object of reflection. Turkle writes:

The idea of a spatial experience of the discourse of news in urban space and the possibility of deconstructing the newspaper captures the fragmentation of how the citizen experiences media in a culture of simulation. It reflects and concretizes an important cultural and political moment and makes it an 'object of reflection. (Turkle 2004)

The flow of words evokes a lively flow of thoughts in the temporary community. The audience discusses questions such as: 'What do these related words have to do with my chosen term?' 'How does the ring of words relate to my keyword?' The visitors interpret the given text materials and work out an often critically changed or poetic meaning. Through the narrative montage the participating audience stages a

special form of performative reading and writing (Figure 9).

### The installation as measuring device

Energy Passages is both a work of art and a tool for interactivity. As a tool, it measures the activity of visitors and puts them in relation to the preferences of the newspaper. The starting point for the statistical measurement regarding the visitors' interactivity is the frequency of chosen words, giving an overall picture of their emotional state. (Strauss and Fleischmann 2004e). During the four weeks of the exhibition, around 4.000 people visited the installation. Politics and economy dominated the newspaper, but little was said about education and culture as the infographic shows hardly any frequency in those four weeks. As a result, the culturally valued *Sueddeutsche Zeitung* appears like an economic trade journal. Particularly frequently used words of the newspaper such as 'percent', 'years', 'Germany', 'millions' are of objective quality. However, the majority of the words selected by the participants are of emotional quality: 'price', 'parents', 'victim', 'love', 'food', 'girl'. Thus, the sober pragmatics of the newspaper faces the emotional subjectivity of the intervening people. The colour-coded statistical image is a description of the frequency of news topics throughout the exhibition period. The tallest blocks in this cityscape represent the topics of economy and politics. The visitor's choice of words contrasts with the topics of the news, as can be seen from the documented selected terms on the website. The chosen terms seem to express the current mood of the people (Figure 10).

Media art curator Christiane Paul comments on the fusion of public arenas and local public spaces:

In new media art, the exploration of information flow – particularly with regard to the newspaper – has become a broad field of experimentation, and Energy Passages takes these explorations to a new level. Literally





**Figure 9.** Energy Passages (2004) Information flow, keyword and semantic linking. ©Fleischmann & Strauss.

inscribing the daily news, as a linguistic and semantic space, onto the streets of the city creates a fusion of public arenas that usually remain fairly separated in the physical sense (...). While the inhabitants of a city naturally dwell in both of these spaces – the public domain of information and of the city – they usually do not have the possibility to experience these localities as connected networks

or collaboratively reconfigure them (Paul 2004) (Figure 11).

## Conclusion

The media art works by Fleischmann and Strauss presented here show an artistic position

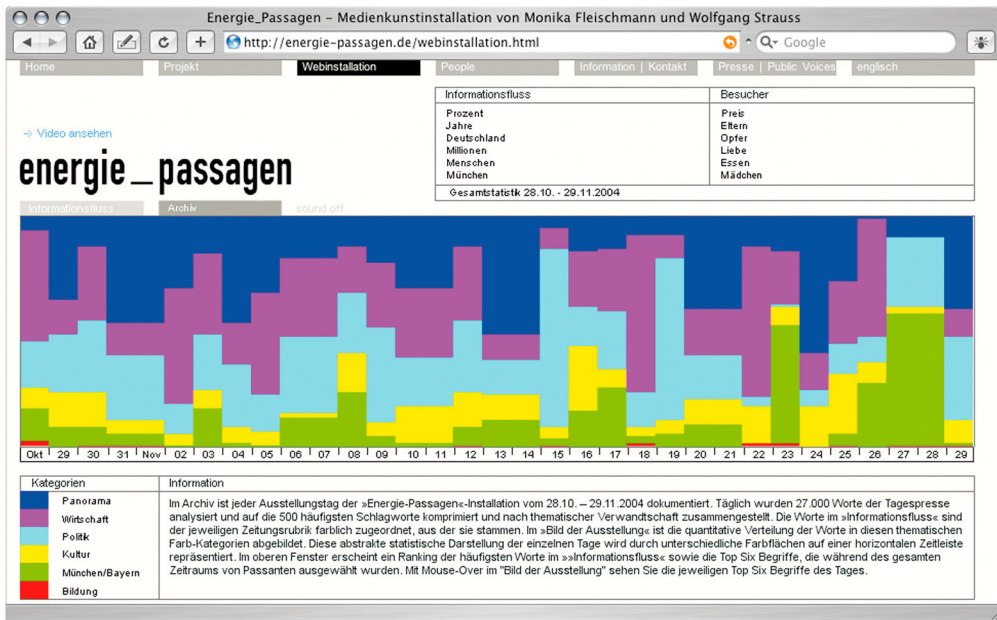


Figure 10. Energy Passages (2004) Colour coded interactive measurement protocol ©Fleischmann & Strauss.

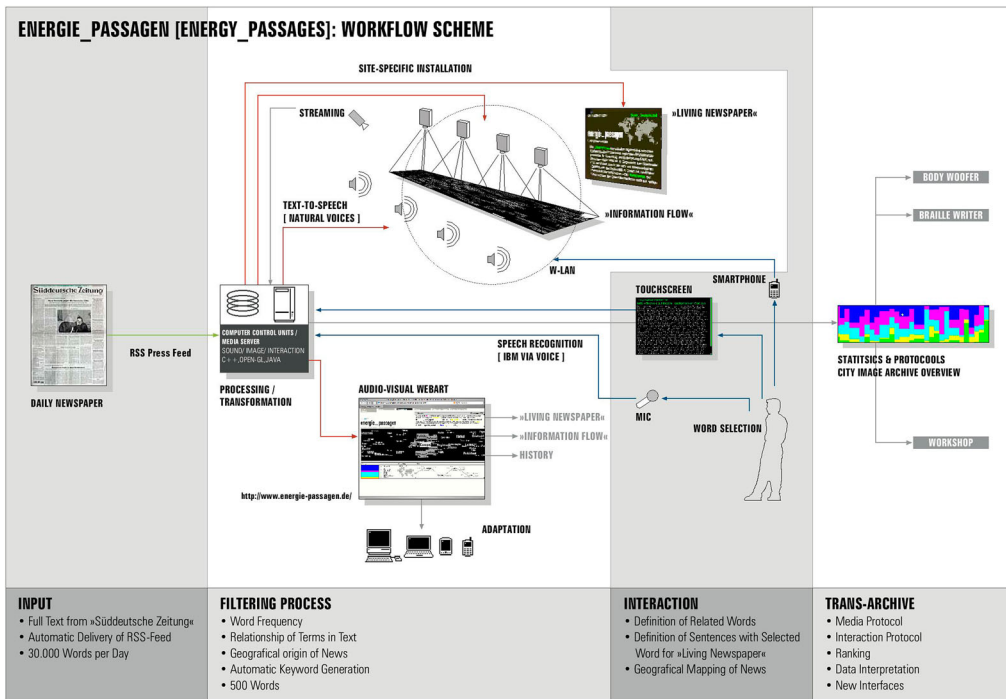


Figure 11. Energy Passages (2004) Workflow Scheme ©Fleischmann & Strauss.

that deals with the flood of digital information and the concept of the thinking space. The Media Flow as a visual finding tool and research browser serves to read the online archive and to access information. By establishing relationships between works, texts and lectures, an open form of learning is practiced as thinking in relationships. Learning is a social process and digital tools only have a learning effect if they increase the learner's motivation and ability to solve problems.

In the example of the Energy Passages it is the other way round. Here the amount of information is reduced to keywords and separated from the body of the text. In a way, the area of a construction site is created where the components lie around individually and only take shape over time. Based on small parts of AI, the interactive narration is no longer created by artists alone. Rather, the artists use artificial intelligence to develop strategies and narrative structures that create a narrative of reality out of the hidden digital reality of data. They use AI to 'reinforce' human intelligence. The question is not whether machines can think, but whether people can still think when everything is automated. For artists, working with AI means learning to play a new instrument.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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