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## **Implosion of Numbers – Performative Mixed Reality**

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**Fraunhofer** Institut  
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The Exploratory Media Lab  
**MARS** Media Arts & Research Studies



Today, the world of information understands the human being at the centre of a wirelessly linked world, which comprises all networks. We study different concepts of integrating digital processes into the space of everyday life. Instead of ignoring the physical space, like in traditional Virtual Reality (VR) approaches, we create interfaces and processes, which link human perception to the computer's programme and the real/virtual Mixed Reality space. In our focus is the human being with his/her sensual, cognitive and culturally coded experiences in order to create contact between people via perceptive, performative and mobile interfaces.

**Monika Fleischmann** is a research artist and head of the department MARS - Media Arts and Research Studies at the Fraunhofer Institute for Media Communication in Sankt Augustin, Germany. Her multidisciplinary background - art and drama, computer graphics, fashion design - has made her an expert in the world of art, computer science and media technology.

**Wolfgang Strauss**, architect and media artist, studied Architecture and Visual Communication. He is researcher, lecturer and teacher in Interactive Media Art and Design. Currently working on interfaces connecting the human body and digital media space, he co-directs the MARS Lab at the Fraunhofer Institute for Media Communication.

In 1988 Fleischmann & Strauss co-founded Art + Com, Berlin, one of the first transdisciplinary research institutes for computer-assisted media research. Their artistic work has been presented in exhibitions and festivals widely throughout the world e.g. at ZKM - Karlsruhe, Nagoya Science Museum, SIGGRAPH, ICC - Tokyo, Imagina - Monte Carlo, ISEA and was awarded with the Golden Nica at Ars Electronica 1992.

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IMPLORION  
OF NUMBERS -  
PERFORMATIVE  
MIXED  
REALITY



The digital implosion is the basis for an aesthetics of the unpredictable data space. In this generative space, which is constantly mutating by random, there is no fixed position, neither for the user nor for the objects.

"The traditional concept of space is a concept based on perspective. It was developed half a millennium ago and perceived space from a fixed and absolute viewpoint as being an endless, homogeneous and three-dimensional expansion. The decisive novelty brought about by cubism was the displacement of this absolute perspective by a relative one. Artists experience the space's unreal comprehensiveness as its essential element ... and that one has to move through space to be able to really experience it as being three-dimensional" .

Alexander Dorner, Hannover 1931

Berlin 1988 – generative transformations of space: "I say cubes and you visualize a cube with 6 surfaces, 8 corners and 12 edges. Cubes, cubes, cubes – a vast amount of cubes. I feed cubes into my computer and it reacts by producing a digital crash! Instead of Euclidean geometry, it presents the implosion of numbers, which changes perspective dynamically with each cursor-movement of the viewpoint. In our first experiments working with computer graphic workstations, the computer screen displays images of numbers between Zero and One. Like in real-time morphing, we see a continuous transformation of shape. Perspective, proportion and scale of space are transformed into a matrix of free floating numeric data, which points out the mathematization of space and architecture."

The screenshots "Between 0/1" represent interpretations of one and the same set of data. Simple cubes transform into a myriad of elements and figures. It is like Alexander Dorner was saying: each movement of the viewpoint radically changes the view of space. Here, the digital implosion is the basis for an aesthetics of the unpredictable data space. In this generative space, which is constantly mutating by random, there is no fixed position, neither for the user nor for the objects. The snapshots "Between 0/1" demonstrate the transformation of figure and form similar to Eadweard Muybridge's motion studies. The individual pictures show the connection of human sight and perspective to a virtual camera viewpoint. In fact it is a digital camera obscura, which presents images from inside an artificial 3D model-world. Vilém Flusser supposed this images to be representations of his vision: „I dream of a house with walls that can be changed at any time, of a world whose structure is no more than an expression of my ideas.“ It is a body adaptive architecture. It turns space into a space-suit, which is tailor-made camouflage for its user.

Mixed Reality Space to perform eith

A decade later the world of information understands the human being at the centre of a wirelessly linked world, which comprises all networks. It is our aim to gain an understanding of the link between man, machine and space. We extend the notion of „Mixed Reality“, which Paul Milgram defined as a spectrum extending from real to virtual experiences. We study different concepts of integrating digital processes into the space of everyday life. Instead of ignoring the physical space, like in traditional Virtual Reality (VR) approaches, we create interfaces and processes, which link human perception to the computer's programme and the real/virtual Mixed Reality space. In our focus is the human being with his/her sensual, cognitive and culturally coded experiences in order to create contact between people via perceptive, performative and mobile interfaces . Due to its superposition with the digitally networked environment, physical space appears to be an information- and knowledge space. The term knowledge space refers to an architectural rapprochement to digitally stored information – for example a digital archive of sounds to enter. The question is: How can information space become physically perceptible beyond a metaphoric sense in form of space one can walk into?

Murmuring Fields

"Murmuring Fields" (1999) is based on a Mixed Reality environment for performers on different real and virtual stages. It is oriented towards the experience of spatial knowledge like the Theatre of Memory or mnemonics - that is methods of memory training. Mnemonics are a medium, which manifests itself in graphic or space-related interfaces and can be characterized as the interface to memory. Neuroscience today refer to our thinking as a theatre play, just as philosopher Giulio Camillo Delmino had transformed the „Art of Memory“ into a practical means for constructing a „Memory Theater“ in 1550. This theatre was described as a fan-shaped building with a wooden structure, which would allow one or two individuals at a time within its interior to play with memory and to train discourse. The Memory Theatre was an aspect of a science of the imagination which was practiced from Classical times up to the Renaissance. It was used for the development of memory, and also as a mind-map - a connected symbolic space, often represented as a building.

Fig. 2 Murmuring Fields – staging the space of mixed reality

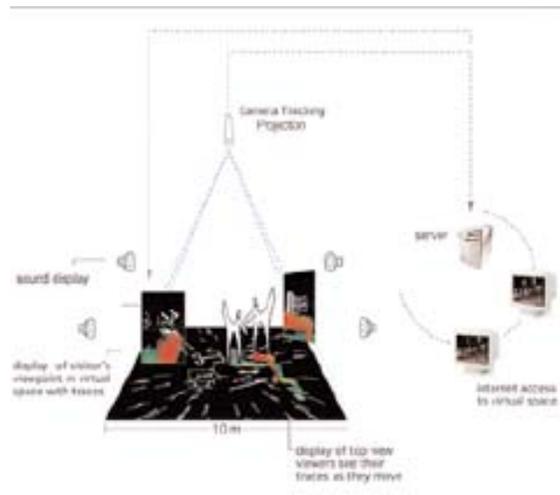




Fig. 3  
Murmuring Fields - interaction and movement on the Mixed Reality stage

In the soundscape of *Murmuring Fields* we study collaborative Mixed Reality space. It is explored in a performance by two dancers, using Memory Theatre principles of spatially arranged information. The stage of the dancers and the virtual stage environment are linked with each other via optical tracking. The performers literally move in an imaginary landscape of audiovisual signs. Surrounded by voices and words, syllables and sounds the dancers act in a sphere of digital data which are mixed by their movement. The information space is structured in four zones with acoustic samples in different languages and talks from media thinkers, such as Vilém Flusser, Marvin Minsky, Joseph Weizenbaum and Paul Virilio. The virtual stage is a landscape of iconic signs and archaic pictograms, which are linked to the theories of the individual thinkers. Depending on speed and direction of movement, the performers create re-readings to the audience. As the temporal structure of digital signs and sounds appear in a different way, the audience perceive a re-collection of statements.

Through the performative use of the Mixed Reality environment a battle of words unfolds. Sound follows movement and thus generates a dynamic circuit of bodies engaged in space. The digital material is re-sampled, re-written and re-composed. The performer's body becomes a musical instrument. The almost audible experience communicates the feeling of something that is created with the body, e.g. playing sounds through body-movement. The dancers' experience is, that interactive space creates "a novel understanding of presence, time, duration and space".

The neurologist Hinderk Emrich put forward his thoughts on Mixed Reality by experimenting on stage: "The audience experience that everyday events are no longer in harmony with their impressions of their internal and external world.

The electronic space stands for the inner reality, the physical space can be equated with the external world." He describes the process of interaction on different levels.

First, he mentions the stage technology – the electronic multi-user stage environment eMUSE, 1998 – as being an enormous "sensitive system", to experience via one's own body. Then he refers to the perception the actor has of him/herself. "I do not only see myself from my usual perspective. At the same time, I also watch myself from the exterior, from a second perspective. I observe myself. This is a phenomenon, which can be also used for therapeutic purposes. We never live exclusively in the external world; we always live in an imaginary world created by ourselves, too. And, maybe this is the most important task of this installation, to make people understand, that we always live in Mixed Realities".

*Murmuring Fields* presents a model for an electronic stage. Here Mixed Reality is like a room furnished with data in a multistorey box for overlapping spaces of polar consistency. The notion of the room stands for physical interaction space. Data-furniture is an embodiment of digital information allocated to a real object. Data-furniture connect experience of mnemotechnics and cognitive science to the interface. In *Murmuring Fields*, the body, materiality, mediality and interactivity are placed at the centre of observations under the aspect of performance. The body is not only the point where all experience takes place. It is also the interface and the link to all things in the world. These considerations follow the understanding that sensual experience and conceptual reflection are coming together in the "body's sensual thinking", which is a view that has been discussed by the epistemologist George Lakoff in "Philosophy in the Flesh".

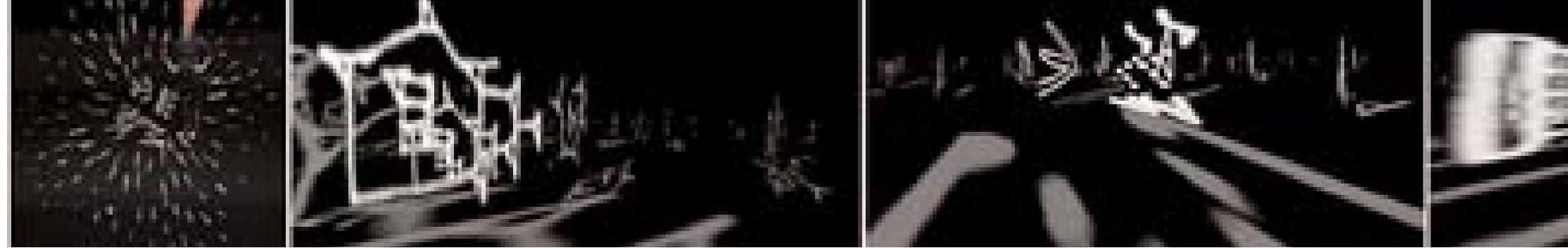


Fig. 4  
Caption: Murmuring Fields – layers of the mixed reality stage This is a short caption to explain the content of the picture. For now it doesnt make much sense it is only her to give an impressipect how it will look lateron.

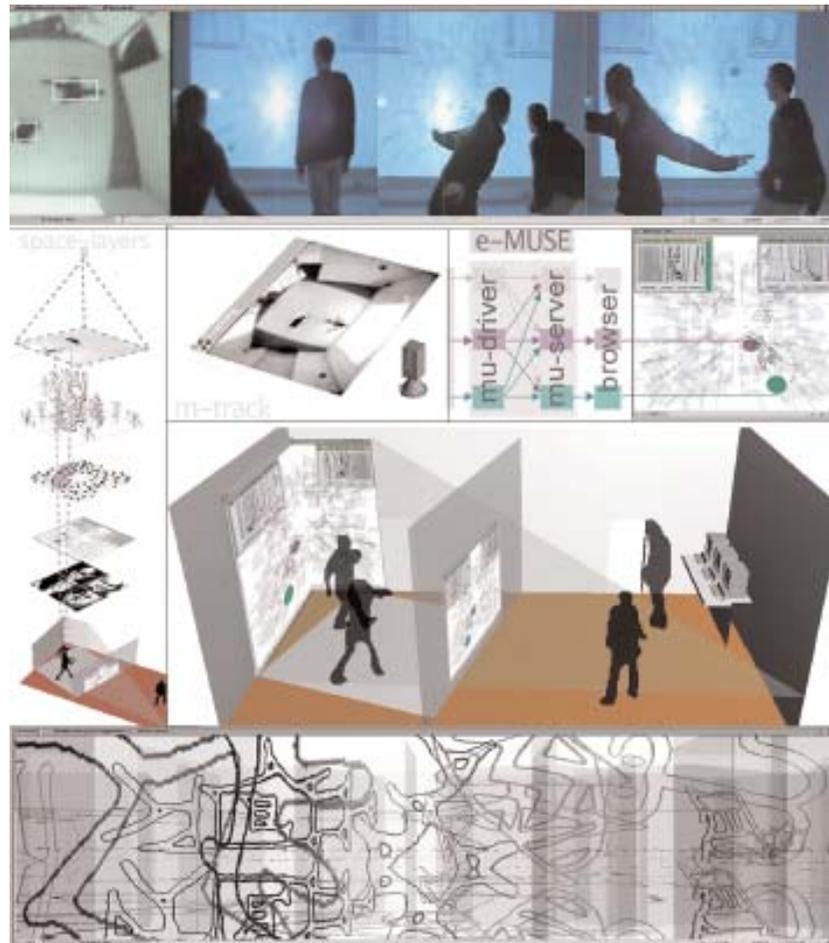


Fig. 5  
Caption: Murmuring Fields – the electronic stage of transparent polygons and drawings

#### Energy Passages: Reading and writing the city

„Energy\_Passages“ - an artistic installation in public space generates linguistic space of the city in form of a data flow. Hundreds of catchwords taken from current newspaper appear via RSS -Feeds in a projected „information flow“. They are spoken by artificial computer voices. As soon as passers-by select individual words, thematically related networks of terms start to perform in this flow. Thus text is detached from its linear context and it is staged as a media reading in urban space.

An automated software, daily analyses the news and reduces it to the 500 most used words. The 27,000 words contained in current news are reduced to the 500 relevant ones. The words filtered according to this process appear in a large projection as information flow at the place Salvatorplatz in front of the House of Literature in Munich. This data flow represents a spectrum of information, which usually accompanies us unnoticed throughout the day and which forms our cultural conscience. The words mentioned most frequently in this performative public installation are percent and million. Whereas words such as truth, friendship or love are quite rare, but mostly chosen by the passers-by.

The public performance process is as follows: Visitors to the installation select individual terms from the information flow via microphone or touch screen. Then, a network of terms appears which, in the newspaper, were linked to the chosen terms by content. Computer voices directly react to their selection and accompany these terms in form of a polyphonic echo. By selecting specific terms, passers-by “re-write” the newspaper and a “Living Newspaper” thus develops. Their selected catchwords also lead to the retrieval of the corresponding passages from the daily press. The information cube displays a world map indicating the geographical origin of each individual message. This highlights the partnership links, which the city has with other cities, but also those, which do not appear on the map. Whereas some terms contained in the information flow allow for associational links, the fragmented enumeration of individual pieces of text, as they appear in the Living Newspaper, refer to the loss of context which we experience due to the acceleration and mass of information. As a public and experimental stage for the perception and experience of a Mixed Reality, the installation offers a test area, in which those present have a decisive say in shaping the public space. The large projection in the street creates a cheerful space for verbal communication and gestures. Things are turned public. Public items are discussed publicly.



Fig. 7  
Energy\_Passages – context based generated cluster, related to the word “Kunst” (art)



Fig. 8  
Energy\_Passages – information flow of SZ newspaper, 29.11.2004

### Public Voices

During the four weeks of exhibition of “Energy\_Passages”, we received a lot of feedback from reputed experts from Germany and abroad. Especially children, artists and female passers-by walked enthusiastically through the flow as if it were a shower of light and energy. It is a project at the interface between the art and science. We understand this work on the access to information as a contribution to information sciences based on our work on knowledge discovery. Here, artistic research creates a computer-based linguistic tool, which is turned into an information browser by machine-made “cross-reading”.

Sherry Turkle, Professor of Sociology at the MIT, wrote with reference to Energy\_Passages: “A true evocative object: The notion of a spatial experience of the discourse of the news within a city space and the possibility of deconstructing the newspaper captures the fragmentation of how media is experienced by citizens in a culture of simulation. It thus mirrors and concretises an important cultural and political moment, turning it into an object for reflection.”

Christiane Paul, curator at the Whitney Museum in New York, sent a statement with reference to the video and the internet live streams: “Literally 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: the public information space of daily events and the local, public space of the city traversed by a constant flow of people. 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.”

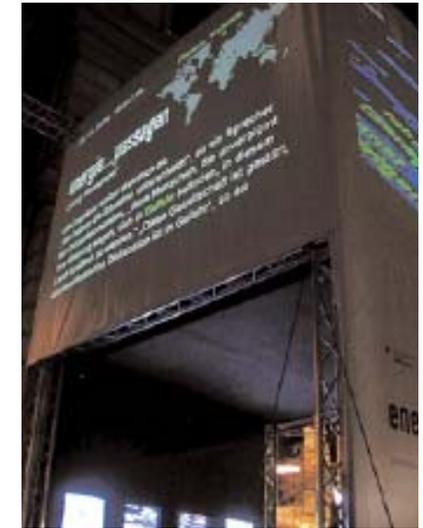


Fig. 9 Energy\_Passages - the Living Newspaper created by visitors

Fig. 10 Energie\_Passagen – in overlay with Jenny Holzer

Fig. 11: The physical architecture of Energy\_Passages





"Energy\_Passages" literally reinscribes the passages of energy that inform our daily life onto the street, allowing the passers-by to "perform" the events of the day in their multiple semantic connections."

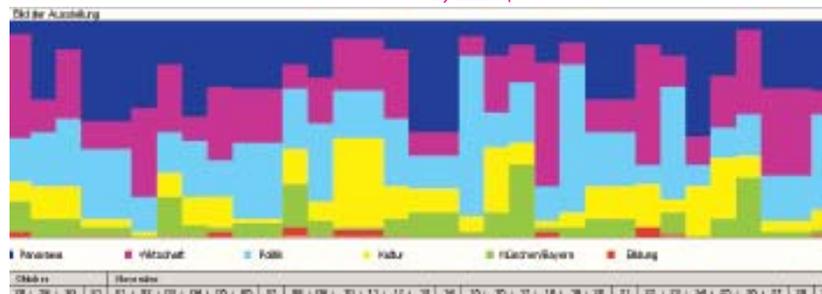
Architectural Space

The technical carrier constructions for "Energy\_Passages" are the physical architecture for the virtual environment on. The construction consisting of aluminium cross beams forms one unit together with the information cube. They serve to contain the projection and the audio technology. The cube is the entry gate and the information interface. It contains all the hardware equipment. Blocks of concrete, which are necessary for static purposes, frame the information flow looking like cliffs. The installation's physical parts have an independent space-shaping impact and are at the same time a symbol for the audio-visual installation which

can be heard throughout the day but which only becomes visible once dawn sets in. The installation's architecture forms an ensemble of external buildings, an electronic front garden in an urban space. Together with the existing furniture in form of stone tables and benches by Jenny Holzer, this reading garden has developed into an external space for the House of Literature, which specifically relates to it.

Under the heading of the "Local appointments - The arts in the public space" in Munich, a virtual, sensual and cognitively perceivable urban space was developed, which was mainly created by the electronic medium and algorithms. This new space is clearly understood to be different from spaces existing in the world of goods with it advertising messages and images.

Fig. 12 Energie\_Passagen - city energy protocol from 28.10. - 29-11.2004



The theme of the flow in form of a large image creates a public and media space which is designed by text, language and light and which is directly on one's way. It is the moment of time that occurs in the information river onsite. It is as good as real water because it comes as a refreshing instant flow of consciousness. For the audience the information projected in public space is not difficult to read. The text and words projected, represent daily public short time memory as dispersed by media. The installation also serves as a media protocol, when ranking and filtering the most prominent words used at a place in a given time. Thus the installation mirrors and reflects the reality. This process is digitally stored and the data provide the painting material for painting the final imagery of the archived status with the complete procedure of the four weeks urban intervention including tracking data of the visitors' activities. This image in fact looks like an architectural iconic abstraction of the city (in a certain time).

Conclusion

We use the term Mixed Reality for different scenarios of body, space and time. In Murmuring Fields digital information is positioned on stage. Body and spatial sound environment are linked together. Space is extended by virtual space. In Energy\_Passages media reality like the newspaper creates interactive and time-based public space. The collective mind of the daily newspaper is displayed in public space for digital and subjective transformation. This allows re-reading reality by building own associative topic maps. With Energy\_Passages we support the formation of opinion in public discussion. Our above mentioned strategies are inspired by the Renaissance Memory Theatre, which we develop further to a Mixed Reality Experience. In today's Mixed Reality Memory Theatre the notion of memory is extended in many ways: the memory of the body, the memory of space, the memory of time, the memory of thoughts.

In the future Mixed Reality applications will be integrated in everyday life as touchless, invisible or ambient immaterial interfaces. Therefore we have an interest to experiment with new technologies from an artistic point of view.

With our “Interactive Experience Lab” we provide a basis for a debate of experiments and prototypes, which we prove and reflect in playful learning scenarios or as artistic installations in public space. Memory Theatre, digital archives, information space and spatial structuring of knowledge are some of the topics we identified as important issues for new architectural concepts.

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- [2] Refer to: Wolfgang Strauss; Monika Fleischmann. Virtuelle Architektur und Imagination, in: Film + Arc 1, Artimage Graz 1993 and Wolfgang Strauss, Monika Fleischmann: Space Of Knowledge: Zur Architektur Vernetzter Handlungsräume. URL: [http://netzspannung.org/cat/servlet/CatServlet/\\$files/150567/Strauss.pdf](http://netzspannung.org/cat/servlet/CatServlet/$files/150567/Strauss.pdf)
- [3] Vilém Flusser in „Home of the Brain“ (1992) by Fleischmann/Strauss. URL: <http://netzspannung.org/database/home-of-the-brain/en>
- [4] With regard to this topic, refer to the initiative of the “Wireless World Research Forum”. URL: <http://www.ww-rf.org/> founded by Alcatel, Ericson, Nokia, Siemens etc. in 2001.
- [5] This term was first used by Paul Milgram and Fumio Kishino in 1994 and coined in: A Taxonomy of Mixed Reality Visual Displays, IEICE Transactions on Information Systems, Vol. E77-D, No.12 December 1994.
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- [10] Knowledge presentations do not refer to knowledge in the sense of wisdom, but in the sense of knowing.
- [11] Refer to Peter Matussek: Computer als Gedächtnistheater [Computer as Theatre of Memory]. URL: <http://www.sfb-performativ.de/seiten/b7.html> and Peter Matussek: Der Performative Turn: Wissen als Schauspiel, published on netzspannung.org, knowledge room for digital art and culture. URL: <http://netzspannung.org/positions/digital-transformations/> first published in Monika Fleischmann, Ulrike Reinhard (Editors): Digitale Transformationen - Medienkunst als Schnittstelle von Kunst, Wissenschaft, Wirtschaft und Gesellschaft. Heidelberg. whois verlags- und vertriebsgesellschaft, 2004
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- [17] George Lakoff, Philosophy in the Flesh. The Embodied Mind and Its Challenge to Western Thought. New York 1999.
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- [19] Really Simple Syndication = XML based format to synchronize content.
- [20] Refer to the simulation and the installation's archive on the web: <http://www.energie-passagen.de/webinstallation.html>
- [21] Sherry Turkle, Professor of the Social Studies of Science and Technology and Director, MIT Initiative on Technology and Self Program in Science, Technology, and Society, in form of an e-mail sent from Boston (MA), 11.11.2004. Full quote under: <http://www.energie-passagen.de/presse2.html>
- [22] Christiane Paul, Lo-fi's guest curator for January 2005, put together the News Readers show. See on URL: <http://grandtextauto.gatech.edu/2005/02/05/news-readers/>
- [23] Christiane Paul, Adjunct Curator of New Media Arts at the Whitney Museum of American Art, sent an email from New York, 5. December 2004. Full quote see on URL: <http://www.energie-passagen.de/presse2.html>
- [24] German title of the exhibition: “Ortstermine 2004 – Kunst im öffentlichen Raum”. URL: [http://www.ortstermine-muenchen.de/seiten/projekte\\_2004/energie\\_passagen.html](http://www.ortstermine-muenchen.de/seiten/projekte_2004/energie_passagen.html)

In the future Mixed Reality applications will be integrated in everyday life as touchless, invisible or ambient immaterial interfaces. Due to its superposition with the digitally networked environment, physical space appears to be an information- and knowledge space.

