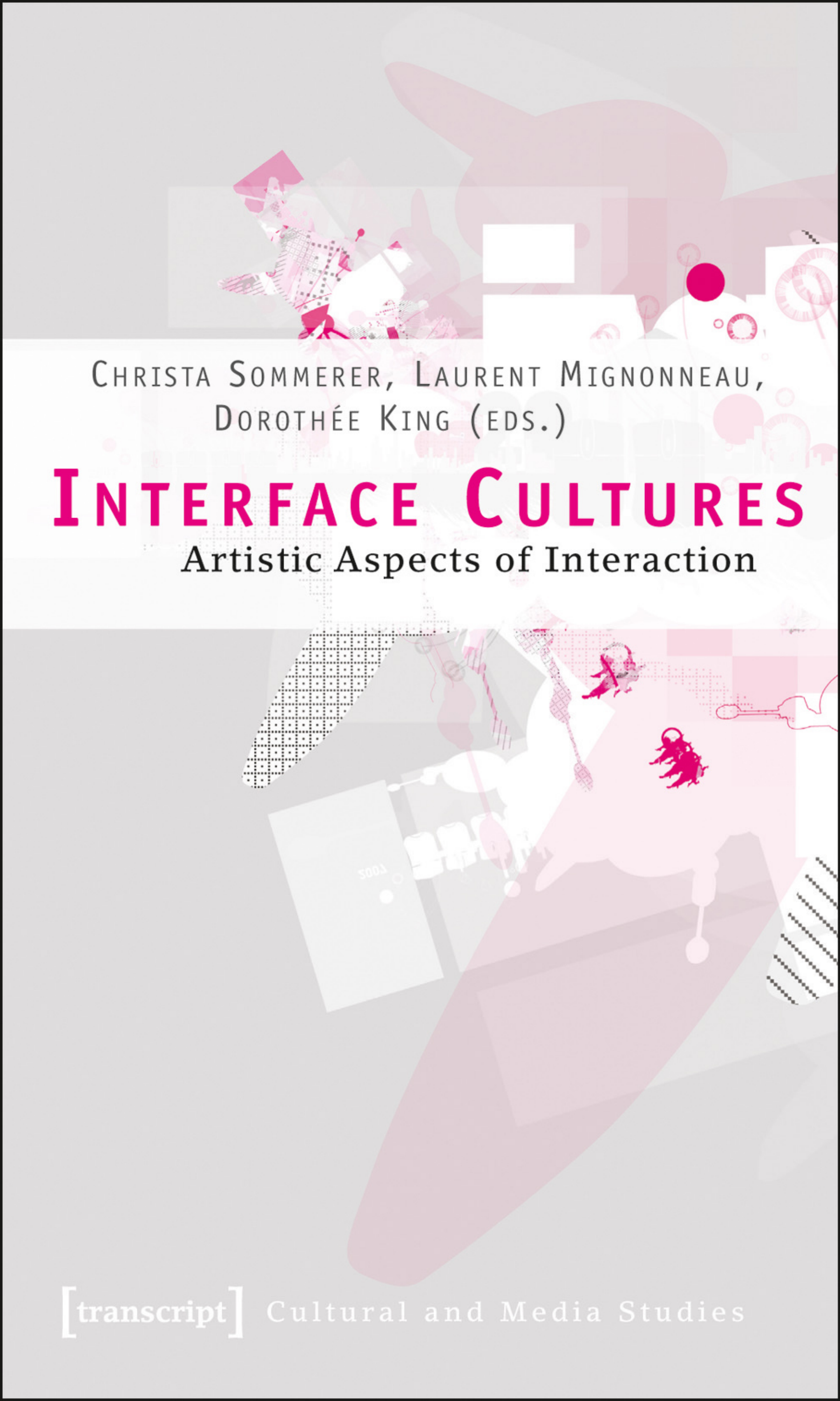

Christa Sommerer, Laurent Mignonneau,
Dorothée King (eds.)

Interface Cultures

Artistic Aspects of Interaction

[transcript] Cultural and Media Studies

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[transcript]

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Content

BIOLOGICALLY INSPIRED INTERFACES

CULTURAL ASPECTS AND AESTHETICS OF INTERACTIVITY

INTERFACE CULTURES – ARTISTIC ASPECTS OF INTERFACE DESIGN

CHRISTA SOMMERER, LAURENT MIGNONNEAU

In 2004 the University of Art and Industrial Design in Linz established a new master study program called Interface Cultures[1]. The title of this program was coined by the university based on the book »Interface Culture: How New Technology Transforms the Way We Create and Communicate« by Steven Johnson (c.f. Johnson 1997). He predicted that new types of interfaces will alter the style of our conversations, prose and thoughts in the future and he rightfully forsaw that interface designs would be strongly linked to artistic innovation as they reach out into the applications of our daily lives.

Artists and designers in the area of interface and interaction design have long been conducting research on human-machine interaction (c.f. Weibel 1989, Sakane 1989, Laurel 1990, Cornwell 1992, Sakane 1995, Dinkla 1997, Hünnekens 1997). By designing interactive systems that bridge social, entertaining and artistic elements, their prototypes and installations have often reached into the wider field of media products and entertainment applications. An introduction to artistic prototypes that went beyond the art arena, into areas such as mobile computing, intelligent ambience, intelligent architecture, fashionable technology, ubiquitous computing and pervasive gaming is provided in literature (c.f. Sommerer et al. 2008).

When we were asked to take up the position of professors for Interface Cultures in 2004, we were able to start a whole new master study program that not only needed to concentrate on human-computer interface design in the classical computer engineering approach, but could also include artistic and social aspects. It was important for us to keep the field of Interface Cultures as open and as inspirational as possible. We thus mapped out areas of investigation, which we deemed promising for further artistic research. These areas are:

1 http://www.interface.ufg.ac.at, (March 14, 2008).

- Interaction and Interface Design
- Tangible, Multimodal and Hybrid Interfaces
- Auditory Interfaces and Audio-Visual Interaction
- Gaming Interfaces
- Ubiquitous Computing and Intelligent Ambiences
- Wearable and Fashionable Technologies
- Interactive Art, Net Art and Hybrid Art
- Experimental Forms of Interaction including Nano Art and Bio Art
- Media Art History and Media Archaeology

Being situated at an art university, we foremost concentrated on the development of artistic prototypes and projects that bridge the gap between art, design, entertainment and product development. One of our main goals is to create an environment where artistic exploration can be combined with technical and scientific research. Especially in the fields of human-computer interaction and media design, the development of innovative and perhaps at times unusual artistic interfaces can lead to new services, new paradigms and new forms of communication~~s~~, as described by Johnson (1997).

The Interface Cultures program is a master study program. It teaches hands-on development of interfaces and interaction designs, and encourages students to test and implement their prototypes in real situations. For a long time the Ars Electronica festival in Linz, Austria has been a breeding place for interactive art works, as it established Interactive Art as a separate category for the Prix Ars Electronica competition in 1991 (c.f. Leopoldseder 1991). Every year experts in interactive art gather in Linz to present and discuss about the latest developments in media art and their societal implications.

Interface Cultures Student Project Presentations at Ars Electronica 2005-2007

In the past four years we have supervised and developed around 45 student projects. Each year the student projects were presented at the international media art festival Ars Electronica in Linz, Austria. This has proved to be very motivating for the students, as it gave them the opportunity to present their latest protoypes to an international audience of media experts, receiving valuable feedback and know-how in the process.

The first exhibition of projects by Interface Cultures students in 2005 showcased interface design work in the fields of interactive art, tangible interfaces, intuitive music and composition instruments, acoustic and object-based interfaces as well as CAVE applications and examples of interactive games (c.f. Mignonneau et al. 2005).

The second presentation of student projects at Ars Electronica 2006 was divided into more or less five thematic clusters, corresponding to courses of study in the Interface Cultures program (c.f. Sommerer et al. 2006), these were:

Interactive Media Archeology

Works in this category dealt with media archeology. For example, the interactive installation *re:call phone* showed how new sensor technology and a picture screen can be added to a telephone from the 1920s to become an interactive tool that allows users to experience the history of telecommunications in a playful way. *The Digital Barrel-Organ* combined an old barrel-organ with digital MP3 sounds, delivering a satiric commentary on the pressure to innovate that contemporary musicians face.

Interactive Artificial Life Projects

Programming courses familiarized students with generative processes. The results included several interactive installations that dealt with the *game of life* theme and computer-generated nature.

Fashionable Technology Projects

Another area of emphasis of the Interface Cultures program is fashionable technologies and the development of sensor technologies. In a project entitled *No more under cover*, for instance, books that have been out on loan from the library too long gradually change color. Other works included *Enlightened Collection* and *Clothing that arranges the body*.

Intelligent Environments, Tangible Interfaces and Auditory Interfaces

This field gave rise to projects such as *iShaker*, which makes it possible to generate beats and sounds with three iPods, *AtemRaum*, an interactive environment that reacts to breathing, *Shape, Color & Sound*, a tangible interface that combines the worlds of Ittens and Schönberg, and *Scream Point*, an ironic work about interactive photography.

Robotic Interfaces

In a special course taught by Time’s Up, students were introduced to the basics of artistic robotics and presented their robots in a performance.

The exhibition of these projects documented how interactive technologies are increasingly used in creative applications and hybrid art projects, and, via innovative recombination of technology and art, are giving rise to interesting prototypes at the nexus of media art, design and R&D.

The thematic emphasis on the projects selected for the Ars Electronica 2007 student exhibition was based on physical computing and hybrid interfaces (c.f. Sommerer et al. 2007). For this exhibition, the interface concept developed in the Interface Cultures program was expanded via links to other artistic and artisanal disciplines such as textile design, industrial design and interior design. These works embody original, innovative concepts for interaction, involving intelligent furniture, clothing and environments, interactive toys, pervasive gaming, new analog and digital musical instruments as well as technical, artistic and applied interactive prototypes and hybrid systems. The thematic clusters of this exhibition were:

Physical Computing Interfaces

News Knitter by Ebru Kurbak and Mahir M. Yavuz converts information that is gathered from the daily political news feed from the Internet into unique visual patterns for knitted sweaters.

Massage Me, by Hannah Perner-Wilson and Mika Satomi, consists of two jackets that are designed with integrated soft wearable game pads. As users massage each other they control two game characters, which fight against each other. Massage Me thus converts the game player's hectic finger movements into a relaxing massage.

Garden of Eden by Thorsten Kiesl, Harald Moser and Timm-Oliver Wilks consists of eight airtight Plexiglas domes that contain lettuces. The domes are connected to the Internet, which provides access to real-time data on current air pollution levels in the capitals of the G7 countries and Austria. This data is used to concoct the same concentrations of pollutants in the atmospheres of the individual domes as currently contaminate the air in the respective capital cities.

Affective Twins by Gabriela Carneiro consists of two interactive chairs where people can sit or touch each other over distance and also see these interactions being displayed as light patterns.

Pervasive Gaming Interfaces

Noon – A Secret Told by Objects by Christina Heidecker and Tiago Martins is a pervasive gaming interface that uses objects and physical space to convey an interactive narrative. The player takes on the task of unveiling the origins of a tragic fire. He/She must don a special device, the Gauntlet, and use its powers to probe and navigate memories contained in salvaged objects. The advent of personal computation and public networks made new forms of gaming possible. We envision gaming activities that take advantage of real spaces and objects as interfaces themselves.

news machine by Nicole Weber is an interactive news mixer that enables users to personally generate their own news. To do so, users are provided with a wide variety of components (video samples) that can be variably combined and assembled in the spirit of »remix culture.«

New Musical Instruments

Mountain Guitar by Junichi Kanebako enables musical expression through custom-made sensor technology, which measures the height at which the instrument is held and transforms it to musical output during the playing session. *Mountain Guitar* has no strings, and anyone can make real guitar sounds by simply pretending to play through body movements.

PipeSound by Thomas Wagner and Lukas Rettenbacher is an experimental musical instrument that can be played by multiple users simultaneously. Moving the tubes closer together or further apart changes the pitch and duration of the instrument's tones; adjustable screws function as a mixing console; levers produce sound filters. Each tube serves as a channel, and each respective combination of them results in a novel sound experience.

Interface Cultures International Guest Lecture Program

Besides courses on interface and interaction design, media archaeology, programming, game design, sensor technology, fashionable technology, audio visual interaction, history of media art, interactive art, bio and nano art and robotics classes, the international guest lecture program is an important source for new inspiration. It is set out to cover a wide field of interface related subjects. The book »Interface Cultures – Artistic Aspects on Interaction« is a collection of these lecture notes by national and international experts who came to present their talks to the students. The thematic clusters of these talks can be grouped in five areas:

Information Design and Social Media

Professor Chris Stary, an expert in usability from the Kepler University in Linz spoke about usability and user experience in the development of interactive artifacts and the importance of hedonic qualities. Prof. Dietmar Offenhuber and Judith Donath write about visualizing communication along network paths, Jürgen Scheible gave a workshop on wireless com-munication networks, doctoral candidate Stefano M. Vannotti researches interface design for institutional repositories, Georg Weichhart gave an inspiring lecture on Software Agents, and Georg Russegger spoke about Software as Cultureware and its connection to pervasive media cultures.

Biologically Inspired Interfaces

Another strand of guest lectures researched new areas of interface design connected to physics and the life sciences. Here we invited Prof. Paul Thomas who talked about nano vibrational interfaces, Dr. Ingrid Graz who presented new packaging materials and glues based on nano technologies, Dr. Tomor Elezkurtaj who introduced evolutionary algorithms for industrial design applications, doctoral candidate Mika Satomi who researches body extensions and wearable technologies and Prof. Mischa Schaub who deals with neo-analogue interfaces and their connections to craft.

Cultural Aspects and Aesthetics of Interactivity

Regarding the aesthetic and cultural aspects of interactivity we were fortunate to have international experts such as Prof. Erkki Huhtamo talk on tactility in contemporary art and media, Dr. Christiane Paul speaking about media art and artware, Dr. Katja Kwastek teaching a whole class on the term, meaning and aesthetics of interactivity and doctoral candidate Penesta Dika researching motifs and visual aspects in interactive media art. Doctoral candidate Dorothée King, who is currently works on decoding gaze in immersive and interactive media art productions and doctoral candidate Mahir M. Yavuz, who is researching new interfaces for city mapping tools. Finally Prof. Giaco Schiesser spoke about the importance of willful obstinacy in the production of media art and Prof. Hiroshi Yoshioka stressed the importance of cultural parasitology.

Stage-Based and Audiovisual Interaction

An important and growing area of interface design is stage based and audiovisual interaction. Here we were also fortunate to attract some of the key experts of these fields. Internationally renowned choreographer

Scott De La Hunta talked about interactions between choreography, dance and new media technologies, dancer and choreographer Martin Kusch gave a workshop on interactive technologies for stage-based interactions and doctoral candidate Andreas Weixler and Se-Lien Chuang teach audio visual interaction and apply it to their own interactive audio-visual performances. Internationally renowned choreographer Klaus Obermaier talked about the interactive aspects of his stage performances and finally Wolfgang Kopper, and Oliver Wittchow presented game boy musical interfaces.

Interactive Art Practice

Over the past four years we also attracted well-known media artists to share their work and research practice with our students. Gebhard Sengmüller regularly teaches media archaeology and has presented many of his wonderful artworks. Ulf Langheinrich came to share his artworks that deal with conceptual forms of interaction and perception, and the renowned group Station Rose (Elisa Rose, Gary Danner) gave a comprehensive lecture on their 20 years of experience in media art production. Ursula Endlicher spoke about her ironical Internet driven art works and Japanese artist Keiko Takahashi presented several of her interactive artworks based on childhood memories. Composer and sound artist Kim Cascone gave a workshop on genetic programming for sound production, Herwig Turk talked about his installation work based on scientific metaphors and practices and Austrian media artist and game developer Sylvia Eckermann spoke about her interactive artworks that present virtual knowledge spaces in the art and game context.

Summary

This book is intended to give an overview of the reserach topics we have discussed at the Interface Cultures study program over the past four years. We would like to thank all the guest lecturers and the students who have put their time and energy into developing this exciting field of practice-based research and who have been open to explore new territory and embark on new fields of artistic investigations. We also hope to give the readers an impression and outlook of what kind of artistic research topics are to come in the future. To conclude, we would like to stress again the importance of artistic creativity and hybrid thinking in the development of new forms of interactions and communications. It will remain important to propose media productions that defy the strict boundaries of art, design, entertainment and product design.

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USER EXPERIENCE AND MODEL-BASED DEVELOPMENT OF INTERACTIVE ARTIFACTS

CHRIS STARY

Currently, we recognize increased interest in the various notions of user experience and related design issues in HCI, e.g., Ballard (2007). Moving beyond usability in terms of effective and efficient use of interactive artifacts user experience means tackling the appeal of interactive products in terms of their hedonic qualities. Actually, the use of interactive software systems depends on the emotional state of a user (McCarthy et al. 2004), and on his or her personality (cf. Brave et al. 2003). The latter triggers a certain behavior at the user interface (Norman 2004). Based on these findings it is not astonishing that different people interact with an artifact quite differently in a particular role, such as tourist or accountant. Individuals also act according to their current »Befindlichkeit« (well-being), thus, showing different behavior in an identical role.

User experience (UX) targets the hedonic relationships between user and products as well as between the contingent systems (e.g., an organization) and the product (cf. Jetter et al. 2006). Users recognize the latter via marketing, branding and other customer relationship management activities. Hedonic qualities target individual and socially grounded properties, such as curiosity, pride, and self-confidence (cf. Burmester et al. 2002). They establish what could be termed joy of use and concern factors beyond traditional ergonomic usability criteria (Hassenzahl et al. 2000). Dealing with hedonic qualities involves affective and cognitive mechanisms that influence design activities significantly, as Norman's design layers reveal (2004).

Design representations or models are set up in the course of artifact development or re-development. They serve as containers of ideas and a means of communication among developers and between users and developers. They also serve as executable specifications for prototyping. As such they require a ›language‹ that can be understood by a variety of parties involved in development (Forbrig et al. 2003; Rosson et al. 2002).

Traditionally, software-design representations, such as UML-specifications (cf. Forbrig 2002), contain diagrammatic symbols, visualizations, and/or some restricted forms of natural language. In this way, users express their expectations and needs.

Usability engineers express their design ideas; interpret results from user tests and evaluations. Finally, software engineers rephrase requirements, take input from users and usability engineers to plan upcoming activities and report on functional tests.

User experience can be interpreted as individually anticipated or experienced mental representations, being either explicit or tacit (Stary 2006). As soon as users become part of the design process, they become part of the development process. UX can either be represented in specifications explicitly or be encoded in implementations.

Mutual understanding and embodiment of UX into user-interface design representations at the methodological level requires special techniques and languages, as their semantic capabilities play a crucial role for eliciting and representing user and design knowledge. User knowledge comprises information about the context of use as well as all properties relevant for artifact design. It includes facilitators for task accomplishment, aesthetic requirements, and fun factors. Explicit design knowledge can be described by means of natural language and transferred to conceptual languages in the course of development. This type of languages is designed to mediate between users and programmers, as they allow for a representation for all inputs provided in design in a human-orientated way – a prerequisite for human-centered design (Norman et al. 1986).

However, the use of conceptual languages, such as UML, requires proper elements if they should capture information provided by users accurately. Context-specific user knowledge elicitation might even require ontology development in cooperation with users (Oppl et al. 2005). The explication often leads to enrichments in existing conceptual languages, and to the application of elicitation techniques concerning implicit knowledge. For instance repertory grids allow users to express user expectations and experiences in terms of their individual value system and mental structures (cf. Hemmecke et al. 2006). They allow the revealing of subject-relevant information when interacting with artifacts or performing tasks.

Model-based design approaches (cf. Paterno et al. 2003) encourage designers to embed user tasks into design representations, in order to achieve a context-sensitive picture of the functionality of an artifact. Such representations are either based on conceptual languages, such as UML, or on structure definition languages, mainly based on XML, such as XUL or XIML (www.mozilla.org/projects/xul/, www.ximl.org).

Model-based design techniques reflect user perspectives on work processes and support their refinement to interaction procedures. Artifact designers utilize user and task information for creating several, mutually dependent models. These models capture tasks, task domains, user characteristics etc. accordingly. A variety of models have to be used in the course of design, in order to involve all stakeholders (users, analysts, software and usability engineers), to capture their perspectives and the context of use.

For instance, the ProcessLens approach (Stary et al. 2003, Dittmar et al. 2004) comprises a task-oriented development procedure that is based on several models: the user, task, data, and interaction model:

- The *user model* represents a role model by defining specific views on tasks and data (according to the functional roles of users). Typical elements used in this context are *organizational unit*, *position* and *person*.
- The *task model* comprises the decomposition of user tasks according to the economic and the social organization of work as well as the different activities that users have to perform to accomplish their tasks. Typical elements used for modeling are *task*, *activity*, *and tool*.
- The *(problem domain) data model* describes the data required for work-task accomplishment. In contrast to traditional data modeling, in ProcessLens both aspects of data are captured: structure and behavior. A commonly used element is *material*.
- The *interaction (domain) model* comprises the interaction style(s) required for interactive usage of an artifact. A commonly used style is browser-based interaction embedding GUI (Graphical User Interface) specifications.

In ProcessLens UML class diagrams are utilized to specify the structure of all models and their mutual relationships. A set of predefined elements (some of them are mentioned above) and links support modeling of work processes and their relation to user, interaction, and problem domain data. Problem domain objects (data objects) can be derived from the task model, as they represent the subjects of user work. Both, tasks and domain data have to be related to the interaction model, in case the information is visible to users, and thus, becomes part of the interaction. Typically, interactive tasks become menu options or icons, whereas data elements become form fields for editing or display.

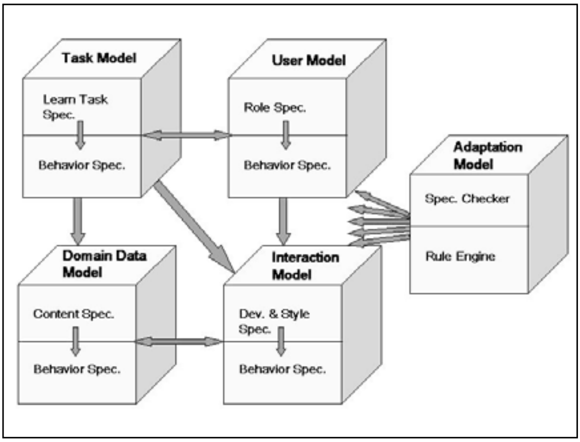
Assuming a tourism setting, the planning task of a tourist for sightseeing can be decomposed into providing a profile including user interests and a wish list including schedule data. The problem domain data in this case comprises places, objects, and information of interest for tourists, and needs to be related to the wish list, in order to set up a plan. At the user interface the tourist might not only enter profile and wish-list data, but also modify them in a form after receiving proposals from the artifact.

Designers have to specify and assign activity diagrams to dedicated model elements, such as the leaves of a task hierarchy, to describe the actual accomplishment of tasks (including the manipulation of data) and role-specific behavior (see *Figure 1*). If elements from different models are related at the structure level (upper part of the models in *Figure 1*), not only activity diagrams have to be specified, but also special kinds of ProcessLens transitions have to be used to synchronize the respective behavior specifications. This link of the dynamic specifications enables to specify the entire operational structure of an artifact (see also application model).

Recent findings have led to the definition of an adaptation model (Brusilovsky et al. 2003; Stary 2007). It contains rules, which affect elements of different models. It captures a cross-model operational perspective, since domain-specific information has to be considered in various contexts, as shown in *Figure 1* for e-learning application development. The adaptation model is a set of rules that trigger a certain behavior of an application, with respect to user roles, work tasks, and the situation of use. Users are able to perform certain activities according to their functional role. A tourist is able to plan a city tour using a multimedia kiosk system, or provide feedback after completing the suggested tour. Those tasks might either be performed at a stationary browser system, e.g., at the railway station, or on the move, e.g., using a PDA (Personal Digital Assistant). In this case, the interaction model is triggered according to the interaction device, which subsequently triggers the data and task model.

The specification checker of the adaptation model ensures the syntactic and semantic correct use of relationships and links, both within and between models. For instance, an ›is-handled-by‹ relationship can only be set between a task (as part of the task model) and a user role (as part of the user model). A more complex task is to keep structure and behavior diagrams consistent (Stary et al. 2003). For instance, the ›before‹-relationship between subsequent tasks in the task model requires a proper coordination of behavior, i.e. the execution of the respective activity diagram in the corresponding sequence.

Figure 1: Model-based Design Representations enabling Adaptation



Graphic: Chris Stary.

The rule engine influences the behaviour of an artefact through situation-aware information – which role is performing which task using which device. The role primarily identifies a set of tasks (represented in the task model) that require a set of data, and permits to access those data (represented in the domain model). The use of a certain device, e.g., at a certain location, triggers a certain interaction style and behavior (represented in the interaction model). For instance, using the PDA requires different encoding of information from stationary artifacts due to space limits for displaying data and the light conditions of the environment.

The integrated specification comprising all models is termed *application model*. It does not only comprise structure information, e.g., the composition of interaction styles, such as GUIs, but also the synchronization of task, functional, and interaction behavior. Structure integration is enabled associating design class diagrams in UML, whereas interaction diagrams allow to tune behavior diagrams, e.g., the workflow to the browser elements. In this way,

- Work tasks can be performed in various ways, according to user expectations or previous experiences
- Interaction can be designed in a variety of ways, increasing the joy of use
- Users might play different roles leading to different interaction styles and paths

- Data that is retrieved, manipulated, and displayed can be accessed in different ways and format, according to user needs and situational requirements.

Using model-based development techniques, polymorph applications can be designed in a unified way capturing different development perspectives. In case the specifications are executable, prototypes can be shown to users at an early stage of development. Users might experience functionally equivalent artifacts in different flavours, individually tuned, using adaptation capabilities to enjoy and please the users.

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COMMENT FLOW: VISUALIZING COMMUNICATION ALONG NETWORK PATHS

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Introduction

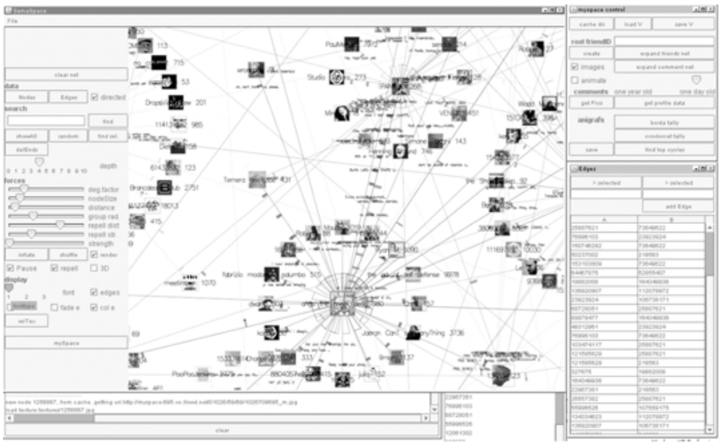
In the last couple of years, online social networking platforms have become widely popular. In these services, participants create self-descriptive profile pages that often include their tastes and preferences, and a number of links to other members of the same service, usually called »friends«. The purpose is to meet new people, make new business contacts by taking advantage of network effects.

Social networks are abstract organizational structures that help us understand the relationships among a group of interconnected individuals. Much recent research has focused on understanding the structure of these networks, identifying patterns such as bridges, structural holes, etc. and on developing visualizations for these often complex entities.

Typical network diagrams are detailed in their structure, but generic in their representation of the nodes and links. Yet it is the differences among the people (nodes) and their relationships (links) that create the specific structure of each network and that determine the strength and significance of the ties. The first part of the paper outlines the key issues in visualizing social networks with individuated nodes and links. The second part describes a specific research project - the visualization of communication patterns in an online social network site - carried out within this program.

This project serves both as an illustration of one approach to the general problem of individuated network visualization and as an example of the practical uses of such representations. In the mySpace service (the networking site used for this research) network-only visualization methods are no longer sufficient to meaningfully represent the community structure.

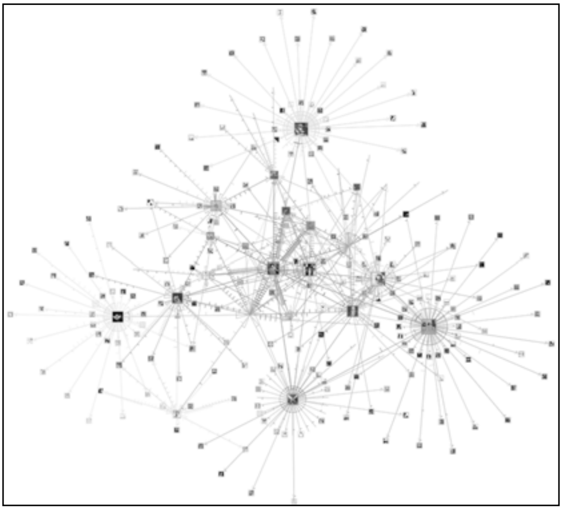
Figure 1: Screenshot of the »Comment Flow« application.



Picture: Judith Donath, Dietmar Offenhuber.

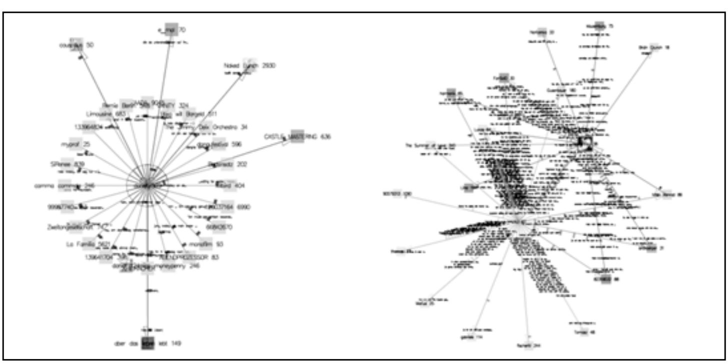
Numerous commercial profiles, fake/spam/celebrity profiles and widgets such as automatic friend adders result in a huge numbers of connections, many of which carry little information about a person's actual social ties and behavior. The average mySpace user has around 131 friends, but there are also profiles with over a million »friends«. By going beyond the »skeleton» of network connectivity [1] and looking at the flow of information between the individual actors we can create a far more accurate portrait of online social life. Comparing the first generation of social networking sites to the services that are currently popular, we find that today's social software platforms are more content-centric than their earlier counterparts, which were more concerned with the structural representation of the social network. In recent social software platforms such as Flickr, Facebook, mySpace, the social network serves the purpose of providing context information for the different kinds of activities. As Donath and Boyd described (Donath and Boyd 2004), most traditional social networking sites rely on a similar model for interpersonal connection that suffers from a problematic simplification. The links between people are mutual and public, but also un-nuanced and de-contextualized: no distinction is made between the connection to a close relative and a complete stranger. All friend links are equal, and usually equally visible to public. The information is not very reliable - extra information is required to acknowledge the highly differentiated nature of human relationships. Feld used the term ›focus‹ for the different, sometimes incompatible partitions of social relationships (Feld 1981).

Figure 2: A distance 3 network. The edge colors indicate the topological distance from the selected node, visually supporting the interactive exploration of the network.



Picture: Judith Donath, Dietmar Offenhuber.

Figure 3: The visual pattern of one-way and two way message exchange. On the left side we see a band profile with a number of incoming posts, but very few replies. On the right side we see a group of profiles using the comment section for extensive conversation. In our application, leaf nodes are grouped around their connected node and appear as circular clusters. Applied to the myspace data, the clustered nodes represent such instances of one-way communication.



Picture: Judith Donath, Dietmar Offenhuber.

As a result, people browsing public profiles of strangers in order to meet new people do not know whether the interesting profile they encounter represents a real person at all – it might as well be a commercial disguised as a person. There is also active spamming activity, the fake profiles don't wait to be discovered – members of sites receive numerous invitations, often accompanied by a message written in a personal tone, that are in fact automatically generated spam. The users have little awareness of the social nature of the space they move through, no means of understanding who these other people are they meet.

One way of solving this problem is by focusing on the communicative activities taking place in the social network. By looking at their flow of conversation, we can understand who these strangers are.

Related Work

The visualization of social networks has a long history dating back to Jakob Moreno's work on sociometry in the 1930s (Freeman 2000). Essentially, there are two ways for the graphical representation of social networks: first, the arrangement of the participating actors in the rows and columns of a square matrix, its cells containing information about the relationship between the corresponding actors. The second and more popular way is the graphical representation of the social ties between the participating actors in the form of a node – link diagram. Each node stands for an individual, while their relationships are expressed through connecting lines. While matrix representations have the advantage of an occlusion–free and compact view on the network, node link diagrams are glanceable and easy to understand. However, depending on the complexity of the network, they tend to produce a layout problem.

A number of toolkits have been developed for this purpose, JUNG (O'Madadhain, Fisher et al. 2003), Touchgraph (Shapiro 2002), Guess (Adar 2006) are systems for the display of network structures. The Vizster toolkit (Heer and Boyd 2005) is able to handle large graphs and has been applied for visualizing the community structures in the Friendster (http://www.friendster.com) network. However, in spite of the number of existing tools, very few of them are designed for the interactive manipulation of large graphs with several thousand edges at reasonable frame rates, working with the data from mySpace, this is a necessity. A second requirement was the possibility of displaying media content, activities and flows on top of the graph. Because of these two requirements, we decided to develop a custom tool designed to fulfill these purposes. Our software ›Comment Flow‹ builds on top of the conceptual framework of the semaspace prototype (Offenhuber and Dirmoser 2004). The software developed for Comment Flow is not restricted to social networks, but designed as a compact tool for exploring, editing and displaying large networks, and thus fills the gap between extensive modular frameworks and compact but limited graph drawing applications.

Conversations in mySpace

Contemporary Social Networking Sites offer a number of ways for their users to interact with each other. The services usually allow the exchange of private messages, but most of the interaction takes place in the public: sharing media, poking, exchange of small gifts or public messages on each other's profiles. The most popular way to communicate with a friend is to post a comment on the friends profile page, where it can be read by all friends or everyone in the network (Amanda Lenhart 2007).

Among the available social networking platforms, we picked the mySpace service for illustrating our concept. The reason for this is not only its present volume, but also the problems and challenges that it poses for the understanding and visualization of social networks:

The cost of adding new connections is very low – a click on a link on the profile page is enough to send a request, after approval through the profile owner the connection is made. In contrast, services such as the professionally oriented LinkedIn (http://www.linkedin.com) make this process harder by making sure that the people seeking the connection actually know each other. The low barrier for establishing connections results in a very high number of connections per profile – a median value of 1311[1], whereas profiles with hundreds of thousands connections are not uncommon.

The mySpace network shows many structural differences to real-world social network. As a result of the prolific number of a profile's connections, the mySpace network has a very small diameter. For example, the shortest distance between any two users is usually two, since every new profile starts with a friend connection to Tom Anderson, the president of mySpace.

The role and identity of a profile owner is ambiguous. A profile may represent an individual person, but not necessarily. Fake profiles of ce-

1 As determined from our sample of 27000 profile pages, excluding profiles from the music section (bands have a friend count up to 10 times higher than standard profiles, resulting in a median value of 1186 from a sample of 6700 band profiles).

lebrities and historical personalities are as common as profiles that are spam–generating advertisements (Aaron Zinman 2007), (Roush 2006). A friend connection to a fake profile is a way to specify personal tastes and preferences in an implicit way and as such meaningful information. However, since the network does not differentiate between real humans and fake profiles, commercials and organizations traditional network analysis is not useful in that case.

MySpace does not offer an API or tools to facilitate the exploration of the personal networks. The interface could be described more properly as a people directory rather than a social networking tool.

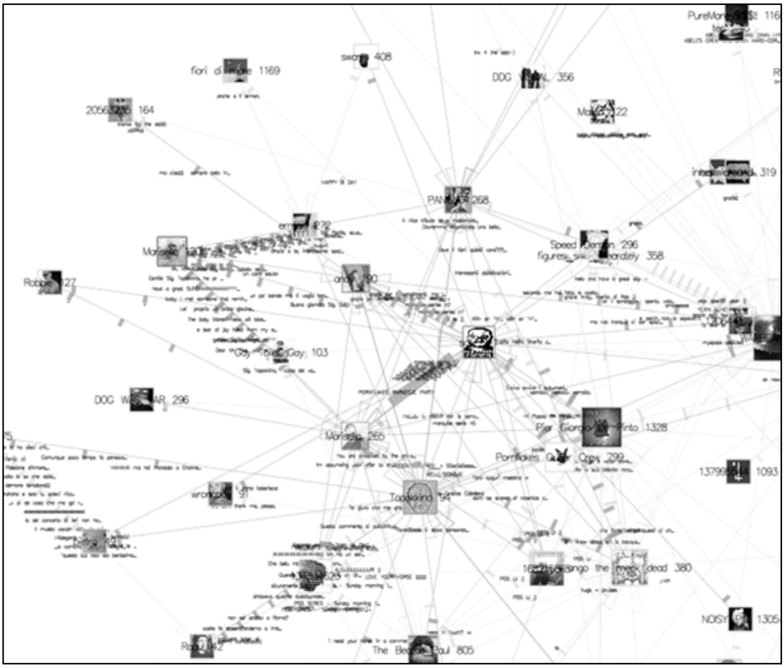
With a large number of friends and a limited amount of space on the front page of a profile, visibility is an important issue. Only a few connections can be displayed, a dedicated space, the »top–n box« allows the profile owner to select which friends should be featured on the front page of the profile.

Another way to appear on the front page of a profile is through a posting in the comment space. This part of the profile is designed similar to a guest book – visitors can leave short personal messages and images as entries. The comment space however does not discriminate between friends and follows a strict chronological order. Since posting a comment is a convenient way of being visible on the front page of other profile pages, many of these comments have the character of commercials. However, on personal profile pages, the comment section is often used for ongoing conversations among friends.

Looking at these conversational postings, we see that the guest book format has a number of characteristics: First, the communication process is non–collocated – the answer might be instantaneous or follow weeks later.

Second, the communication does not take place in the same space – the messages are dispersed over multiple profiles, making it harder to follow the conversation for someone who is not involved. Third, the postings are usually visible to the public. This encourages other friends to join in and comment on an existing conversation. Instead of a traditional one to one interaction, this turns into a hybrid conversation with multiple thematic threads and participants at the same time. However, the threads are not extensive, usually they disappear after two or three bounces. Comparing the incoming communication with the comments on the pages of friends allows for reconstruction for a conversation.

Figure 4: Closeup, each mark along the edge corresponds to a message posted in the comment space of a profile.



Picture: Judith Donath, Dietmar Offenhuber.

Privacy

Most social networking sites have privacy filters implemented to a different degree. *mySpace* allows setting a profile to private. However, the default setting is a public profile, and a minority of users takes the step of changing that. Furthermore, its interface is designed in a way so that it is not immediately obvious which parts of the profile are visible to the public and which are not. But not only the own profile settings but also those of the top linked friends contribute to online identity of the profile owner. »*Social status, political beliefs, musical taste, etc, may be inferred from the company one keeps*« (Donath and Boyd 2004).

Most users know that their comments are visible to the public, but when embedded into the profile page within a mass of other comments, this fact is easily tolerated. It is like having a conversation in a crowded restaurant, surrounded by chatter. In a similar way, the fragmentation of messages across multiple profile pages offers, if not privacy protection, at least some level of comfort. However, the situation might change if the available information is extracted and displayed in a different context. As Jeffrey Rosen puts it: »when intimate information is removed from its original context and revealed to strangers, we are vulnerable to being misjudged on the basis of our most embarrassing, and therefore most memorable, tastes and preferences.« (Rosen 2001) A tool like the one that we are proposing changes the visibility of personal information in its social neighborhood. If deployed and accepted by the users, the tool would certainly affect the way in which people communicate within the network, since it could possibly portray the users in an awkward light. One way to deal with this issue is to only visualize the structure and temporality while hiding the actual comments. In order to read them, the user has to navigate to the specific profile, where they are displayed in their original context.

Usage Scenario

Many users made the experience of accepting friendship from a stranger and ending up with hundreds of spam messages on their comment boards. Naturally, before accepting an offer, one wants to know whether this person is a real person or a spam bot. Our tool can be used to visually assess communication behavior. Looking at the comment sections, three parameters seem especially meaningful:

- The temporality of the network – the age of the messages, the frequency of communication. Is a profile constantly updated?
- One vs. two-way communication – is it a conversation or is it one way broadcasting? Could this provide clues whether people really know each other?
- Quantity of information – is it a one–time greeting of a newly added friend or actually a conversation?

The temporality is expressed through the opacity of the nodes. Based on the age of the last message posted by a specific profile, its transparency is increased until becoming invisible if older than an adjustable threshold age.

The directionality can be determined through the way how the participating profiles are visually grouped together by the layout algorithm: nodes with one directional communication are clustered around the central node to which they are connected, while nodes with bidirectional exchange are unconstrained.

These two properties combined make characteristic communication patterns visible. A cluster of other profiles that did not receive a reply to their message surrounds each profile. The amount of unidirectional comments is a first hint at the type of the profile: certain profile types, such as band or celebrity profiles have comment sections usually have a very high rate of incoming comments that remain unanswered. Personal profiles tend to show a lower rate of incoming comments, but these are more frequently answered and often grow into an ongoing conversation. Finally, fake profiles used for commercial purposes usually uniformly broadcast a large number of messages into their network, without receiving any reply. With the visual output of our tool, it is possible to get an idea about the posting behavior of an unknown profile and its activity within its proximate neighborhood. For a more detailed view of the interaction between profiles the marks along the edges can be examined.

The quantity of information is obvious through the marks along the edge, each of them representing a single comment. If desired, they can be animated along the edge in order to clarify their direction in a very dense network. By zooming in and displaying the actual text can follow conversations, otherwise spread across multiple profiles, in the same space.

Design and Implementation

The Comment Flow software was specially designed for the interactive manipulation of very large networks. The tool is designed to be generic, not limited to the application on myspace. Comment flow was written in java, utilizing the JOGL library for OpenGL accelerated graphics. It uses a force directed layout algorithm, a simplified and computationally less expensive version of the Fruchterman/Rheingold spring–embedder (Fruchterman and Reingold 1991). It uses a clustering approach that discriminates directed and undirected edges, in our case corresponding to the directionality of exchange.

The network can be explored both in 2d and 3d space. Zoom, pan and orbit (in 3d) are the main methods of navigation; the view can be automatically centered on a node selected from a list or from the visible area. Large network structures can be partially rebuilt. To support visual identification of profiles, the profile pictures are extracted and displayed on the node. Comments are displayed as visual elements with text labels and distributed along the connecting edge. To suggest the direction of the exchanged, they are placed on the same side of edge as the asymmetrical arrowhead. In order to resolve any confusion about the flow direction, the comments can be animated along the edge. The neighborhood of the selected node is highlighted through a color gradient based on the topological distance, facilitating the visual identification of personal networks. The transparency of a node indicates the age of the last activity, helping to identify the most active parts of the network.

Data acquisition in Comment Flow usually starts with a single profile, continued by a successive expansion of the network by extracting the comment network from the code of the profile page. For each identified profile a new node is created and the exchange of comments in both directions determined. A single profile page shows typically up to 50 comments, the number of new nodes increases exponentially with each successive step. At distance 4 from the original node the network usually has more than 15000 nodes. However, this network is very sparse with an edge count only slightly higher than the number of nodes, omitting many interconnections that might exist between the nodes.

Conclusion

This paper presents a visualization system for the representation of communication within social networking sites. The visualizations generated by »Comment Flow« serve as a meaningful map of the social activities within online social networks. It creates a more differentiated picture of individual relationships than the list of uniform »friendships« offered by social network platforms. We believe that this is a step towards the next generation of social net– work visualization, where nodes and links are highly differentiated and associated with diverse media formats. It shows a viable path to the general problem of representation of online identity and its context in social network visualization.

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Mobile Interaction

Jürgen Scheible

We carry mobile devices with us nearly always and everywhere. Up until now we have used them mainly for sending text messages, making phone calls, taking photos and videos, handle contact and calendar data, and occasionally connect to the Internet for information retrieval or application download. Recently these mobile devices – especially so called smartphones – have grown rich in features and functionalities like built–in GPS readers, motion sensors, bar code readers, touch displays, just to name a few. The questions easily arise: Can we use these devices for interactions with our physical surroundings, and see the personal mobile phone as a mediator between the virtual and the physical world?
In the mobile space we currently see new developments of services and applications that deal with concepts such as:

- Location based services
- Interactive context–aware services
- Interactions between mobile devices and public displays
- Smart objects
- Pervasive multi–user games
- Mobile multimedia creation
- Use of sensors like cameras, GPS, RFIDs, microphones
- Multimodal interfaces
- Augmented, virtual and mixed reality interfaces
- Mobile Social Networks

There is a growing need to gain knowledge and understanding on how to design interfaces and suitable interaction models for these services and applications. We need to deal with questions like:

- How should applications and services be designed?
- How should the new user interfaces look like?
- How can we achieve high usability and good interaction design?

Rather than trying to provide answers to these questions, this article aims to highlight some practical approaches that may help to deal with them when searching for answers during your own real world design activity.

To do this I want to share my own experiences of being active in the field of Mobile Interaction design as an artist, researcher, lecturer and designer. We will therefore look firstly at the research approach and design process that I usually take when doing projects. Secondly, we look at the process of rapid prototyping on the mobile platform and describe a programming toolkit that I developed to build fully working mobile phone applications, including user interfaces and networking capabilities. Finally, three of my artistically motivated projects are described, that demonstrate how the toolkit and an iterative design cycle have served as practical means for designing applications and various interfaces that were needed for different interaction scenarios.

For those interested in some theoretical frameworks on mobile interaction design, the book ›Mobile Interaction Design‹ (Jones/Marsden 2006) might provide you some help in learning relevant design principles.

1. Research Approach

My own research focuses on designing multi–modal user interfaces for creating and sharing interactive artistic experiences. This includes combining mobile, web and commonly shared interfaces, such as public displays, into real–time publishing environments. The approach I take is to draw ideas from artistic inspirations and design thinking and then turn them into technical solutions, applications and interfaces that can be deployed and evaluated. Therefore I usually

- Make proof of concept through rapid prototyping of applications and interfaces
- Put prototypes into hands of users in true environments of use
- Make user evaluations where the outcomes inform the design of new pieces that can be appealing and original, but also moves the field of research forward.

This process reveals already at an early stage the strong and weak points of your design. This helps to make further design decisions, e.g. in regards to usability or the applied interaction model.

I will not outline the mentioned process further, but want to focus on one part in particular: Rapid prototyping of applications by using ›Python for S60‹. I experienced this to be very useful for exploring new interface designs.

2. Rapid prototyping of applications on the mobile platform

When developing applications using a rapid prototyping approach it is essential that one can apply a fast iterative design cycle for implementing and testing your solutions. On the mobile platform (particular Nokia's S60 platform) this can be ideally achieved by using the programming language Python[1]. Compared to other languages such as Java or C++, it brings a turning point in developing mobile applications from a previously ›difficult‹ and ›time consuming‹ level to an ›easy‹ and ›fast‹ approach, plus it is quick to learn, even by novice programmers. As an artist or designer, this allows focusing on ideas and concepts by developing novel interfaces. It makes it possible to turn creative ideas quickly into working prototypes, instead of going through a lengthy programming process that even often requires the assistance of highly specialized programmers. Due to this, one can make programming modifications quickly, which allows a fast iterative design cycle of trying out many different design options e.g. in regards to the interface or the interaction model.

2.1 The PyS60 toolkit

Before one can run Python on the mobile device, one must install a so-called Python interpreter software application named Python for S60[2] (mainly Nokia Smartphones). It is open source and provided by Nokia, freely downloadable from the Internet[3]. This allows to instantly run and test the so-called Python scripts. Such a script consists often of only 15–20 lines of code that make an entire, fully functioning application. One can write these lines with Notepad or any other text editor on a PC, Mac or Linux machine. By connecting the phone via Bluetooth or USB cable the script file is moved to the phone for instant testing and use.

1 http://www.python.org (October 8, 2007).
2 http://wiki.opensource.nokia.com/projects/Python_for_S60 (Oct. 9, 2007).
3 http://sourceforge.net/projects/pys60 (October 13, 2007).

This mechanism allows making quick changes to the script and the entire application functionality, thus allowing a fast iterative design cycle. With Python for S60 ond can utilize many functionalities of modern smartphones i.e. camera, Bluetooth, Video recording, GPS, Accelerometer sensor, 2D/3D graphics, UI elements, messaging, keyboard keys, internet access just to name a few. Through this a rich set of programmable mobile phone features is available and can be combined to create completely new types of applications and interfaces for providing entirely new and enriching experiences to the users.

My adoption of ›Python for S60‹ for creating mobile applications, has led me to the development of many short Python scripts, each covering a different functionality of the phone. These so called code snippets can serve as easy to use building blocks for new kinds of applications. I published a free online tutorial with all the code snippets and instructions on how to use them at www.mobilenin.com[4]. Thousands of people from around the globe use it every month. I call the collection of these code snippets combined with the Python for S60 interpreter software, a toolkit – the PyS60 toolkit.

2.2 Toolkit Features

Python for S60 is wrapping complex low–level technical details of the Symbian smartphone operating system[5] in simple coding interfaces. The code snippets of the PyS60 toolkit use these simple interfaces to create abstractions of different functionalities of modern mobile phones e.g. camera, messaging, Bluetooth, accelerometer. Simply by putting combinations of code snippets to your script and by making few adaptations to them, the implementation of new mobile applications can therefore be achieved. One can also add own UI graphics if wanted.

In the following we see a list of some mobile phone features that can be utilized with PyS60.

- **Camera** to take photos and record video
- **Text–to–Speech** to make a phone read any text aloud
- **UI elements** such a pop–up notes, input fields, forms, tabs, menu structures etc.
- **Create an own GUI** with own graphics

4 Scheible, Jürgen (2007): http://www.mobilenin.com/pys60/menu.htm (October, 10, 2007).

5 http://www.symbian.com/ (October 6, 2007).

- **3D/2D graphics** to draw to the screen or manipulate images e.g. for games
- **Built–in accelerometer sensor** to build gesture controlled application (3–axis control)
- **Bluetooth** to send files or control data to other phones (multi–user games) or to control applications on the computer or public displays
- **Upload/download files to the Internet** or a Blog like images, videos, sounds
- **External micro–controller**, connecting the phone to a battery-powered micro–controller such as Arduino[6] for communicating with different sensors, whereas the phone serves also as a gateway to the Internet
- **Record and play sounds** like mp3, wav, Midi
- **Read GPS data** with the built–in positioning module
- **Parse incoming text messages** to trigger some functionality on the phone etc.
- **Send text messages** to multiple users at the same time automatically
- **Connect to the internet** via WiFi, 3G, GPRS…

Here are three examples of code snippets, each representing a fully working application to highlight the simple programming approach:

1. Text to speech to speak out the word ›Hello there‹:

import audio
audio.say(›Hello there‹)

When running the script on the interpreter on the phone, a so–called library is imported that has the name *audio*. With the next line the interpreter executes a function named *say* (that belongs to the *audio* library) to which a string is handed over as a parameter in braces. This is the word that needs to be spoken – in this case ›Hello there‹. Instantly one can hear the spoken word through the speaker of the phone.

2. Sending of a text message with pre–made text. One simply need to hand over two parameters to the *send_sms* function, which are the phone number of the receiver e.g.*›12345678'* and the text of the message *u'Greetings from Hillary Clinton'*:

import messaging
messaging.send_sms(›12345678', u'Greetings from Hillary Clinton')

6 http://www.arduino.cc/ (September 15, 2007).

3. Taking a photo of the size *640x480* pixels and saving it to the phone's memory card with the name *picture.jpg* :

```
import camera
image = camera.take_photo(size = (640,480))
image.save(u'e:\\picture.jpg)
```

With the PyS60 toolkit, it seems, that the possibilities are endless and up to users' imagination and creativity on what kinds of applications she may want to build. For me it has been fascinating to see the many novel applications that people have build with it, especially as outcomes of many of the Mobile interaction design workshops that I taught over the last two years, using the PyS60 toolkit to trigger innovation in the field of mobile services and applications. Past outcomes have included applications such as, pervasive GPS based games, Bluetooth multi–player games, gesture controlled interactive audiovisual art installations, learning games, mobile web 2.0 client server solutions and support tools for professionals e.g. veterinaries, plumbers, electricians.

Also it is important to notice that the developer community is continuously adding new features for Python for S60 and make these available as open source code ready for others to use freely.

2.3 Further readings on Python for S60

As a contribution to the Python for S60 programming field, I wrote a book in 2007 with my co–author Ville Tuulos with the title ›Mobile Python – Rapid prototyping of applications on the mobile platform.‹[7] On the books website www.mobilepythonbook.org one can find over 100 inspiring and fully working Python script examples that can be instantly executed on a S60 phone. They were designed to be combined, modified and enhanced by one´s own ideas. In the book we provide a light and engaging hands–on coding style that quickly gets one going and increases your skill in a smooth and fast manner. One hardly needs any programming knowledge to start diving into the Mobile Python experience.

7 Scheible, Jürgen/Tuulos, Ville (2007): Mobile Python – Rapid prototyping on the mobile platform, Hoboken: John Wiley and Sons.

3. Artistically motivated Mobile Interaction projects

In the following sections I shortly describe some of the projects, which I have recently done in the field of Mobile Interaction. They demonstrate how the PyS60 toolkit and an iterative design cycle have served as practical means for designing multimodal interfaces needed for deploying and evaluating the applications in the field. In the context of this chapter I look at mobile interaction from a perspective of art inspired approaches.

3.1 Mobilenin

The MobiLenin system focuses on employing a large public display and personal mobile phones for social interaction between people via interactive entertainment. The principal idea is that each user can interact with an interactive multi–track music video shown on the public display (Figure 1). The video consists of six parallel tracks each showing a different performance style of the musician. Each user can individually vote for one of the tracks by selecting the corresponding choice from the menu in the mobile phone application, and the track receiving most votes is shown. Thus, the MobiLenin system empowers the users with a joint authorship of the interactive art piece. As an incentive for interaction, the system chooses randomly a winner among the users having voted in each voting interval. The winner receives a coupon on the phone entitling her for a prize. The mobile client was programmed using the PyS60 toolkit. Public displays and mobile phones make an interesting couple in terms of strengths and weaknesses from an interface point of view. While shared displays typically offer greater conceptual power and larger presentation space, they often limit interaction to one user at a time. Mobile devices, on the other hand, disperse control and access to participating users, though limited conceptual power and smaller screen sizes often hinder dynamic interaction. Thus, connecting shared displays to mobile devices is an obvious way to leverage the best of both worlds. MobiLenin provides both public and private graphical user interfaces. The display serves as the public GUI for sharing public information. The personal mobile phones serve as the generic private input and output device for entering private commands (votes) and receiving private information (winning coupons).[8]

3.2 Manhattan Story Mashup

Manhattan Story Mashup is an urban storytelling game that combines personal mobile phones, the web and a large public display into interactive, collaborative street art. The game is based on real–time interaction between mobile and web users. It was done within the frame of a Nokia Research project in which I was the creative director, contributing the concept idea and co-designing the Manhattan Story Mashup system. In the game website's storytelling tool, anybody was able to write stories to be illustrated in real-time by street players in New York, taking photos with camera phones. The best illustrated stories were displayed on eleven large public displays in Times Square (Figure 2) and the story writers could see their illustrated own story in their web browser in real-time. Manhattan Story Mashup worked in such a way, that individual keywords of textual stories written by web users were presented, one word at a time, to mobile users for the purpose of taking a matching photo.

Figure 1: MobiLenin – User evaluation in a real world setting on–going

Source: Jürgen Scheible

8 More information on the MobiLenin project can be found in ›Mobilenin – combining a multi-track music video, personal mobile phones and a public display into multi-user interactive entertainment‹ (Scheible/Ojala 2005). It covers design issues, implementation details, discusses usability and includes a user evaluation.

Each resulting keyword-photo pair was then validated by presenting the photo together with the original keyword and three other words to two other mobile users, who were asked to choose the most appropriate word for the given the photo. If either of the two chose the original keyword, the photo was approved into the resulting visual story. Selected best stories were displayed on the web and on a large public display as collaborative work in form of street art. The players were awarded points for taking photos and for choosing the original keyword. The storytelling tool on the web allowed a user to write stories from scratch or pick a previously contributed story as a basis for an own story. It empowered the user to leave a creative handprint onto a large public display in an iconic location as Times Square, but also allowed interacting with real people in the streets. The game was run in September 2006 with 184 players moving around Manhattan for 1.5 hours, shooting 3142 photos in total.

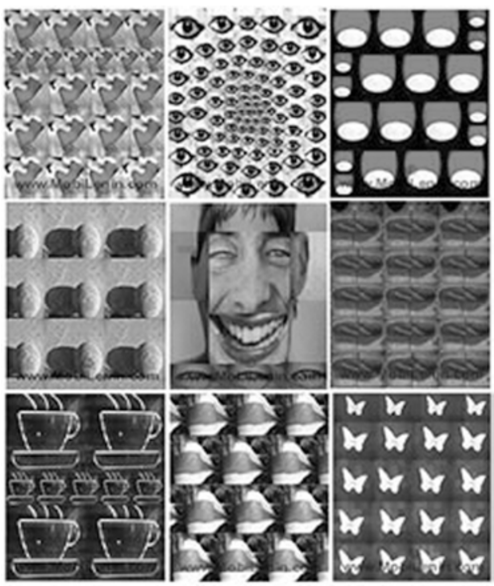
A user evaluation that was conducted during the game showed, that people enjoyed playing the game. Some game features seem to be particularly strong and essential: Taking photos – finding something to photo-graph based on a given noun. Guessing – choosing the correct noun for a given photo. The fast pace – players need to think and act fast. Team play and acting out – if an abstract word was too hard to photograph, team–mates were asked to act out the difficult concept. Some players were crossing boundaries of ordinary behaviour in public places and enjoyed the possibility to make spontaneous street performances. The possibility to participate in a unique collaborative storytelling effort proved to be highly motivating, too – especially since the unpredictable results were to be presented in Times Square.[9]

9 A detailed description of the Manhattan Story Mashup system as well as an analysis of the findings of its experimental evaluation can be found in ›Combining Web, Mobile Phones and Public Displays in Large–Scale‹ (Tuulos/Scheible/Nyholm 2007). Additional information on the iterative design cycle and the entire design approach can be found in ›Story Mashup: Design and evaluation of novel interactive storytelling game for mobile and web users‹. (Scheible, Jürgen; Tuulos, Ville; Ojala, Timo (2007): »Story Mashup: design and evaluation of novel interactive story-telling game for mobile and web users«. In: Proceedings of the 6th international conference on Mobile and ubiquitous multimedia, AICPS Vol. 284, pp.139-148.)

Figure 2: The Reuters Sign at Times Square

Source: Jürgen Scheible

Figure 3: MobileArtblog images



Source: Jürgen Scheible

3.3 MobileArtBlog – the mobile device as my art tool

One of my favourite phrases to say is ›my mobile device is my greatest art tool‹. I like to be creative with it and produce artistic outcomes. One such example is the Mobileartblog[10] where I collect memories from my travels. A photo taken with a camera phone is fed into an image composition application built with the PyS60 toolkit. The application creates a composite image (Figure 3) and sends it instantly to my blog at http://www.mobileartblog.org including GPS coordinates and some added tags. This way my personal mobile phone has become my personal art tool. I use it when shapes, colours and forms of objects in different cities, places and situations, inspire me. I try to capture the moment, transforming the experience into a memorable art piece on the spot.

4. Summary

This article highlights some practical approaches that can be useful when dealing with Mobile Interaction projects. The described PyS60 toolkit shows how easy it is to build powerful and fully working prototype applications that utilize the latest phone features for exploring various kinds of new interface designs and interaction models. It allows applying a fast iterative design cycle and enables creative mobile phone users to develop applications and interfaces based on their own ideas. By showing some of my own mobile interaction projects, this article aims to provide insights on how interactive systems can be designed, that utilize mobile devices, the web and public displays combined. My message is: Be creative! Use your talent, skills, ideas and energy to inspire the world – with your mobile device!

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Let us do what we do best! But how can we produce Knowledge by designing Interfaces?

Stefano M. Vannotti

> The main skill of a designer is his practical approach to make useful and inspiring things. When a designer becomes a PhD researcher, his focus shifts from creating artifacts to producing knowledge. The challenge is to find an adequate methodology to gain knowledge from what he does best – designing.

In the initial phase of collecting material for my doctoral thesis[1], one of my main concerns was the extensive search for a methodological framework to combine my practical work in the field of interaction design with my aim to do research. From the very beginning, it was clear to me that on the surface the two worlds of design practice and design research may seem highly contradictory. Thus, I was obliged – more than I had originally thought – to confront this area of conflict in order to identify a stringent methodological ground and an appropriate research approach for my doctoral thesis. However, this problem seems fairly typical and therefore crucial not only for me, but for every doctoral candidate in art and design. The aim of this article is to provide a brief overview of this matter from a practitioner's point of view in the field of interaction design.

Before addressing this issue, I wish to recall the general criteria applying to doctoral work (cf. Newbury: 11–13). (1) Such work must represent a substantial contribution to knowledge resulting from a sys–tematic investigation. (2) The author must be aware of prior research and research methods in his field of study. (3) On a formal level, submission is followed by the oral defense and publication. These general criteria also apply to PhDs in Art and Design, although such theses

1 My doctoral thesis »Designing User Interfaces for Institutional Repositories« investigates different facets of user experience (e.g., noninstrumental qualities) for information systems in the institutional context.

normally consist of a written and a practical part. However, these general criteria inevitably provoke questions concerning my own research methodology: Is there any widely accepted research approach that allows me to integrate design practice and its typical characteristics into a scientific method?

In this article, I would like to find answers to this question by presenting a brief summary of my findings based on my own experience as an interaction designer and on a review of current literature in the field of human–computer interaction, design, and design research. The first section deals with the everlasting conflict between design practice and design research. Then, a practical approach to research is presented and some criteria for the evaluation of research contributions are discussed. Finally, I briefly summarize to what extent my considerations could be of use to the broader field of undertaking doctoral work in Art and Design.

Practice and Research: Mutual Antagonism or Effective Liaison?

The area of conflict between practice and research has become a well–discussed topic within the design community. Particularly with the emergence of design as a scientific discipline and the subsequent increase of PhD programs at traditional design schools, this issue has gained even more importance. Several good books and articles, which provide a deeper insight into the current discourse, are now available (cf. Michel 2007). The following section, however, places this discussion within the frame of personal experience. By working out the main characteristics of both worlds, I attempt to provide a basis to understand this oxymoron (Krippendorf 2007: 67-79), which seems central to my own and any practice–based research endeavor in this field.

Let me first give two short and simplified descriptive definitions of design practice and design research. Together, these represent a kind of working model for all further considerations in the present article.

Design Practice

The term *design practice* describes an activity conducted by expert designers (e.g., people with appropriate training and working experience in a traditional design discipline). They are aware of the appropriate methods and techniques relevant in this field and follow »the designerly ways of knowing« (Cross 2006). Therefore, neither the common practitioner's everyday design nor a technical engineer's work may be called *design practice* according to the above definition.

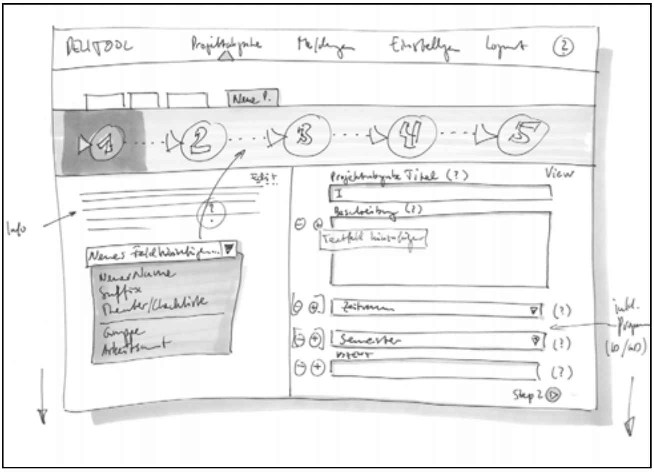
Design Research

Design research is first and foremost aligned with the basic principles of traditional research. To simplify matters, it may be described as a set of systematic inquiries whose main goal is to produce knowledge in the field of design. This could also be done in a very practical manner. However, it is important to distinguish this scientific process from the practitioner's intense involvement in developing a specific design solution. Although the two processes have much in common, the former aims at generating scientific knowledge whereas the latter tries to create a commercially successful product for the market.

I would like to examine these two perspectives of design practice and design research in greater depth. The above working definitions suggest a strong contradiction between the scientific and practical approach to design. Phrased differently, my own design practice focuses on the creation of user interfaces for complex information systems. I am engaged in finding appropriate design solutions for generally ill-structured problems. I adopt a typically design-oriented manner by deploying a highly iterative and user-centered design process, sketching and prototyping being my main methods. An early integration of first low and then high fidelity prototypes in the real world is characteristic of this approach (Figure 1). Testing and evaluating my interface solutions is accomplished in live demonstrations and user tests, resulting in novel and sometimes surprising insights as to how the interfaces I design are being used.

This repetitive cycle and the interplay of designing, testing, and optimizing bring me closer to the preferred solution. At the outset of the design process, however, it is not yet clear when exactly this point will be reached. I always try to find the most appropriate, usable, and inspiring solution for a specific problem. It is in this case up to me as an interaction designer to decide when my product has met all these criteria and the process can be completed. My final product, however, may never be called the ultimate solution because it lies in the nature of design practice that the solution space is extremely open. Therefore, the user interface I have designed is *my* preferred solution among many other possible ones.

Figure 1: Example of a low-fidelity paper prototype.



Graphic: Stefano M. Vannotti.

In my capacity as an interaction design researcher and a PhD candidate, however, I am forced to follow quite a different approach to fulfill the criteria of traditional research. My main focus now lies on the production of knowledge according to the general concept of research. To this end, I investigate and seek to understand the current state of the art in a scientific manner. Consequently, I have to prove that my own design solutions are ›better‹ than others, that is, the *right* ones.

This statement must be based on an extremely objective and transparent process where subjective and semi-proved thoughts are given no room. Moreover, a researcher should under no circumstances interfere with the process or results of an investigation. General validity of an argument can only be achieved by using appropriate methods (e.g., empirical measurements) so that the data obtained result in a valid contribution to scientific knowledge.

By describing these characteristics of design practice and design research from a personal point of view, these two concepts appear to express a mutual antagonism. In particular the differences in methodology and evaluation criteria provide strong evidence for their dichotomy. However, as an interaction designer and researcher, I am really interested in taking the best out of each of these two worlds. Why should it not be possible to gain knowledge from design practice? If we disregard the obvious differences in approach and methodology for a moment, we might even discover similarities in the work process itself: The aim of both is to *create* something, products in the one and knowledge in the other case. Both are creative processes, which, by being complementary, could eventually benefit from each other. The two approaches might establish an effective liaison to open up new perspectives for both fields.

A Practical Approach to Research

In search of a methodology permitting me to continue using my habitual design practice even in the context of research, I have come across the seminal article »Nature of Research« by Bruce Archer (1995). Therein, Archer addresses what he calls »research through practitioner action«. Before examining this in closer detail, it is worth taking a step backward to concentrate on Archer's categorization of different research activities. With reference to tradition, he distinguishes various types of scientific research: (1) Fundamental Research, (2) Strategic Research, (3) Applied Research, (4) Action Research, and (5) Option Research (Archer 1995: 2). In my case, the fourth category seems particularly interesting as Archer describes this kind of research activity as a »systematic enquiry conducted through the medium of practical action, calculated to devise or test new, or newly imported, information, ideas, forms or procedures and to generate communicable knowledge« (Archer 1995: 6). Furthermore, he points out when this method is really useful: »There are circumstances where the best or only way to shed light on a proposition, a principle, a material, a process or a function is to attempt to construct something, or to enact something, calculated to explore, embody or test it« (Archer 1995: 11). However, so–called »In Action Research« is even more important for my search for a methodology to undertake research through practice. Here, »the investigator is explicitly taking action in and on the real world in order to devise or test or shed light upon something« (Archer 1995: 11). Archer's comments on Action Research and in particular on the »research through practitioner action« cover the problem fields identified earlier. Furthermore, they provide important answers to my initial question concerning a scientific method for conducting practical research.

- It supports my assumption that practice and research could establish an effective liaison under specific circumstances.
- It points out that as opposed to other research activities the intentional interference of the investigator is central to practical research.
- It describes the possibility to actually generate communicable knowledge through practitioner action.

All these definitions, which make »research through practice« a legitimate research activity, are highly interesting for all practitioners, in particular for those design researchers situated between their traditional design practice and their claim that such practice could result in communicable knowledge. It is therefore not surprising that this method is widely adopted among design researchers. In current design research literature, several contributions deal with design practice in the context of research. However, three different perspectives need to be distinguished: (1) research into/about design, (2) research for design, and (3) research through design (Frayling 1993: 1–5, Findeli 2004: 40–51, Jonas 2007: 187–206). Or, to return to Archer's statements on practice, (1) »research about practice«, (2) »research for the purposes of practice«, and (3) »research through practice« (Archer 1995: 11). Although the described perspectives slightly differ from author to author, we can summarize them as follows: (1) a more theoretical discussion in the area of design theory and philosophy, (2) design as a kind of applied science, and (3) the effective design practice in the context of research.

Apart from theory, I would like to describe what the third perspective – »research through design« – means for our work as interaction design researchers. By using this method, our activity results in a set of research artifacts and a documentation of our design process. In addition, we frame the problem and put forth arguments as to what extent our design solutions are the *right* ones. In this sense, all our theories, principles, and ideas reside in the artifacts we create. Creating artifacts created through a »research through design« process enables us to answer research questions and solve specific problems. These artifacts act as intermediaries for the transfer of knowledge and build the ground for further investigation.

Criteria for Evaluating Research Contributions

Since not every product emerging from design practice can be automatically regarded as a research contribution, it is crucial to remain aware of the exact scientific criteria adopted for evaluating the process and the resulting artifacts as research.

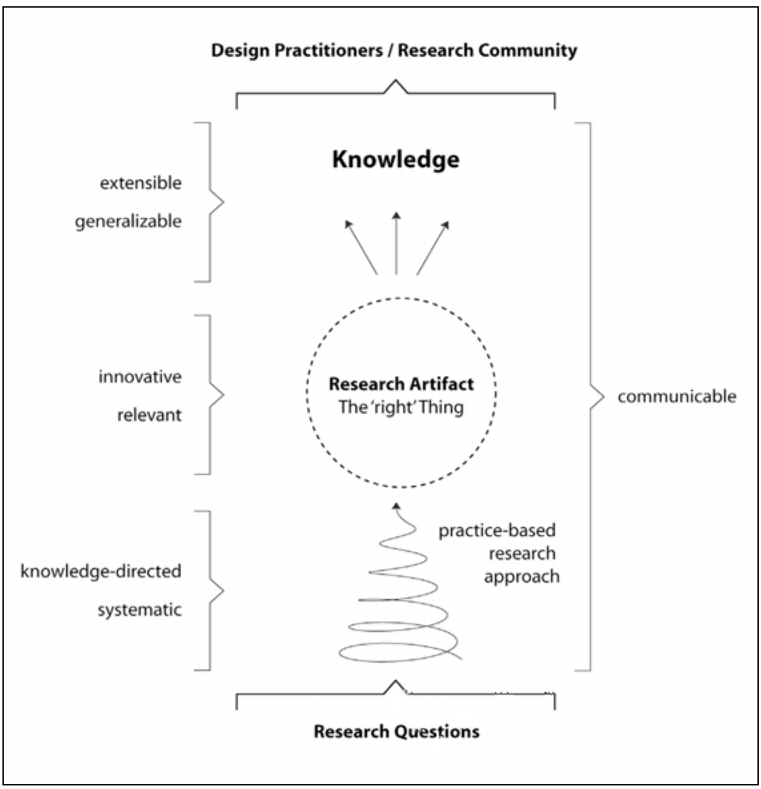
In general, practical research activity has to follow the same principles as other research activities. According to Archer, it must be »systematic«, »inquiry–based«, »knowledge–directed«, and »communicable« (Archer 1995: 6). Bartneck claims: »If design is to become a scientific method then its results must be measured by the quality criteria for scientific knowledge« (Bartneck 2007: 1). In his article, he discusses and compares the general scientific criteria (»generizability«, »falsifiability«, »truth«, »novelty«, »parixomy«, »precision«, »accuracy«, »efficiency«) and their counterparts in design (»universality«, »falsifiability«, »compatibility«, »innovation«, »simpli-city«, »relia-bility«, »effectiveness«, »efficiency«) to bring the »design method into a more scientific direction« (Bartneck 2007: 1). He concludes that science and design have much in common (e.g., the creation process) and that we should make the design method more objective to »improve the generizability of the knowledge produced« (Bartneck 2007: 3).

Archer, on the other hand, sees a key problem of »research through practitioner action« exactly in this »generizability«: »It can hardly ever be objective, in the strict sense of the word. Moreover, Action Research is almost always 'situation–specific'. […] It is thus difficult and dangerous to generalise from Action Research findings« (Archer 1995: 11–12). Notwithstanding his reservations, Archer is certain that this approach »can advance practice and can provide material for the conduct of later, more generalisable, studies, provided the research is methodologically sound, the qualifications are clearly stated and the record is complete« (Archer 1995: 12). However, these citations make it quite obvious that the discrepancy between design practice, which requires the creation of an artifact, and design research, which aims at the production of knowledge, poses incessant and non–negligible questions concerning scientific quality.

The question of scientific quality is central to the design researcher, particularly when it comes to judging his research results in the form of artifacts. What, then, is the difference between a research artifact and a design practice artifact? To put it simply, we could describe research artifacts as the designer's answer to a specific research question with the intention of producing knowledge for the research community. Therefore, the artifact should be novel and innovative and mark a significant advancement in a specific field. In contrast, a design practice artifact is more focused on adequate integration in a given context. In this sense, it does not necessarily have to be innovative and outstanding. Crucially, it needs to meet the client’s and user’s needs in the best possible way. In a recent article, however, Zimmerman et al (2007) propose four lenses – (1) »process«, (2) »invention«, (3) »relevance«, and (4) »extensibility« – for evaluating an interaction design research contribution. (1) It is important that design researchers document their employed methods and contributions in such detail that the process can always be reproduced. (2) It must be shown that the research contribution constitutes a significant invention by producing »a novel integration of various subject matters to address a specific situation and by advancing the current state of the art in the research community« (Zimmerman et al 2007: 499). (3) To be relevant, interaction design research »must also articulate the preferred state the design attempts to achieve and provide support for why the community should consider this state to be preferred« (Zimmerman et al 2007: 499–500). (4) It must be possible to build on the resulting outcomes.

As we can see, the evaluation of results based on a *research through design* approach is a delicate matter. We must be aware that the described research approach is an opportunity for all practitioners to do research in terms of what designers can do best. However, it should by no means be a stalking horse for the normal design practitioner to present his work as the result of a scientific process.

Figure 2: Criteria for Evaluating Research Contributions.



Graphic: Stefano M. Vannotti.

Reflections and Conclusions

The question whether design practice may be considered an accepted scientific method for doing research can be answered with a bold ›***yes!***‹. The approach I was looking for is called »research through design« and is grounded in Action Research. It allows the practitioner or, in my case, interaction designer, to do what he does best: to use a traditional design process in order to answer specific research questions by creating the *right* artifacts (e.g., novel interaction styles and presentation forms for interfaces). This process is highly knowledge–oriented. It must therefore be well documented and its result thoroughly innovative. Only if all these criteria are fulfilled will the outcome of a »research through design« process mark a genuine research contribution capable of meeting scientific quality standards.

As an interaction designer undertaking doctoral research, the method described herein provides me with a unique opportunity to do research in an accustomed manner. What opens up new perspectives for me could also lead to novel and unexpected insights providing a possible benefit for the whole research community. The topic discussed in this article not only appears relevant to design researchers but to all practitioners in the arts drawn to scientific work. Therefore, let me boldly affirm that there *is* a way and that we *can* produce knowledge by designing interfaces – let's get started!

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Software Agents

Georg Weichhart

This article gives a brief introduction to software agents and related research fields. The discussion focuses on agents that interface users, or are visualized in a way that allows the user to watch the system's evolution. The first part establishes the notion of software agents, and introduces agent types ranging from a single intelligent agent communicating with the user to cellular automata and other systems, where the overall system solves complex and large problems, yet the individual agent is dumb.

Software Agents

The main ideas and approaches to agent-based systems will be discussed in this section. Some exemplary implementations are introduced. This is by no means an exhaustive review of agent theory, but rather a loose collection of examples of agents with particular emphasis on agents that have direct contact to the user.

Notions of Agency

Wooldridge and Jennings (1995) distinguish a »Weak Notion of Agency (Multi Agent Systems)« and a »Stronger notion of Agency«. With the former, they establish a set of attributes that are often found in software agents and especially in multi agent systems. The text below follows Wooldridge's and Jennings' list of attributes for describing agent based systems.

Autonomy: Software agents are, set in contrast to more traditional e.g. object-oriented software, able to operate without the direct intervention of humans. They posses control over their actions and their internal state. This does not mean that they will run wild, once set loose, but they will follow given rules, yet there is no direct control exercised by humans.

Social ability: Since there is no direct control, agents need some means to interact with other entities that are acting in the same system. This includes in particular human users. This interaction often happens by exchanging information with other agents using some kind of agent–communication language.
Reactivity: In addition to exchanging information, agents will also use other means to sense their environment. This environment includes the user interface and information networks like the Internet. They respond to changes in this environment.
Pro–activeness: But agents do not only act in a stimulus response fashion, they actively follow goals. In order to achieve their goals, they will take the initiative when ever necessary.
In addition to the above almost mandatory attributes, a number of obligatory attributes are also given. These include *mobility*, *veracity*, *benevolence*, and *rationality*.

Mobile agents have the possibility to physically transmit their code from one computational device (including cell phones) to another. Agents that possess veracity do not communicate knowingly false information. Benevolent agents will always do what is told to them (esp. by their owner/user). A rational agent will act in a way that allows him to reach his goal and refuse to execute actions that prevent him to reach his goals.

In their stronger notion of agency Wooldridge and Jennings (1995) state that in addition to the above attributes an agent is conceptualized and/or implemented using concepts that are typically only used with humans. Having established a notion of agency we discuss in the following sections different incarnations of software agents.

Single Agents

There are a number of implementations and conceptual designs of »User Assistants» or »Interface Agents«. One of the first and a widely known system has been implemented by Patty Maes (1994). The following figure shows an agent in situ, helping users to sort out e–mails.

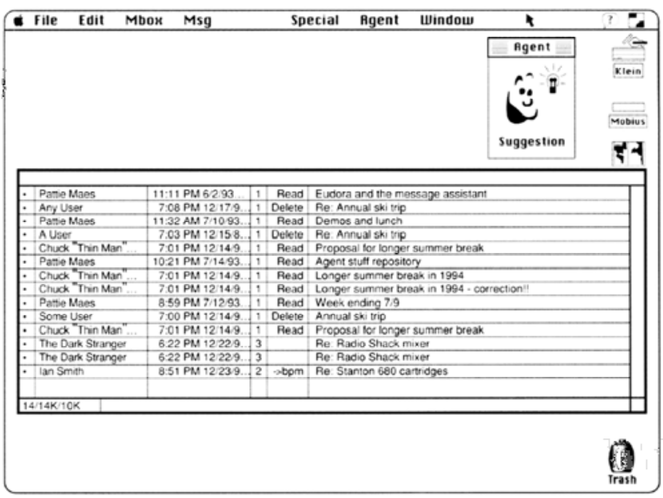
The little chap sits on the UI and watches the user to perform her work. Over time he gains competence and will propose what to do with certain e–mails. The next image shows different competence levels and the reactions of the agent if the user agrees or disagrees with certain actions. Above the »do it« threshold, the agent is simply acting without asking. Below this, but above the »tell me« threshold the agent makes some suggestions and shows a gratified face when doing it right but gets surprised when the user disagrees. Below the »tell me« level the agent is unsure and pleased or confused, depending on the user's agreement.

Another example of a single user agent that helps the user is the »Letizia« agent implemented by Lieberman (1997):

»Letizia is an autonomous interface agent that treats search through the Web space as a continuous, cooperative venture between the user and a computer search agent.« (Lieberman 1997: 3).

This agent also watches the user while she is browsing the web, and continuously suggests related web sites and other sources related to the watched site at hand. Of course more recent approaches to user interface agents exist. More natural and realistic looking characters (e.g. virtual human 2007) are possible than in the mid-nineties. Systems have also advanced in their ability of multimodal user interaction, e.g. using natural language and being able to recognize gestures. Agents are also able to run on a wide range of devices (e.g. SmartKom 2007). An example is shown in Figure 2.

Figure 1: A User Interface Agent suggesting what to do with a number of e–mails.



Source: Maes 1994: p.34.

Figure 2: Multimodal »Smartakus» Assistant and ZAMB! interactive Game.

Source: SmartKom 2007, Virtual Human 2007.

Multi Agent Systems

With multi agent systems individual agents are typically less visible. Such systems are built to find solutions for large problems by using a *divide and conquer* approach. Another reason for using this technology is that a distribution of different parts and actors is given per-se. Such a situation can easily be found in e-market places, where sellers meet potential buyers and an agreement on price, and quality (among other attributes) has to be found in order to sell respectively buy a certain good.

In the following section such a multi agent system is visualized. Details of the system are described by Karageorgos et.al. (2003). Without going into detail about the actual work done by the multi agent system, Figure 3 shows how a solution emerges.

Basically the system is composed out of 12 agents, where 11 are shown in the image, and the 12th is the »monitoring agent« which provides the visualization. The monitoring agent assigns an icon to each of the working class agents, and draws a line between two agents when these two communicate. Each of the working class agents only knows it's own internal state (e.g. his workload) and a few other agents he communicates with.

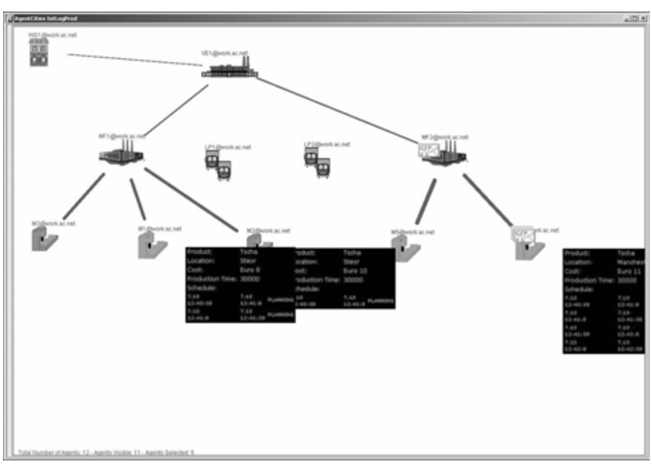
It has to be understood that no agent is able to provide the full solution or knows the overall system state[1]. Figure 3 shows the system in action. The black rectangles show the memory of an agent. The lines show the communication channels.

1 This is also true for the monitoring agent, as he only visualizes without understanding.

The emergence of a solution found by a group of cooperating agents shows screenshots at 15 different stages (see Figure 4). In the first picture only the agents are shown, no lines are drawn as the monitoring agent did not watch any of them communicating. In picture tweo and three a few agents start to get engaged in discussions (lines appear). The black rectangles show possible solutions to small problems assigned to individual agents. As can be seen, the agents consider more and more alternatives (the rectangles get longer). But some of the solutions are discharged immediately, or are discharged after trying to fit solutions to sub–problems together with other agents. This can be seen in picture 12 where the rectangles are smaller, in some cases, as before (picture 11). Picture 12 actually shows the state when a solution is presented to the user. The last row (images 13,14,15) shows how each agent cleans his memory after having executed the solution.

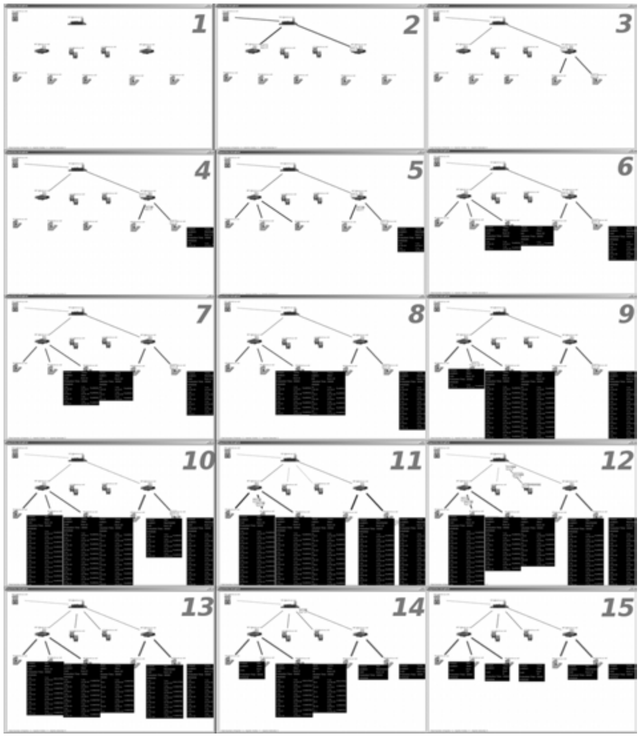
It is said that a solution emerges, as there is no controlling system present. Agents at upper levels (rows on top of each image) divide the overall problem into smaller parts. These are sent to agents on a lower level / row of each image. Agents on the bottom level send solutions back to a higher level. An agent on a higher level, having received solutions, tries to glue these solutions together. Some of the solutions can then already be discharged. If a solution is found, it is sent again to an agent on a higher level. By using a nested way of problem decomposition and solving each agent solves a pretty small problem but still an overall solution to a very large problem can be provided.

Figure 3: A Multi Agent System.



Screenshots of a system described in Karageorgos et.al. 2003.

Figure 4: Emergence of a solution in a Multi–Agent–System.



Screenshots of a system described in Karageorgos et.al. 2003.

Ants, Swarms, Cellular Automata

In the single agent section above each agent described was intelligent and some of them even eager to learn and adapt. The section on multi agent systems describes software systems that follow a divide and conquer approach, where each agent has only limited intelligence. If this approach is followed further, systems can be designed that have a large number of quite dumb »agents«. Again such multi agent systems solve large problems.

One of the best–known types is Cellular Automata, and within this field a prominent program is Conway's *Game of Life* (Conway 1970). Here a grid of spaces exists which may host a number of cells (simple agents). The behavior of the pattern can be explained by a short list of simple rules. Each rule references neighboring cells. Each space on the grid has eight neighbors (Top, Bottom, Left, Right and four spaces in diagonal).

- A cell on the grid survives if it has two or three neighboring cells. More or less neighbors cause the cell to die.
- An empty space on the grid gets populated with a cell if it has three cells in the neighborhood.

The other types of agent systems such as swarms and ants differ in the number and quality of the rules that each agent knows (how intelligent each agent is), and their particular means of interaction.

In ant based system each agent does not communicate directly to other agents but places digital pheromones in the environment (e.g. Parunak and Brueckner 2001, Valckenares et.al. 2001). In swarm based systems each agent's decision what to do next (for a flock of birds: go straight, go left…) is influenced by what the agent's neighbor does.

Agent Related Research

Above I have described three classes of agent-based systems. Now I want to place agent technology in a wider context and highlight some of the current research trends, which are connected to agents[2].

In the following sections I introduce each research domain briefly, to pin–down the role of agent based technology in that particular field in the second paragraph.

Semantic Web and Service Oriented Computing

The underlying idea of the semantic web is to enable seamless information exchange between independent computer systems. Some of these computer systems provide not only access to information but more »active» ways to interact. Services enable the outside world to transform data and trigger events.

This technology (in contrast to agent based systems) follows a more traditional object–oriented approach. However, some properties these systems exhibit can also be found in multi-agent systems that are multi-

2 This text follows the structure proposed in the Agent Link Roadmap (Luck et. al. 2005).

ple computational units that run distributed on different physical servers. Coordination has to take place between these sub-systems. Runtime properties are hard to predict as for example the number of services exposed by, and outsiders do not know the processor load of a single server. Issues like life support (for services running 24/7[3]), failure tolerance, robustness and load balancing through switching machines on the fly are to be addressed in both domains.

Ambient Intelligence

The notion of »Ambient Intelligence« (AmI) has been, to a large extend, driven by the European Commission identifying trends for the future use of information and communication technologies. AmI combines Ubiquitous Computing (Embedded Intelligence), Ubiquitous Networking, and Multi–modal and Adaptive User Interfaces.

»The emphasis of AmI is on greater user–friendliness, more efficient services support, user–empowerment, and support for human interactions.« (Information Society Advisory Group 2001: 7).

Multi agent systems will play a crucial role in this domain. The AmI infrastructure can basically be seen as a multi agent system. The user interaction in this world where computation takes place everywhere and all devices are connected can be supported by the principles described in the Single Agent section above.

Self-* Systems and Autonomic Computing

Visions of computational systems that are able to manage themselves have been around since the work of Charles Babbage (Luck et. al. 2005). Such systems have recently be named self–* systems (pronounced »self–star«) where the asterisk (*) might be replaced by aspects like management, configuration, diagnosis, organization, repair.

»Ultimately, the aim is to realize the promise of IT: increasing productivity while minimizing complexity for users. The key message to be drawn from this vision is that it shares many of the goals of agent-based computing, and agents

3 Pronounced twenty-four-seven; this indicates systems which have almost no down time i.e. run 24 hours a day, 7 days a week.

offer a way to manage the complexity of self–* and autonomic systems.« (Luck et.al. 2005: 25)

Complex Systems

Technological and societal developments over the last hundred years have lead to the discovery and design of systems that have an intrinsic complexity that does not enable individual humans to understand the overall behavior. This includes software systems where faulty code is hard to find, large physical artifacts like bridges or electricity networks which breakdown unpredicted, and also includes groups of humans, which exhibit unforeseen behavior.

Agent based simulation is a promising candidate for allowing to understand systems where many objects interact with many other objects in a great many ways.

Cognitive Systems & User Interaction

Cognitive Systems research tries to understand and model human behavior. Having such models these can be formalized and used by intelligent software to better understand the users. Better understanding includes better communicating through natural and multi modal interaction between humans and computers.

Research on interface agents has started quite a while ago to address these issues. For a better understanding of users models of the user, models of the context in which the user acts have been researched. Other issues addressed are affective user interfaces and artificial agents capable of emotions (Trappl, Petta and Payer 2003).

Conclusions

This article provides a brief introduction to software agents and related research. Discussing some examples highlights the features and underlying ideas of such kinds of systems. Yet no exhaustive state of the art review is presented. Emphasis has been placed on system which can be visualized or interface the users.

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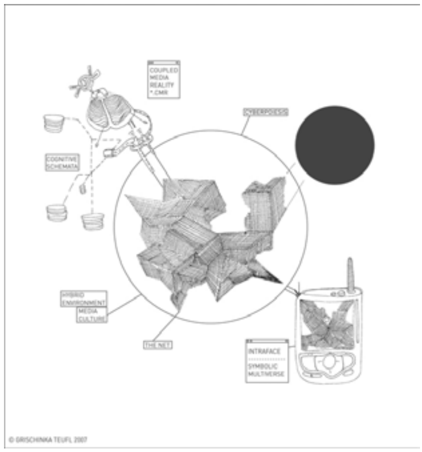
SOFTWARE AS CULTUREWARE - SHAPING THE VECTORS OF PERVASIVE MEDIACULTURES

GEORG RUSSEGGER

The »New Media« is not new anymore. We are surrounded by digital media– and communication-technologies and they are affecting our everyday life like never before. In the beginning the counter media culture of net-based communication and interaction was the domain of a few high-skilled gatekeepers from the field of technology, science, design and art. Today we have to face the fact that we are operating in a globalized »Networked Society« (Van Dijk 1992; Castells 1996) within many-to-many communication sets and mediacultures which are detaching the dominant settings of one-way mass-communication. These shifts are not only changing the ways human beings are connected by machines, technologies, software, hardware and protocols, they are also transforming the ways we are connected to other people, groups, communities, ideas, concepts, projects and cultures. The human history is rich in examples of how informational and mediaspecific developments have changed our way to think about the world and ourselves. This article will focus on the dynamics of todays proto media realities which have not yet been transformed into cultural programms of mass-usage and mass-accessabiltiy, designated as a post-desktop metaphor of computing labeled as pervasive computing. This leads to the question how an internet of things will influence the internet of social beings?

In an early stage of development the artist as an early adopter of mediacultures, abstraction-systems and society-movements plays a major role in forcasting new perspectives for the near future of society and culture. On the other hand the role of the »creative« embeded in the cultural program of »creativity« emerging as »creativ class« (Florida 2002) in »creative cities« (Landry 2000) is more and more applied in cultural industry, knowledge work, self-design, etc. and is increasingly constituting an attractive role model in post–modern society-structures.

Figure 1:



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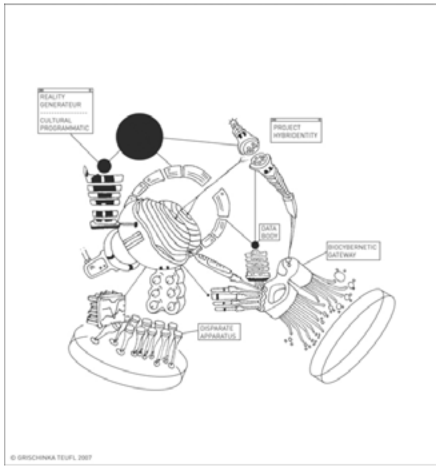
Whitin the given shortness of this article I want to outline three perspectives:

- The new dispositions of media reality triggered by pervasive computing, locative media, mobile computing and networked objects.
- The vectors of cultural programs under the conditions of these media dispositions and how they are influencing the delineation processes of proto-social and proto-cultural development.
- The emerging forms of cooperative interactivity organised in »Communities of Projects« (Faßler 2007: 141–169) and the thereby arising individual ability profiles like playfulness, hackability, cooperation-intelligence, complexity-sensibility, projectability and creativity.

Figure 2:



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Locative Dispositions

»Computing not computers will characterize the next era of the computer age«, Malcolm McCullough

When the »World Wide Web« emerged, a media based on digital information- and communication-technology, we were thinking about a place called cyberspace where all the transmission and (inter-)action was taking place and by this interpretation it was strictly devided from »meat–space« (William Gibson 1984). Nearly twenty years after the rise of »The Net« we have to face the fact that these dualistic borders between the real and the virtual have merged in some kind of »vireal« form of glocalized net-mediated space. Enabled by developments in mobile computing, geo-spatial webs, locative media, networked objects, multisensoric interactivities and pervasive media technologies we are creating a multiverse of layered interaction scenerios triggered by heterofactorial intermediaries and semi-automated information spaces. We are surrounded by devices and artefacts which feature »distributed«, »networked«, »context-aware«, »semi-automated« and »sensoric« functions enabled by micro-chips, micro-processors, sensors, satellites, computers, cameras and audio–visual interfaces which are the infra-structural elements of the system–architecture in pervasive and ubiquitous computed spaces. However this strong technological impact is destitute without cultural forms of application. Within the embodiment of pervasive media realities the task of exploring new sites for old discussions about the relationships of consciousness to place and other people is one of the main goals artists have focused on in the field of mobile art and locative media projects since the early 21st century. The art-ensemble »Blast Theory« for example describes their work with the following interpretation:

» ›Can You See Me Now?‹ draws upon the near ubiquity of handheld electronic devices in many developed countries. Blast Theory are fascinated by the penetration of the mobile phone into the hands of poorer users, rural users, teenagers and other demographics usually excluded from new technologies. […] ›Can You See Me Now?‹ takes the fabric of the city and makes our location within it central to the game play. The piece uses the overlay of a real city and a virtual city to explore ideas of absence and presence. By sharing the same »space«, the players online and runners on the street enter into a relationship that is adversarial, playful and, ultimately, filled with pathos.«[1]

From this point of view the artistic goal is to provide an abstract and playful system of interaction where proto cultural and proto spatial programs can be tested by people and groups to arrange a relationship with new forms of mediaspecific and complex systems of information and communication technologies which are leading to a transformation of user culture. With the growing complexity of networked media landscapes and data, the questions about the actors and their exploring off structures of connectivity, have to be adressed in a transdiciplinary field of research. How does an always-on, hybrid form of multifactoral scripted media reality, embeded in physical space, influence how we imagine individuality, community, society and culture? This is not a question which can be answered in short terms but what can be pointed out so far, is that we have to think about the parameters of global, cultural, personal and collective understanding of »space« from another perspective. In this context, Manfred Faßler talks about »space as a programm within cybernetic localisms«2. On one hand this means that digital communication– and mediatechnologies are offering orientation for individuals and groups which can be described as visual / mediated / auditory / semiotic / semantic / experimental / planning/ selective / composing inputs, but on the other hand we are also forced to establish new mental

1 Blast Theory: »Can You See Me Now?«. Available at: http://www.blasttheory .co.uk/bt/work_cysmn.html (November 29, 2007).

2 Faßler, Manfred (2007): Cybernetic Localism. In: T. Theilmann/P. Gendolla et.al. (Hg.), Geo-Codes: Siegen.

and neuro-physiological analogies within this understanding of environment. Surrounding structures and environmental knowledge are not only enlarged through tele-mediated dispositions, they are also explored by networked objects which provide a new kind of reference system which can be individualized by ideosyncratic instruction-sets within the vectors of cooperative interactivity. This cooperative interactivity is not only restricted by interpersonal connections, it is also expanded through the growing field of machine-machine-interaction released by data–-xchange in the internet of things. Julian Bleecker pointed out three major points for his so-called »Blogjects« in the »Manifesto for Networked Objects«[3]:

- Blogjects track and trace where they are and where they've been;
- Blogjects have self-contained (embedded) histories of their encounteres and experiences;
- Blogjects always have some form of agency – they can foment participation, they have an assertive voice within the social web.

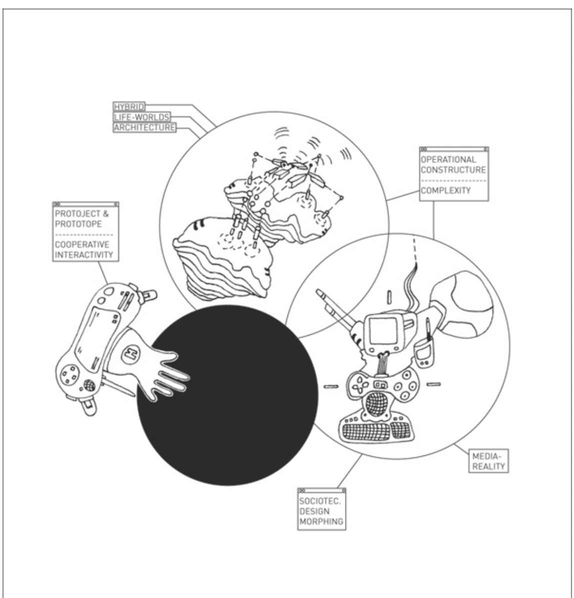
For this reason networked objects let us: observe shared (re-)presentations of action; provide meta–information about the related environment; track and trace their movements and positions; apply histories of their actions; operate by semi–automated and semi–intelligent protocols; take self–contained action as reflexive entities and –transform complex information–quantities into interpretable data for human beings and other participative objects within the internet of things.

With this short outline on technology initiated vectors of emerging media cultures we can transform the question about the configuration of mediologic elements and their medialiteracy into a question of »cultural programs« (Schmidt et al. 2003: 38–45) and »cultural-codes« within pervasive landscapes of digital media, which can be examined through a »science of delineation« under the conditions of contemporary forms within networked societies and networked intermediaries. By these pervasive and para–referencial mechanisms of media realities subjective senses for locality, understood as patterns of presence and absence are getting transformed into a model of compositoric space which is designated through individual and collective forms of recognition, enabled through personal fields of presence and fields of ressource. With the

3 Julian Bleecker (2006): »Manifesto for Networked Objects«. Available at: http://www.nearfuturelaboratory.com/files/WhyThingsMatter.pdf (November 29, 2007).

fields of presence the accessability and the heterotopographical patterns of presentation and representations are marked. With the field of ressource the collateral infrastructures and possibilites to address communication in a certain communication situation is described, and it is based on the environmental richness of communication channels and symbolic space. With this perspective of complex figuration processes and information configurations a reciprocal differentation of subjects and objects is not very helpful anymore, more than ever it has to be analyzed under the conditions of experimental circuit contexts and selection statuses within the (inter-)action and communication progress of »Communities of Projects« (Faßler et al. 2006: 141–169) and under the conditions of exclusive internal- and external relationships of human-artefact-distinctions. Like Vilém Flusser pointed out, we are in the middle of a transformation from »subject to project« (cp. Flusser et al. 1994) which can be interpreted as a form of project identity based on new forms of media-dispositions and locative configurations within globalized information and communication cultures and settings of collaborative systems, generating common sense processes to create sustainable structures of symbolic abstractions and manipulations.

Figure 3:



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Protoject and Prototope

»Knowledge follows Project / Form follows Project«, Manfred Faßler

With the given outlines of transforming parameters within environmental and spatial reconfigurations the demand for human beings is to place their intentions and abilities in short-term goals and processes which can be described as open (unfinished) outcomes. For this reason humans have to apply actions which are permanently transforming their soft skills of information reduction, interlinkage of information sets and communication sets which have to be designed for open-ended and continuing chances of communicational connectivity. These skills have to be trained, used and optimized in information sensible and simultaneously abstract and complex mediated environments. What happens if we take this claim seriously? First of all we have to think about individual learning processes differently because if we support a theory model of constant change and open-ended learning something like personal identity or subject is not finished after a period of learning and understanding the basic facts of »who I am« and »what I am doing«. Instead we are some kind of open-source proto-ject (taken from subject) which is constantly forced to upgrade, downgrade, reconfigure, learn, forget, relearn a.s.o.

For this reason I want to insert the idea of a personal project-identity which is forced to write a biographical history in lifelong transforming project settings and project worlds. Compared to the traditional interpretations of identity profiles like national culture, native language, religion or ethnos within the global biography of individual and collective project-worlds we can observe a major change since the late 20th century. Life stories and episodes are transformed through digital media and networks in a mode of subjective significants and interaction which is demanding individuality as an open and interchangeable creation of self-formation. It opens the ability to take part in dynamic interfaces of abstract and remixed patterns of recognition and establishes ability-profiles which can be applied in transformable short-term, medium-term and longterm project realities of interrelations between the subjective self and the consensual symbolic multiverse of others. Within the settings of project dispositions ability profiles like selfobservation, selfdesign, co-operation intelligence and project narration are main strings of self-design and can be understood as in settings andactions operating in proto-mode. Let us try to combine this issue with the approach of cultureware.

With the term »prototope« I am describing a prototypical setting of creative, conceptual and unstable system of interrelations between different forms of soft-skills (software, thoughts, ideas, habits, mental abilities and practical knowledge) and hard-skills (artefacts, instruments, tools, devices, technologies) combined and operated within a matrix of projects (intersubjective sets to achive social / cultural / creative / mediated / economic goals). Under the conditions of net-mediated, dislocated and distributed elements of communication the soft-skills of creation have to be transformed into a collaborative interface and participative outline of understanding to get the job done without an overange of communcational and informational noise. Within the vectors of human-computer-interaction and human-mediated-communication the formal keywords are given to describe the informational, communicational, cognitive, economical and cultural learning- and training-abilities in hybrid, mediated, displaced, instantanious and hetero topological models of human (inter-) action. Media and computer software (codes, algorithums, protocols) and their structural tendency to format action within cooperative settings of delineation between project-members has to be taken seriously and cannot be described as a simple tool anymore. Like Malcolm McCullough qouted: »Protocols, so essential to the social role of the net, remained a function of embodiment.« (McCullough 2004: 10).

From this point of view there is still something »new« within »New Media« and it still can be observed but under the conditions of »software as cultureware« which integrates a mediologic and media-evolutionary side combined with a co–evolutionary context of socio-technological and techno–cultural developments, interpersonal codes and programs of interaction, cooperation and communication. This hypothesis can be described through a model focusing on »anthropology of media« (cp. Faßler 2007)[4] which is based on research of human transformation through mediated developments and a science of delineation-processes forced by new identity-profiles and personal abilities to deal with media and complexity. The position of the artist as a creator of test environments and playful applications within the vectors of abstraction, conceptionism, aesthetics and collaborative production can be seen as an interface between the cutting-edge scientific approach of media and communication theory and the processes of implementation for new ways dealing with cultural understanding and development. Within the definition of free development and expression of opinion, artistic

4 Manfred Faßler (2007), Mission Statement »FAMe« Frankfurt (Researchnetwork Anthropology of Media). Available at: www.fame-frankfurt.de/index.php/Main/DGVKongress (November 29, 2007).

projects have the chance to fulfil a goal which is still a unique approach of artistic behavior and can be seen as a rich potential for understanding new forms of cultural and social movement. But, this also means the artist is forced to be a hacker in a broader understanding, not only hacking the limitations of technology and media based specifications but also hacking the identity models and guidelines of self, subjectivity, folksonomy, sociality, art, society, cooperation, communication, inter-action a.s.o. It sounds like a tough schedule for artists and actually it is!

Conclusion

With this cutup of theoretical spin-offs the specifications of art and science are required again. To create a new paradigma of media-culture-science-art we have to escape from the delusion of trademarked broadband mechanics which are still around in interpretations of the genius-artist. In the case of culture-construction »emergencies«[5] the bottleneck is always on top of the bottle like Peter Drucker once said. For the topic »software as cultureware« we have to ask questions about how things are made and under which conditions they are designed and developed. This becomes more and more difficult if we think about the whole D.I.Y. (Do It Yourself) movement in plenty of fields today and specially in media art. We have to discuss a new global type of individuality, emerging through new environmental qualities of media- and communication technologies within vectors of net-mediated space, instantaneous information streams and pervasive digital infra-structures. Triggered by communication and media specific reality shifts, new forms of complex socio-technological connectivity options and cultural programs have been developed by creative communities. Under the per-spective of liquefied, informational and dissipative net-virtualities, conven-tional »subject / object distinctions« are no longer arbitrative for the maintenance of communication processes. They rather (re-)assemble forma-tions of human and non-human counterparts and thereby configure exclusive internal- / external-relationships of human-artefact-distinction. These requirements are forcing endurable creative self-transformations of individuals within the complexity-fields of pervasive and ubiquitous mediarealities.

5 »Emergencies is connotative of emergence, emergency, urgency, and agency.« Cp. Mission Statement »Art & Technology Zone ICC« (NTT Intercommunication Center, Tokyo) available at: http://www.ntticc.or.jp/Archive/006/Openspace/art_technology/emergencies.html (November 29, 2007).

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Nano Vibrational Interfaces

Paul Thomas

Nanotechnology through the Atomic Force Microscope (AFM) is carrying on a machinic tradition of transfiguring the material world into quantifiable data. In this chapter I want to demonstrate a relationship between the AFM's machinic interface for recording data and it's potential for transmitting data back to interface with the material world through vibration. The AFM records data by interfacing with the material world through touch allowing for sonification and visualisation to be made from this metaphorical sensorial data.

»Visual representations do things: they can sit quietly and be observed; they may aid in the performance of some activity, let's say, in science; they may act as repositories for previously compiled information; they may, through the format of their presentation, guide users or readers toward new ideas, or new practices. In science, and in chemistry particularly, visual representations are vital components of the material culture of practice.«[1]

This quote from Cohen references the symbolic representation of scientific data and its potential for guiding users to new interpretations. The scientific use of the AFM's visualising techniques needs artistic interaction and interpretation of the data created. It is this interface via touch of the imaging technology that generates the data which models the nano world and brings into question the machinic images it creates.

To create a historical context from the introduction, I want to initially develop a connection between scientist Etienne-Jules Marey (1830-1904) and the philosopher Henri Bergson (1859-1941) to demonstrate the concept of duration, vibration and the objectification of sonic vibration. Bergson and Marey would have been aware of each other's work as they were colleagues for a short while in the same institution until Marey's death in 1904. I want to then look at a comparison between the early

1 Cohen, B. R. (2004): »The Element of the Table: Visual Discourse and the Preperiodic Representation of Chemical Classification.« Configurations Volume 12(Number 1): pp. 41-75.

work of Marey and how that work relates to the function of the Atomic Force Microscope (AFM). Marey was a scientist working initially in the area of medical devices and later in the realm of image science. The medical device I want to focus on is Marey's Sphygmograph which was his first graphing instrument used to chart pressure changes (see Figure 1). Marta Braun states the device recorded:

»Those changes that occur in the heart as it undergoes its double sequence of contraction and expansion. This was his sphygmograph, or pulse writer, which he presented to the Academie des Sciences in 1860... Marey's instrument was very simple. It comprised of a lever, with one end resting on the pulse point of the wrist and the other connected to a stylus, and a clockwork mechanism that moved a strip of smoke–blackened paper under the stylus at uniform speed, converting the pulsations into a fluid inscription.«[2]

The sphygmograph interfaced with the body in the same way as a needle on a gramophone might operate and an Atomic Force Microscopes cantilever. As the blood is passed through the vein the arterial wall moves and the needle responds. This response is then translated via an arma-ture to create a graph of the pulse over time. This graph was a visual representation of the tempo that Bergson discusses as a concept of duration by using an analogy of hearing the sounds of footsteps:

»I retain each of these successive sensations in order to combine it with the others and form a group which reminds me of an air or rhythm which I know: in that case I do not count the sounds, I limit myself to gathering, so to speak, the qualitative impression produced by the whole series.«[3]

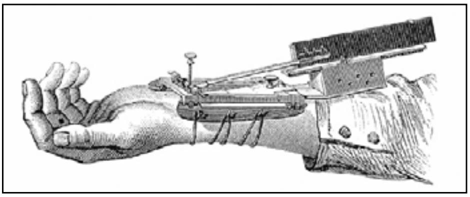
This reference places the sound heard, not as a series of individual notations to be counted, but as a ›qualitative impression‹ that could be understood as a whole experience. Bergson's theory demonstrates that time can exist without space by using sounds of footsteps.

.

2 Braun, M. (1992): Picturing Time: The Work of Etienne-Jules Marey (1830-1904). Chicago & London, The University of Chicago Press, pp. 16-17.

3 Bergson, H. (1960): Time and Free Will: An Essay on the Immediate Data of Consciousness. New York, Harper and Row. p. 86.

Figure 1: an illustration of Etienne–Jules Marey's sphygmograph.



In one instance, the sound of the footsteps are heard in the form of a rhythm; we place these sounds together as a sonic object.

In Bergson's article *Time and Will*, as quoted above, we encounter concepts of space as interval marked by duration to become packaged into an object that remerges in space. This sonic object is the personification of vibration.

»Pythagoras (6thC BC) is thought to have described a stone as frozen music. He intuited that the mathematics of frequency which occur in processes such as planetary rotations, cycles of the seasons, right down to the atomic world of elemental matter, are not just lifeless pieces of data but reveal movements, rhythms, relationships and meanings which may be loosely translated as ›stories.‹ Stories in turn generate meanings and artistic expression. The word 'mathema' comes from the Old French 'mathein', to be aware; to awaken.«[4]

Here we see that the durational object captures the space as well as the rhythms into a package that should not be mistaken for the whole. The comparison between footsteps and vibrations of data to be transmitted between nodes as examples of contemporary rhythmical objects, that affect each other. When we put in more rhythmical objects, as rhythms and vibrations, then we are confronted with an ever-increasing relationship between complex transmutations into multi-narrative objects.

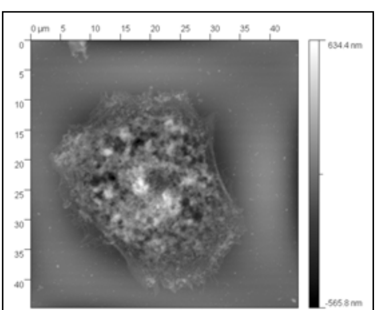
Packages of rhythms and vibrations transmitted in real time to be processed through an interaction. These concepts of rhythm and vibration, when linked to Marey's Sphygmograph, demonstrate how the vibration of the pulse can be seen as an object in one's gaze to be comprehended. This drawing of a sound wave became a recognised image that reflects the time of its making, a sound as a sonic object which contained the rhythm and vibration of its existence.

4 Alexjander, S. (1999): »The Infrared Frequencies of DNA Bases, as Science and Art«. IEEE Engineering. In: Medicine and Biology magazine 1999, http://www.oursounduniverse.com/infraredfreq.html (November 14, 2007).

The AFM

I want to now bring us back to the AFM created in 1986 as a device that works on the same principle as Marey’s sphygmograph. The AFM has three main imaging modes: contact, non-contact and tapping. The AFM can also be used in a non-imaging force spectroscopy mode. Like a record players needle the AFM consists of a micro–scale cantilever with a sharp tip (probe) at its end that is used to scan the surface of the sample. The AFM cantilever is typically silicon or silicon nitride with a tip radius of approximately ten nanometeres. In order to image the samples must be thin and small enough to be placed on a sample stage. The tapping mode AFM imaging relies on an interaction between the oscillating cantilever/tip and the sample surface. The cantilever in contact mode, when lowered (like the stylus of record player) to within a few nanometres of the surface, is affected by an attraction to the surface called the Van der Waals force. The contact mode cantilever moves across the sample surface, records the surface and, as it fluctuates up and down, a laser beam is projected from the head of the cantilever to a photodiode where the data is gathered. The data is gathered from the xyz coordinates to be converted into a representational typography. The AFM can be used to image and manipulate atoms on a variety of surfaces as for example shown in Figure 2. The atom at the apex of the tip »senses« individual atoms on the underlying surface when it forms incipient chemical bonds with each atom. Because these chemical interactions subtly alter the tip's vibration frequency, they can be detected and mapped. The sphygmograph that records the vibration of the pulse is now replaced by the AFM that records in a similar way the vibrations of the atoms of the blood cells themselves. These vibrations become the basis of our sonic understanding of the worlds and, therefore, the infinite smallness of the atomic world.

Figure 2: Image of a skin cell scanned using a gold coated cantilever with an (AFM) in contact mode.



The Art of Vibrational Interface

In 1988, Susan Alexjander, a composer, initiated a collaboration with a cell biologist, Dr David Deamer, at the University of California, after he released DNA Suite and DNA Music – sound recordings based on the data mappings of sequences he gathered of adenine, thymine, guanine and cytosine (DNA bases) movement along the helix. Together they worked on a project, which resulted in creating compositions, this time purely based on the chemical composition of the four DNA bases. Their molecular vibrations were measured using an infrared spectrophotometer. The process involved exposing each DNA base to infrared light and measuring the absorbance of their wavelengths and then transcribing light into sound with the help of a Yamaha synthesizer. The compositions were released in 1990 on cassette titled *Earthday*. Subsequently the compositions were released on CD titled *Sequencia* in 1994 as three original performances – Eikos, Sequencia and Pataphysical Thymine – created on traditional instruments plus electronic keyboard.[5]

In 2002, Adam Zaretsky, a bio artist working in a laboratory at the Massachusetts Institute of Technology, discovered the ›Humperdinck Effect‹, in which the vibrations of ›loud, really awful‹ lounge music applied for 48 hours spurred antibiotic production in E. coli bacteria. Zaretsky, at that time, met with Oron Catts and Ionat Zurr who collaborated together as part of The Pig Wings Project in developing the Dynamic Seeding Musical Bioreactor the Tissue Culture & Art Project (see Figure 3). This part of the project was experimenting with submitting the bone marrow cells, as they were being cultured, to audio vibrations. The work looked at using irregular vibrations to distribute the cells throughout the scaffolding. The audio vibrations were taken from a Napster search for songs with Pig in the title. These songs were then played to the cells by placing a speaker underneath the petri dish. Examples of pig-related MP3 that were played to pig wings: War Pigs by Black Sabbath, Fascist Pig by Suicidal Tendencies, Da Killing of Da Pigs by Da Yoopers, Chokin this Pig by Eminem, Squeal Like a Pig by The Reverend Horton Heat, Filth Pig by Ministry, American Pigs by The Angry Samoans, British Pigs – The Price of Royalty by One Life Choir, PigInCheez by Aphex Twin, Blue Christmas by Porky Pig and of course, Pigs on the Wing by Pink Floyd.

5 Cp. Grosz, E. (2006): Vibration. Darwin, Deleuze and the Music of the Cosmos. Constellations: Sydney.

Figure 3: Dynamic seeding of pig Mesenchenal stem cells onto/into degradable polymer scaffold in shape of wings, using a vibrating speaker that played pig songs

Picture: Ionat Zurr.

The sonic relationship of vibration are explored in context with the development of the Atomic Force Microscopes new imaging capabilities. In 2003, UCLA scientist, James Gimzewski, positioned the sensitive atomic force microscope over a yeast cell to try to detect its motion and the microscope picked up regular vibrations. These vibrations were translated to sound files so one can listen to variations on various material structures at an atomic level. Anne Niemetz, a sound artist who worked on the 2004 Nano exhibition, suggests that, »the AFM can be regarded as a new type of musical instrument.«[6]

James Gimzewski has coined the term ›Sonocytology‹ to name the study of sounds emitted by cells. What Gimzewski needed was a program capable of converting the nano scale vibration into an audio file. The NANO exhibition, which took place at the LA County Museum of Art in 2004, was a result of collaboration between N. Katherine Hayles, Robert Sain, Victoria Vesna and James Gimzewski. Its purpose was to bring nanotechnology before a broader audience and to work on visuali-

6 Niemetz, A. (2004): »Singing cells, art, science and the noise in between. Design/Media Arts«. Los Angeles, University College Los Angeles. Master of Fine Art: p.39.

zation of what is taking place at nano level. An artist, Anna Niemetz, and a researcher, Andrew Pelling (who work with Gimzewski converting the nano scale vibrations to sound files), collaborated *on The Dark Side of the Cell*, a sonic immersive installation for NANO, which for the first time utilized cell sonics and were premiered on June 2, 2004. Nano scale imagery of the cells was projected, together with the sonograms of the cells, onto sculptural elements based on the actual inner structure of cells.

My own research, the Midas project, looked at the transition phase between skin and gold by working with Dr. Thomas Becker from the Nano Research Institute at Curtin University of Technology, using the data from the AFM force spectroscopy that only record the z measurement and the motion of the cantilevers deflection.

The cells cultured at SymbioticA with the assistance of Oran Catts and Ionat Zurr were placed in an AFM force spectroscopy where one cell was isolated to measure the transitional phase between a single skin cell and skin cell touched by gold on a single–molecular level.

The gold-coated cantilever is manually advanced towards the cell suface until it makes contact (see Figure 4). At the point before contact, the tip of the cantilever is attracted and jumps to the cells surface (Van der Waals principle). This process was carried out using four different approaches.

- Gold-coated silicon nitride cantilever on to skin cell.
- Gold-coated silicon nitride cantilever on to mica substrate.
- Silicon nitride cantilever on to skin cell.
- Silicon nitride cantilever on to mica substrate.

Figure 4. Illustration demonstrating the AFM gold–coated and uncoated silicon nitride cantilever used in the experiment.

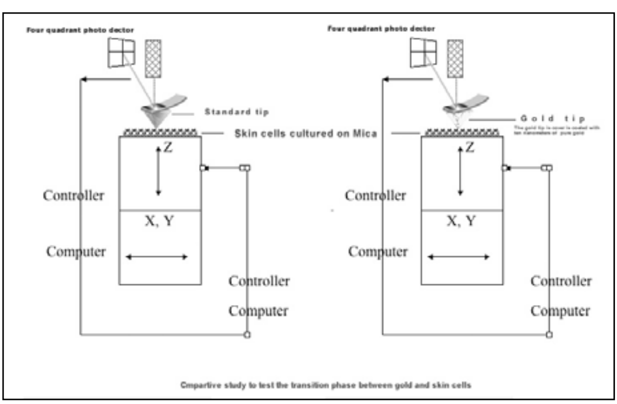
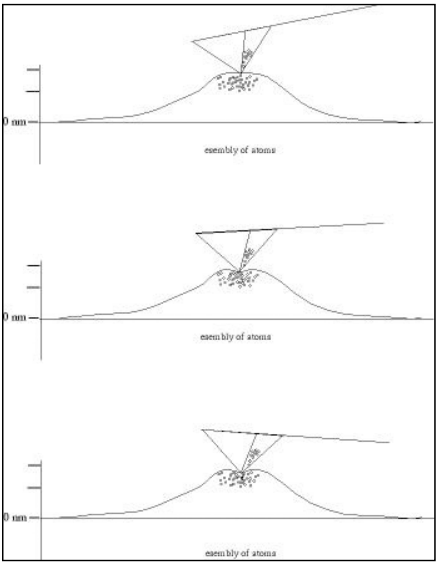


Figure 5. Illustrates the gold coated silicon nitride cantilever approaching the cell and more pressure being applied to the tip. In the experiment the tip was held on the cell for ten seconds to get a reading.



From this data, a comparative study was conducted recording a skin cell using a standard silicon nitride tip and then using a silicon nitride tip coated with 26.7nm of gold. Using the AFM force spectroscopy, silicon nitride tips were placed over the cells surface creating three different dflections. The deflections were three different contact forces for 10 seonds each, exploring the morphology of trans-mediation taking place in the space between skin and gold. In this context the process of skin touching gold was inverted to that of gold touching skin.

The cantilever tip has a radius of curvature of 10 nanometres which touches the cell (see Figure 5). The gold coated silicon nitride tip reads the surface interaction of the vibrating atomic particles. The probe in this context is like a metaphorical figure touching a surface to feel what is happening (like feeling one's pulse).

This data from the AFM was extracted to be translated into a wav files by Kevin Raxworthy, a Master of Electronic Art student a Curtin University of Technology. To translate this data to a wav file, Raxworthy translated the high point as equal to 1 and low point as equal to –1 and 0 in the middle. This rescales and normalises the data in order to generate a range compatible with audio wave data. The timescale in based on the sample rate which was 1ms. The sound vibrations were the basis for the installation work presented in Prague at the Enter 3 exhibition *Unsafe Distance*.

Interfacing with the World through Vibration

»What is transmitted, transformed, and relocated in this movement of forces from chaos to milieu to territory and from rhythm to the refrain to music, is nothing but vibration, resonance. Vibration is the pulse running through the universe from its chaotic interminability to its most intimate inscription on living bodies.«[7]

The place of vibration in the world is now at the core of materiality. The atomic vibrations resonate in a constant swarm that cling together under illusionistic manifestations of organisms and objects, natural and man-made. What we find with Marey's visualisation of the pulse's vibration, is the interface like the AFM becomes a signifier. The vibrations that Marey's sphygmograph recorded are similar to those recordings of vibrations existing within matter. What Bergson's concepts brought to Marey visualisations was to see the vibrations not as purely temporal effects but to see vibrations intuitively. A sonic object that is the sum total of the vibrations that interfaces with the world freely.

»What science and art share is precisely the vibratory structure of the universe, the force of chaos itself. Art makes sensation from vibration (sensation after all is nothing but a vibratory difference capable of resonating bodily organs) where science makes a pattern, measurement, ratio or formula.«[8]

The vibration that exists at an atomic level is permeated in matter, creating potentially new sonic maps that can be interpreted to generate different understandings of existence. In the same way it was suggested that a musician could listen to tune their instruments to tell if it was out of key. The cantilever interfaces with the surface to record the material object that creates the immateriality of the sounds of atomic vibrations that impact sonically back on all matter. The material world is transmitting continuously as oscillating series of patterns that could be diagnosed to understand balance. Rhythm and sonic vibration recognition is a way forward in reconfiguring our spatial awareness of the material world surrounding us.

7 Grosz, E. (2006): Vibration. Darwin, Deleuze and the Music of the Cosmos. Constellations: Sydney.

8 Ibid.

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Grosz, E. (2006): »Vibration. Darwin, Deleuze and the Music of the Cosmos«. Constellations: Sydney.

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Packaging Material and Glue for High-Tech

Ingrid Graz

»Plastic foils of various kinds constitute a non–negligible part of our daily life. These materials seem only important for packaging more valuable objects and are simply to be disposed of after unwrapping. On average each European citizen is currently responsible, directly or indirectly, for the generation of some 172 kg of packaging waste a year.«[1]

Common disposable packaging materials, such as the polymer foils chocolate bars and iced-lollypops are wrapped in, exhibit an interesting internal life. These materials are designed to provide good thermal insulation to prevent chocolate and ice from melting. Lens-shaped voids containing air enclosed within the polymer foils are employed to obtain thermal insulation. The cellular structure of such foams results in quite unusual mechanical properties, being soft in the thickness direction and rather stiff in the film plane. They appear promising as soft transducer materials for the inter-conversion of electrical and mechanical energy and vice versa, yet their technological potential in low– and high–end technology has not yet been explored.

Glues and sticky-tapes, also made from polymers, represent another interesting class of materials, to which only little attention is paid in every-day life. There are two complementary kinds of adhesion – either the glue provides covalent bonds and thus permanent adhesion, or the adhesive sticks only temporarily to its substrate such as post-its or sticky–tapes. But beyond adhesion, these polymers, glues and sticky-tapes may provide a lot of interesting different features that await investigation. Since one can stretch such sticky tapes to an extent many times the original length, glues and sticky tapes appear potentially attractive for mimicking salient features of life – controlled complex movement in actuators.

1 Geo Yearbook 2006: »An Overview of Our Changing Environment«, United Nations Environment Programme (UNEP), http://www.unep.org/geo/yearbook (November 20, 2007).

In what follows, it is outlined that both sensors and actuators can be easily assembled from disposable plastics – no need to throw away the foils used to wrap lollypops or ice cream sticks anymore.

Inspiration in science can come from many sources: natural forms and shapes have always fascinated mankind. Looking at human skin, the heaviest and largest (sensing) organ in the body, is such a fascinating adventure: Technically spoken, skin is an integrated surface of about $2m^2$ in area, serving as a sensor for heat, touch and other senses. Skin is not only a sensing organ; it also directly reacts to the sensed impressions. Various research groups work on transducers, which mimic the properties, and functionalities of the human skin[2] by developing tactile and pressure sensors, which are flexible and conformable, like our soft and deformable skin.

Polymers as Sensors

Whenever looking at a scanning electron micrograph image of a cross-section of a typical cellular polymer used in packaging, one is forced to think of a famous Austrian sweet called »appelstrudel« – there are various layers of polymer enclosing lens-like voids, instead of the »Blätterteig« filled with apples and »Rosinen» in the »appelstrudel» (Figure 1a). Like the appelstrudel, the polymer foam is a very soft material which is easily deformed when pressure in the thickness direction of the film. This quality – the softness of the polymer foam – offers many ways to detect objects. When objects of various shapes are placed upon a polymer foam sheet, the polymer sheet changes its thickness wherever the object touches the foil. The location of the alternation in thickness, which is proportional to the change of the capacitance of the foil, directly relates to the position of the object. Such a capacitive sensor was built in cooperation with the ETH Zurich and is currently being investigated regarding its application in »intelligent storage systems«.[3]

2 Cp. Someya, Takao; Sekitani, Tsuyoshi; Iba, Shingo; Kato, Yusaku; Kawaguchi, Hiroshi; and Sakurai, Takayasu (2004): »A large-area, flexible pressure sensor matrix with organic field-effect transistors for artificial skin applications«, Proceedings National Academy Science 101 (27), pp.9966–9970 and Wagner, Sigurd; Lacour, Stephanie P.; Jones, Joyelle; Hsu, Pai-hui I.; Sturm, James C.; Lib, Teng; and Suo, Zhigang (2004): Electronic skin: architecture and components, Physica E 25, pp.326–334.

3 Metzger, Christian; Meyer, Jan; Fleisch, Elgar; Dansachmüller, Mario; Graz, Ingrid M.; Kaltenbrunner, Martin; Keplinger, Christoph; Schwö-

But foams can do more than just recognizing objects. With a little help from observations in our daily life, the flashes of light, that can be seen when hair is combed, can be used to transform the foam from a passive material to a responding, so called »electroactive« one. (The term »electroactive« describes the ability of the material to directly generate an electrical signal upon external stimuli.) In order to functionalise them, the foams are equipped with thin aluminium electrodes on top and bottom of the polymer sheet. High voltage of about 2.000–10.000 V volts is applied to these electrodes and as a result little microdischarges, like flashes in a thunderstorm, are ignited inside the voids of the polymer foam (Figure 1b). Due to this »lightning« the voids become internally charged and end up carrying charges with opposite signs on opposite sides of the voids.[4] These charged voids resemble macrodipoles (Figure 1c), and they are responsible for the new and remarkable properties of the cellular polymer. The functionalised polymer foam is called »ferroelectret«, where the term »electret« indicates that the charging is quasi-permanent; lasting longer than a typical experiment will take (i.e. up to 10 years). The term »ferro« refers to the novel properties of the materials, which resemble those of ferroelectric materials. (Bauer 2004, Bauer–Gogonea 2003) One of the most striking and useful new properties of the ferroelectrets is that they exhibit a piezoelectric–like effect (the ability to generate voltage upon application of pressure). If the material is deformed by applied perpendicular stress, the voids are deformed, and the charges within the voids´ surfaces are forced closer together, resulting in an output–voltage. The voltage generated by the pressure achieved by one's finger (0.3Mpa) is in the range of 100 Volts (Figure 1d). This is rather high and enables for a large number of applications. Usually the powering of devices is very forcing. Thus most technologies rely on passive sensing, such as keyboards, where each button always has to be checked for applied pressure, resulting in a capacitance change. If now the device itself generates a detectable signal, less power is necessary to reveal its current status.

diauer, Reinhard; and Bauer, Siegfried (2007): »Flexible foam-based capacitive sensor arrays for object detection at low cost«, submitted to Applied Physics Letters.

4 Lindner, Michael; Bauer-Gogonea, Simona; Paajanen, Mika; Raukola, Jaakko; and Bauer, Siegfried (2002): »Dielectric barrier microdischarges: Mechanism for the charging of cellular piezoelectric polymers«, Journal of Applied Physics 91(8).

Figure 1: (a) Scanning electron microscopic picture of PP foam (from: Bauer–Gogonea 2003). (b) Schematic picture of functionalization of the foam by applying high–voltage to the electrodes. As a result microsdis–charges are ignited inside the voids and (c) thus the voids become internally charged, creating macrodipoles (d).

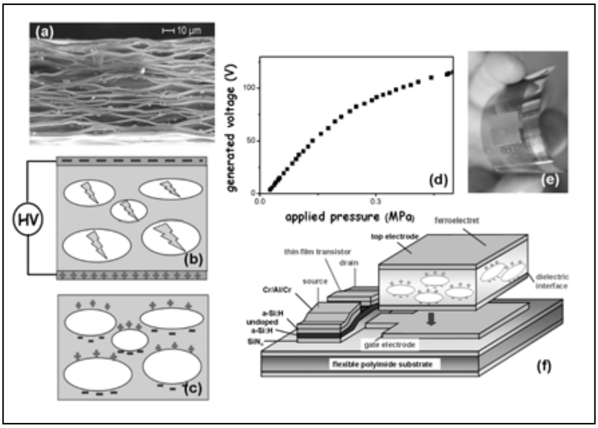


Diagram of the piezoelectrically generated voltage of the ferroelectret versus applied pressure. (e) Prototype and (f) schematic of pressure sensor made from a ferroelectret foil (from: Graz 2006).

Taking advantage of these properties a simple touch sensor and a microphone have been demonstrated. The prototype with the ferroelectret simply attached to a transistor serving as a switch is schematically depi-cted (Figure 1f). Due to the flexible nature of the ferroelectret and the transistor which has also been prepared on a flexible polymer substrate we obtain a fully flexible device which can be bent and remains fully functional (Figure 1e).

Upon application of pressure to the ferroelectret a certain voltage is generated and if this voltage succeeds the threshold of the transistor, the touch sensor is switched on. Thus also different pressure respectively of weight can be detected. We also used sound pressure to generate voltage. The obtained response showed a constant signal over a range of 3 decades – comparable to a commercial capacitor microphone [Graz 2006; Austrian Patent 3A A114/2006]

Common touch pads or screens are based on two transparent electrodes separated by a small air–gap. When pressure is applied to a certain point, the electrodes short–circuit at this point. Thus the position can be determined. Common touchpads also need a power supply. We have assembled a novel touch pad based on ferroelectrets (Figure 2a), which does not need powering as it is self–powered due to the piezoelectric effect of the ferroelectrets. The prototype of the touch pad consists of a ferroelectret, with an aluminium electrode evaporated on top, glued onto an antistatic foil. The aluminium electrode provides nearly no electrical resistance, whereas the antistatic foil exhibits a rather high resistance, but is still conductive. The ferroelectretic polymer sheet is sandwiched between a highly conductive upper electrode and a bad conducting bottom electrode. All 4 edges of the 2d prototype signals are read out. Now if pressure is applied at a certain point, a voltage is generated by the ferroelectret. The bad conducting bottom electrode acts as a large number of resistors connected in series. Due to different amounts of resistance given by different positions, signals of different height are ob-tained, and the position of the touch can be detected (Figure 2b). This simple touch pad does not require a power source (Austrian Patent 34 954). Beside the ability to generate voltage upon application of pressure, the application of voltage results in a deformation of the polymer foam. When an alternating voltage is applied to the foam, it acts as a loudspeaker. Loudspeakers made of ferroelectrets provide only little deflection, thus they are excellent at high frequencies, but of minor quality with low frequencies.[5]

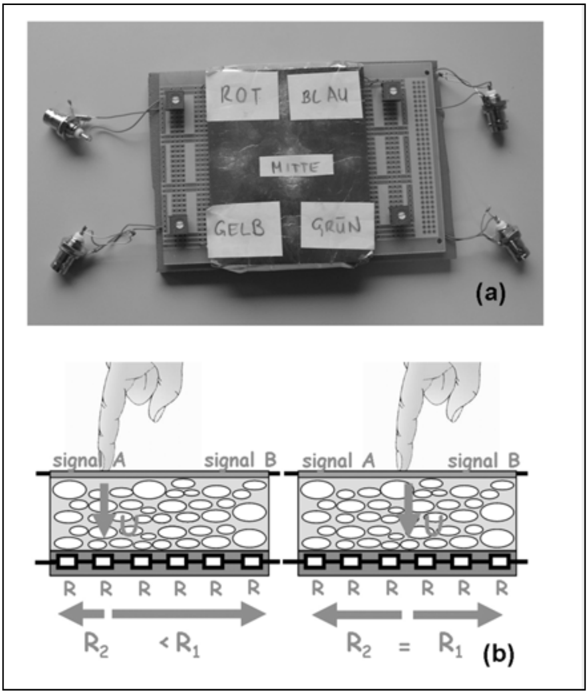
Sticky-tapes as Actuators

Besides sensing, polymers can also be used to mimic another features of life – controlled complex movement in actuators made from elastomers. These actuators, based on sticky-tape and inspired by soap bubbles, may allow the creation of artificial muscles.

Soap molecules consist of two different parts: a polar hydrophilic (=water loving) head and one or two long, hydrophobic (=water hating) carbon tails. The polar heads carry a small electrical charge, which makes them soluble in polar substances such as water but not very soluble in non-polar solvents, e.g. oil. In contrast, the long, uncharged and thus non-polar tails are repelled by water but are dissolved in oil which is also non-polar. This duality of being soluble in water and in oily substances at the same time is the reason why soap is capable of cleaning surfaces.

5 Cp. Paajanen, Mika; Lekkala, Jaakko; and Kirjavainen, Kari (2000): Electromechanical film (EMFi): a new multipurpose electret material, Sensors and Actuators A 84, pp.95-102. and Panphonics Oy (Audio Innovations), Finland: http://www.panphonics.com/products.html (Nov 20, 2007).

Figure 2: (a) Prototype and (b) working principle of a ferroelectric self–powered touch–pad. By applying pressure, voltage is generated and can be detected as signals A and B. Due to the resistive bottom electrode, depending on the position of applied pressure, different signals are obtained. From these signals the position of the touch can be deducted.



Picture: Ingrid Graz

When soap molecules are mixed with water such molecules will tend to gather themselves together and form small spherical structures, called micelles. When arranged as a micelle only the polar hydrophilic heads are in contact with the water, while all the hydrophobic tails are shielded from the water.[6]

Soap films have uniform stress in every direction and require a closed boundary to form. They naturally form a minimal surface – the form with minimal area and embodying minimal energy. Soap bubbles have been an inspiration for architects – tensile architecture is a rela-

6 Cp. Hildebrandt, Stefan; and Tromba, Anthony J. (1996): »The parsimonious universe: shape and form in the natural world - New York«; [Heidelberg]: Copernicus, pp.105-212.

tively new field of architecture devoted to lightweight membrane structures. Typical buildings today are compression structures where bricks are piled on top of one another. Tensile structures are constructions of elements carrying only tensile stress, but no compression. Basically buildings that rely on tensile structures are composed by a cable–net supporting a conformable sheet or fabric. Models of a rigid metal frame and a string serving as boundaries for a soap film are used to evaluate possible structures. The architect Frei Otto contributed largely to the development of lightweight and tensile architecture, as he studied the self-forming processes of soap bubbles, crystals, or other structures found in nature. These natural objects create forms that are very efficient and use a minimum of material.[7]

Elastomers constitute a class of polymers that are characterized by entangled polymer chains creating a highly cross-linked polymer network. These materials are better known under their common name »rubber«, and they are highly deformable. Elastomers can be stretched many times greater than their original size.

For a linear polymer chain there is only one possible state, but an entangled polymer (elastomer) provides many similar states and conformations. If the entangled polymer is stretched – the mechanical energy applied is stored – one single linear state is obtained, and order (within the entangled polymer chains) is created. Thus a linear polymer is considered »ordered«, whereas the entangled is considered »disordered«, or has what is called higher entropy. Entropy describes the degree of disorder, and is dependent on energy (and temperature).

For example, if we look at a bowl of water at room temperature, the water is not turbulent, it is ordered. But when the water is boiled, perturbances causing disorder will be created. Supplying the system with energy leads to an increase in temperature, and the entropy will also increase. When the water is frozen, the temperature decreases resulting in a block of ice. The water molecules are no longer able to move and almost total order is achieved – the entropy is very low.

By stretching a simple rubber band, energy is transferred into the material, and can be detected in the form of temperature increase (very small, but this can be sensed by touching the stretched rubber with one's lips). It is also well known that when things are heated up, they will expand due to thermal expansion. What will happen if the rubber band is stretched and held in place by a load, and than heated? By stretching, the entropy is lowered, since the rubber is more ordered than in the released state. Supplying the system with energy by heating it up, disorder is in-

7 Cp. Hildebrandt, Tromba (1996), p.208 ff.

duced, and should manifest itself in entangled polymer chains. The pre-stretched rubber band contracts thus lifting the load.[8]

If a stretched elastomer is attached to a flexible frame, the elastomer will try to decrease its energy, and the energy released from the contracting elastomer will be partially stored as the bending energy of the frame. Thus complex elastomer-frame structures will be obtained due to the simultaneous minimization of the two energy contributions similar to the soap film-string models. Now if the energy stored by suitable boundary conditions is released temporally stable minimum-energy structures are obtained.[9]

To prepare a simple minimum energy structure, a piece of elastomer film is pre–stretched on a rectangular frame made from a thin overhead transparency, equipped with a rectangular cutout. Thicker plastic film frames are placed on top of the frame/stretched elastomer sandwich to strengthen the frame, and determine the direction of bending. When the structure is removed from the pre-stretching frame, the elastomer tends to release the stored elastic energy, while the elastic energy of the plastic frame increases by bending and buckling. The two competing processes finally lead to a complex minimum-energy structure depicted in Figure 3a.[10] Application of external stimulus allows the self-organized system to alter its configuration, and thus to actuate. This is achieved by a third energy contribution, which manages to couple the energy of the frame and the elastomer, resulting in the formation of a new energy minimum with a different structure.[11] To create actuation of the minimum energy structure, compliant electrodes are applied to both sides of the elastomer sheet, and an elastomeric capacitor is formed which is driven by Maxwell stress.[12]

8 Cp. Vorlesungssammlung Physik - Universität Ulm Versuchslisten (Prof. Martin Pietralla), Versuche TH 10 und TH 7 http://vorsam.uni-ulm.de/ASP/Versuchslisten.asp (November 20, 2007).

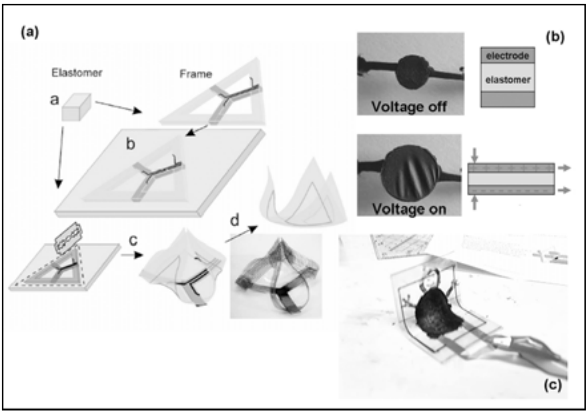
9 Cp. Kofod, Guggi; Wirges, Werner; Paajanen, Mika; and Bauer, Siegfried (2007): »Energy minimization for self-organized structure formation and actuation«. Applied Physics Letters 90, 081916.

10 Cp. Kofod, Guggi; Paajanen, Mika; and Bauer, Siegfried (2006): »Self-organized minimum-energy structures for dielectric elastomer actuators«, Applied Physics A 85, pp.141–143.

11 Cp. Kofod et all (2007).

12 Cp. Pelrine, Ron; Kornbluh, Roy; Joseph, Jose; Heydt, Richard; Pei, Qibing; and Chiba, Seiki (2000): »High-field deformation of elastomeric dielectrics for actuators«, Materials Science and Engineering C 11, pp.89–100.

Figure 3: (a) Schematic of minimum–energy structure/actuator preparation. The elastomer is stretched and applied to the frame. After cutting, the elastomer–frame sandwich is released and a minimum energy structure is obtained. (b) Principle of actuation due to Maxwell stress. (c) Actuator prepared from transparencies and sticky–tape, with applied carbon grease electrodes.



Graphics: (a) reprinted from: [Kofod 2007]. (b) Reprinted from: [Pelrine 2000]).

The principle of actuation can be understood easily, imagine a bow with a chord, where the wooden bow corresponds to the frame and the chord stands for the stretched elastomer. If the chord were to be stretched, the bow (frame) would be allowed to unbend, to relax.

The same happens to the elastomer – by applying voltage to the electrodes, they are charged with opposite signs. Charges of opposite sign attract each other and as the capacitor is elastic, the electrodes move towards each other. Due to the electric attraction force the material gets thinner between the electrodes resulting in an increased (electrode) area (Figure 3b). With respect to volume conservation, the elastomer has to elongate, when compressed. This increase in length counteracts the stretched elastomer and the energy stored in the stretched elastomer is released and competes with the bending energy of the frame. If the energy becomes larger than the bending energy of the frame, the minimum-energy structure is actuated (Figure 3c).

Epilogue

Plastic materials surround us in our daily life such as passive materials for buildings, in cars, as packaging materials et cetera. Even ordinary polymer foils used as sticky tapes or food wrappings can be highly interesting materials for simple transducers. Sensors based on polymers foams and actuators made from sticky-tape show their large potential for future lightweight and low-cost high-tech applications.

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Evolutionary Algorithms in Support of Creative Architectural Designing

Tomor Elezkurtaj

The system discussed in this paper applies artificial evolution methods to architectural floor plan design. Design variants are treated as copies of an evolving species. The properties that are subject to evolution pertain to the form as well as the function of the rooms accommodated. Since function in architecture is an open concept that not only includes physical comfort but aesthetic aspects as well, the system is not intended to make the evolution of designs automatic. Rather, it invites the user to interactively intervene in the process displayed on the screen.

The Problem of Algorithmic Support of Creative Architectural Design

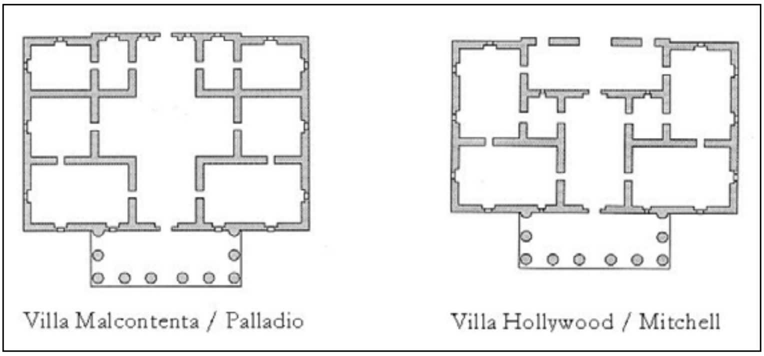
After decades of research, computer aided architectural design (CAAD) still waits to be supported by methods of artificial intelligence (AI). The standard functionality of commercial CAAD software is confined to drawing, construction and presentation: in architectural design, computers are used to handle complex geometries, sophisticated visualization and performance simulation. The core business of architecture, the shaping of spaces and organization of functions, is still not considerably supported by computerized methods.

The great expectations of the CAAD pioneers were fuelled by the impressive early progress of symbolic AI. The approach of symbolic AI to human intelligence is that of programming the use of language. Language is a broad concept, encompassing the use of words, symbols and even shapes. The way suggesting itself for combining CAAD with symbolic AI is formalizing shape grammars. Shape grammars are sets of forms, symbols and rules defining the way in which, e.g., meaningful architectural plans are composed of elements representing walls, ceilings, windows, doors, stairs etc. Plans are meaningful if they are well formed, i.e., if the elements are defined in a clear-cut way and manipulated according to syntactical rules. The art of programming a computer to construct architectural plans by manipulating symbols lies in formalizing the grammar and specifying its rules in such a way that syntactically well–formed expressions are architecturally well done as well.

Remarkably, the use of computer driven shape grammars came close to passing an architectural Turing test. Computerized grammars generated drawings of mock Palladian villas and fake Frank Lloyd Wright Prairie Houses that could easily fool even the expert eye if presented as long–forgotten originals.[1] Nonetheless, symbolic AI never came up with modules suitable for commercial CAAD software. The reason is that architectural design cannot be reduced to producing graphics and imitating style. Architectural plans have to be not only syntactically well–formed, but also meaningful. The meaning of architectural plans lies in the function that the objects represented are supposed to fulfill.

Function, however, is a broad and elusive concept in architecture. The function of a building lies in serving the needs and wants of its users and beholders. The definition of function thus faces two basic difficulties. First, it is unclear who counts as a user or a beholder. Second, the needs and wants are subjective in nature; the concept of function is no less subjective than that of beauty. Moreover, the needs and wants to be accounted for include those of the aesthetic sense. The function of a building (as well as the functions of its constituent parts) cannot be reduced to technical requirements.

Figure 1: Shape grammar of Palladian villas.



Right: original (Villa Malcontenta), left: a floor plan »invented« by the machine (Villa Hollywood by Mitchell/Stiny.

1 Mitchell, W. (1990): »The Logic of Architecture«. MIT Press, p. 179.

Nonetheless, some functional requirements can be operationalized. A good deal of the function of the rooms in a building can be expressed in terms of neighborhood relations. The characteristic function of a hall, e.g., lies in giving access to the rest of the rooms that make up the house or dwelling. The prescriptive meaning of names like »kitchen« or »bathroom« lies to a great extent in the constraints and preferences pertaining to the shape and placement of the rooms in the context. Hence, it is good practice to start working on a plan by translating the names of the rooms listed in the program into preferred size, shape, orientation and neighborhood relations. This translation is the first step to dealing with function algorithmically.

Translating function this way into tangible criteria does not solve all the problems with functions. One should not disregard the difference between the full–fledged subjective concept of function and the concept defined implicitly by the tangible criteria. Neglecting this difference would reduce architecture to engineering. The design of buildings becomes an art precisely through dealing with the subjective needs and wants of the users and beholders. Our sensitivity to architectural qualities goes further than our ability to describe the needs and wants in explicit terms. Because of this, the attention to function in the unrestricted sense is not only a source of risk and labor, but also a source of surprise. Being able to surprise means to be creative. Architecture is an art in that it offers the opportunity of satisfying more needs and wants than the users and beholders were conscious of having. Algorithms that support creative design should help to produce surprises or things that one cannot foresee. How can algorithms be made to produce things not foreseen? What is needed is randomness. Of course, it would not be enough to randomly generate shapes or combinations of shapes. In order to be helpful, the play with chance has to be combined with a goal-oriented search. It has to be turned into an effective, if not efficient, way of exploring a search space. The problem of exploring the search space of architectural design efficiently is that it is hard to demarcate that space. The search space escapes being circumscribed in a conclusive way as long as function remains a loosely defined concept. In principle, it is impossible to deal with ill-defined problems algorithmically. What seems to be possible, however, is a division of labor between the human designer who is equipped to deal with ill-defined problems and the machine that is not.

The application presented in this paper draws a line between the search space demarcated by tangible criteria of functionality and the space of solutions that satisfy more subtle conditions as well. Since the tangible criteria are open to parametric variation, it may be reasonably assumed that the space of interesting functional solutions is contained in the space of solutions that fulfill the tangible conditions.

Artificial Evolution

One of the most basic tasks for an architect is floor plan design. Floor plans are the conventional and proven means of accommodating a program in a situation determined by the shape and size of the lot, the zoning and building regulations, neighborhood and access relations and other factors. A system supporting creative architectural design in the sense characterized above should display the following features:

- It should provide an interface for interactively specifying programs and composing floor plan layouts.
- It should account for the function of rooms in terms of (a) the size, shape, and orientation preferred and (b) in terms of constraints and preferences pertaining to neighborhood relations.
- It should search the space of solutions to the placement problem in a way that optimizes the preferences specified.
- It should make it easy (a) to intervene into the search process and (b) to change the values of the criteria specified.

If we also add the requirement that the system should produce surprise, we find ourselves asking a certain kind of creativity of the system itself. Even though creativity may seem too much to be asked of an algorithm, there are processes in nature that are both creative and capable of being described algorithmically: most notably, the strategies which biological evolution employs on the genetic level. The way genomes are selected, recombined and reproduced in the evolution of a species can be described in algorithmic terms as well as simulated to a certain degree by the computer. The application of strategies discovered in biological contexts for problem solving and optimization forms the essence of what has been called New AI.

New AI differs from the old, symbolic, AI in that the paradigm of intelligent behavior has shifted. Instead of taking language as the paradigm case of intelligence, the focus is now on the adaptive behavior of organisms or populations of organisms.

Among the strategies that proved to be surprisingly powerful in problem solving are Evolution Strategies (ES) and Genetic Algorithms (GA). Both ES and GA simulate what is happening in the gene pool of a population of individuals competing for survival. The individuals that ES and GA act upon are the candidate solutions of design variants. The gene pool consists of the selection of the bit strings that encode the variants. The difference between ES and GA lies in the role that randomness plays in the process of selection and reproduction. In ES, randomness is confined to mutation, i.e., changing single genes. In GA, both mutation and crossover take place. Crossover means that individuals are selected for mating and recombining their genomes. In a GA, both, the couples that mate and the location in the genomes where they are crossed over, are selected randomly. Selection according to the fitness of the individual variants takes place in reproduction. The fitter the variant, the higher its chance is to reproduce. A more detailed description of ES and GA is given in the appendix below.

ES and GA have proved useful in a wide range of placement problems.[2] They have become standard approaches to cutting and packing problems;[3] they are routinely used in VLCS chip design.[4] There are a lot of papers on coding hybrid strategies and there are even applications using them interactively. There is a conspicuous lack, however, of applications that would help the designer of architectural plans and satisfy the requirements (1) – (4) listed above.

A System Supporting Floor Plan Design

In the remainder of this paper, an implementation of requirements (1) – (4) is presented. The system is made of three parts. The first part is an Evolution Strategy (ES) that fits rooms of given size and preferred shape into the outline of a building or, for that matter, storey. The second part consists of a Genetic Algorithm (GA) whose task is to arrange the rooms according to functional requirements that are expressed in terms of neighborhood relations. The third part is the user interface on which the design variant achieving the best score at the time is displayed and made accessible to intervention via the mouse.

The task of fitting a number of rooms of given size and preferred shape into an outline consists of finding out the arrangement that optimizes the proportions preferred and minimizes gaps, overlaps and overflow. Characteristic of the search space of this particular problem is a

2 E. Goodman, A. Tetelbaum, V. Kureichik (1994): »A Genetic Algorithm Approach to Compaction, Bin Packing, and Nesting Problems«.

3 See, e.g., Franck et al. (1999).

4 Schnecke, V., Vornberger, O., An Adaptive Parallel Genetic Algorithm for VLSI-Layout Optimization (1996): »Parallel Problem Solving from Nature« - PPSN IV.

multitude of global optima. The risk of being caught in a local optimum is negligible. Since the space to be worked through is nevertheless ample, a simple ES is adopted for reasons of speed.

Fitting rooms into an outline is a simple task compared to the overall optimization of the neighborhood relations between them. The search of this optimization problem is much more complex, and the search space needs to be worked through more thoroughly. In order to accomplish this demanding task, a GA combining mutation with crossover is adopted. The operation performed by the GA is a kind of re-interpretation of the rooms arranged. It changes the functions attributed to the rooms in order to optimize the neighborhood relations. The output of the GA is thus turned into an input of the ES fitting in the rooms and vice versa (see Appendix).

The reason for adopting this mixed strategy lies, among other things, in speeding up the process. Speed is crucial for interaction with the user. The interface showing the design variant with the highest score at the time provides, at the same time, the possibility of changing the position, orientation, shape and size of rooms during run-time. Moreover, it allows changing the outline into which the rooms are to be fitted, the number of rooms to be accommodated, and the weights of the neighborhood relations between them.

Interaction is crucial for involving the capabilities of the designer that are out of reach for the machine. It can be assumed that human intelligence or intuition can deal with the complexity and opacity of the needs and wants entailed by the broader concept of function. Moreover, the human designer is used to exploit the gap between the intuitive intelligence of perception and the ability to describe what is perceived. This gap is the source of qualities that cannot be made, but have to be found.

Figure 2: Fitting rooms of a given size and a preferred shape into an outline by minimizing gaps overlap and overflow (as performed by an Evolution Strategy).

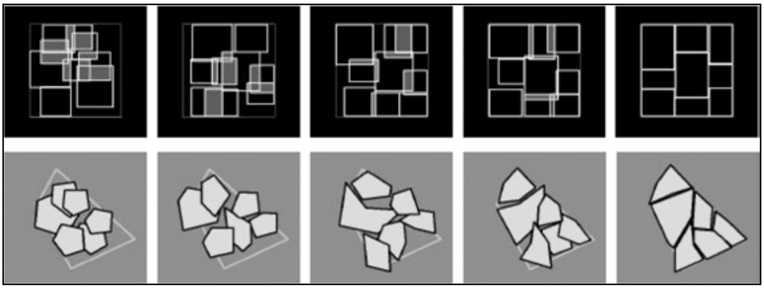
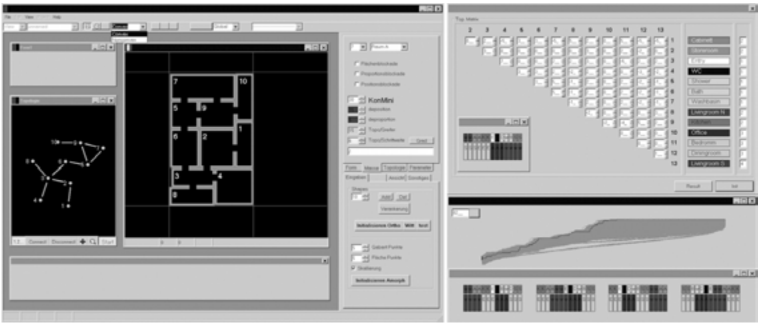


Figure 3: User interface displaying the topology (access relations) left; geometry (floor plan) middle; the topological matrix (containing the relative weights of the neighborhood relations preferred)



Properties that cannot be planned prospectively, but appreciated in retrospect are what lie at the base of architectural quality.[5] The best a machine can do in order to let serendipitous qualities emerge is to engender surprise.

Artificial evolution has the potential to produce surprise. It is a method of accessing problems that resist being described analytically. Describing problems analytically means to describe them in a way that demonstrates that they can be solved and even implies how this may be achieved. The shape grammars of symbolic AI proceeded that way. The production and reduction (parsing) rules they work with are specified in a way that whatever solution is syntactically well-formed looks architecturally well formed as well. The application of ES and GA circumvents this prescriptive anticipation. In order to put ES and GA to work, only the objective function and the material to be worked with need needs to be specified. Of course, the specification needed is far from trivial. What is particular, however, is that ES and GA make use of randomness to an extent that prevents an exact prediction of the result. As a rule, it is not even possible to prove that the solution they render as optimal is indeed an optimum. The idea behind the system presented was that this vice could be turned into a virtue if the designs interactively produced with its help are susceptible to assuming the property of being not predictable but eye opening in retrospect.

5 On this point see Franck/Franck (2001).

Appendix

A. Evolution Strategy

ES was developed in the early sixties by Ingo Rechenberg[6] and Hans Peter Schwefel.[7] In its original form, real–coded parameters were used and subjected to mutation. In contrast to GA, mutation, as search operator, acts on the phenotype or individual. The presupposition that the coding the variables in the ES starts from is that a sufficiently strong causality (small changes of the cause must create small changes of the effect) prevails. The problem to be solved by the evolution strategy described in this paper is considered a kind of a so-called Bin–Packing, Nesting or Cutting Problem. For solving the geometry of the architectural floor plan, the fitness–function (Sg_0) of the ES minimizes the sum total of overlap between the shapes (ij) to be accommodated and the outside area (u).

$$Sg = \sum_{i=1}^{n-1} \sum_{j=i+1}^{n} (S[i] \cap S[j]) + \lambda \sum_{i=1}^{n} (S[i] \setminus S[u])$$

After being initialized, a population of design variants is subject to random change concerning position and proportion. Selection acts through reproduction from generation to generation. The fitter a variant, the higher its reproduction rate is. The proportion preferred is approximated through filtering probabilities.

B. Genetic Algorithms

The study of genetic algorithms originated with John Holland[8] in the mid–seventies. A genetic algorithm is an iterative procedure that consists of a population of individuals, each one represented by a string of symbols, encoding a possible solution to a given problem. Offspring is generated by way of crossover and mutation. Individuals are selected for recombination with a probability proportional to their relative fitness.

The genetic algorithm described in this paper solves the topology of the architectural floor plan. The problem to be solved is a so-called

6 Rechenberg, I. (1973): »Evolutionsstrategie: Optimierung technischer Systeme und Prinzipien der biologischen Evolution«. Stuttgart, Frommann-Holzboog.

7 Schwefel, H.P. (1981): »Numerical optimization of computer models«, Chinchester: Wiley.

8 Holland J.H. (1975): »Adaptation in natural and artificial system,« Ann Arbor: The University of Michigan Press.

Quadratic Assignment Problem[9] (QAP) or a facility placement problem. Consider the problem of allocating a set of facilities to a set of locations, with the cost being a function of the distance and flow between the facilities. The objective is to assign each facility to a location such that the total cost is minimized. Translated to the topological problem of the floor plan, the locations are the rooms (walls), the facilities are the preferences of the rooms (size, proportions etc.) and the flow is expressed as the importance of the neighborhood relations between the rooms. There are two matrices with the elements $W = (w_{ij})$ and $T = (t_{ij})$. The elements w_{ij} of matrix W express the importance of the neighborhood between room (i) and room (j), the elements t_{ij} of the matrix T represent the distance between the location (i) and location (j). The user specifies the weights n_{ij} (see figure 3). The value of n_{ij} expresses the importance of the relationship between rooms i and j. $n_{ij} = 0$ means that the distance is without importance, $n_{ij} < 0$ means that the rooms should be as distant as possible from each other. The fitness function (W_T _ min) is to minimize the products $w_{ij} * t_{ij}$.

$$W_T = \sum_{i=1}^{n} \sum_{j=1}^{n} \left(w_{ij} * t_{ij} \right)$$

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9 Burkard, Rainer E.: »The Quadratic Assignment Problem« (1998).

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DESIGNING OUR EXTENDED BODY

MIKA SATOMI, SABINE SEYMOUR

Technologies are increasingly integrated into our daily lives. Internet, mobile phones, MP3 players, just to name a few, our dependency on technologies is changing our relationship to it as an external tool to an extended body.

Ubiquitous computing or wearable technology offers transparent or opaque interfaces, bringing a new realm to the Human Computer Interface. These technologies turns us into non-penetrative cyborgs enabling us to achieve harmonious interactions with machines. They help us blur the boundaries of our body and let us include machines as our extended bodies.[1]

In this article, we discuss the extension of the body by means of wearable technology from the designing perspective spanning from the personalization of its look and perception in our society to the possible future scenario. The ›H+‹ project realized by Mika Satomi and Christine Foglar serves as a case study for this article. The re-design and even re-purposing of an existing medical wearable device influences the identification of the wearer with the device and its design methodology.

Wearable Technology, Body Extensions

In 2002 the photographer Christophe Luxereau modified the appearance of body extensions through digital photography in his project ›Electrum Corpus‹. In this series, he envisioned medical devices such as artificial hart, artificial knee joints, prosthetic feet and hearing aids as jewelries designed by high-end fashion brands.

In 2005, the Victoria and Albert museum in London held an exhibition called ›Hearwear – the Future of Hearing‹ inviting designers

1 Cp. Clark, Andy (2003): »Natural-Born Cyborgs: Minds, Technologies, and the Future of Human Intelligence«, Oxford: Oxford University Press, pp.25-28, pp.38-39.

to design a new hearing aids of the future. ›Table talk‹ by IDEO[2] or ›Goldfish‹ by Human Beans[3] are realized prototypes that take the notion of hearing aids a step further by offering hearing aids for people without hearing-loss. ›Table talk‹ cancels the background noise and allows the wearer's conversations to be clear in a loud environment through the use of T-loop technology. ›Goldfish‹ on the other hand offers a science fiction like function, where the earpiece constantly records ten seconds of sound and replays when the wearer waves the hand past his/her ear. Through this exhibition, designers challenged state-of-the-art auditory technology by integrating it into the hearing aids looking for new functions in daily use.

One of the pioneers of Wearable Computing, Bradley Rhodes from the MIT, states that wearable computers should be »designed to be usable at any time with the minimum amount of cost or distraction from the wearer's primary task, which is not using the computer but dealing with the environment«.[4] Mechanical hearing aids using transistors have been in use since the 1950s. Hearing aids are perfect examples of what Rhodes described as wearable computers, considering modern hearing aids contain small computer chips equipped with artificial intelligence for efficient sound amplification and noise reduction.

The design guidelines for wearability of such devices has been specified by Gemperle et al[5]. The guideline suggests thirteen criteria including »Placement«, »Sizing«, »Weight« and »Sensory Interaction«. Current hearing aids in the market satisfy most of the criteria raised in this guideline, though the twelveth criteria »Aesthetics (perceptual appropriateness)« is still a challenge. Gemperle points out that »Culture and context will dictate shapes, materials, textures, and colors that perceptually fit the user and their environment«. His point could also refer to how the fashion trends works in our society. His point could also refer to how the fashion trends work in our society. Unfortunately current hearing aids are by far not considered aesthetic or fashionable. They tend to be perceived as outdated, often worn half-hidden. Some

2 IDEO, Table talk (December 12th, 2007): http://www.ideo.com/media/events/events_hearwear.asp.

3 Human Beans, Goldfish (December 12th, 2007): http://www.humanbea-ns.net/hearwear/index.html#hearwear

4 Cp. Rhodes, Bradley (1997): The wearable remembrance agent: A system for augmented memory . In: Personal and Ubiquitous Computing, volume 1, pp. 218-224.

5 Cp. Gemperle, F.; Kasabach, C.; Stivoric, J.; Bauer, M. & Martin, R. (1998): Design for wearability. In: Proceedings of Second International Symposium on Wearable Computers, pp.116-122.

projects seek for innovative appearances such as ›Surround Sound‹ by Industrial Facility[6] or ›Universal hear-ring‹ by Pearson Lloyd.[7] ›Surround Sound‹ incorporates hearing technology in the earpiece of glasses. ›Universal Hear–Ring’ offers a basic core housing for hands-free mobile attach-ments to hearing aids. The ring attachment for the housing can be changed according to the wearer’s style, mood or occasion

The project ›H+‹ seeks to find a new image for existing wearable extensions such as hearing aids, by adding an fashion perspective to the conventional device from cultural, contextual and personalized point of view. As Koda states, fashion has its strength to address more complex and sometimes difficult concepts to the society reflecting our elusive transient ideal.[8] Such highly developed technology should not remain an unattractive medical device, but instead become part of our fashion that extends our body both functionally and aesthetically.

Reality of Hearing Aids

According to RIND[9], two million people in the UK are using hearing aids. Four million people could benefit from using hearing aids, but prefer not to do so. One of the main reasons that some people refuse to wear a hearing aid is directly related to its appearance. Conventional hearing aids tend to have skin color to be less visible. The commonly used hearing aids are the ›behind the ear‹ type and the ›inner ear‹ type. Several companies are nowadays trying to create new designs such as »Delta« by Oticon or »Pluse« from GN Resound. However, the futuristic look and the focus on invisibility lack inspiration, design sensibility, and the option for the wearer to personalize their hearing aids. It seems that the industy approach is to design a mechanical device rather than a personal item to wear.

The ›H+‹ project project focuses on the personalization of wearable items. In the 17th century Japan, wearing a personalized miniature sculpture such as ›Netsuke‹ was a fashion trend. ›Netsuke‹ had a functional use of holding tobacco bags hung from belts. In current days,

6 Industrial Facility, Surround Sound (December 12th, 2007): http://www.industrialfacility.co.uk/if.html.

7 Pearson Lloyd, Universal hear-ring (December 12th, 2007): http://www.pearsonlloyd.co.uk/upload/html/hearwear_01.html.

8 Koda, Harold (2001): Extreme Beauty: The Body Transformed, New York: The Metropolitan Museum of Art, p13.

9 RIND: The Royal National Institute for Deaf People. (Dec 12th, 2007): http://www.rnid.org.uk/information_resources/aboutdeafness/sta-tistics/

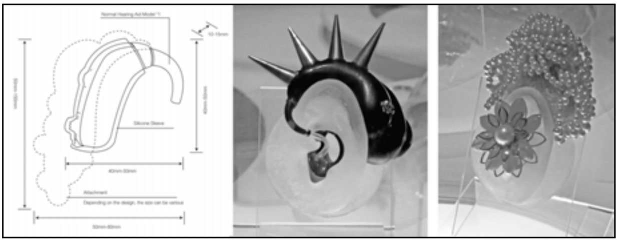
there is a trend to personalize MP3 players such as iPods with various styles of designed sleeves. ›H+‹ aims to propose hearing aids as objects that extend our body, similar to high heeled shoes or glasses. Their design should not be conceived as mimicking the body or as medical devices, but instead aim to show off their identity as fashion accessories. The initial propose of the project is to create a connector or a cover in a modular system that enables different types of accessories to be attached. The wearer chooses his/her own style and identity for his/her wearable extension.

›H+‹ – A Hearing Aid for Us

The realization of the ›H+‹ project proposes the prototype design of stylized attachments on a silicon sleeve. The wearer simply slips a silicon sleeve with the preferred attachments over a basic hearing aid. This solution addresses the separation of the appearance of the device and its technology, enabling a third party such as a fashion designer to supply the design for the wearable device without dealing with the technology of the device. The sleeves are made to fit common ›behind the ear‹ type hearing aids. Figure 1 shows an illustration of a sleeve made from silicon. Different materials are used for the proposed attachments such as metal, pearls, jewels and papers to give identities from its textures.

The proposed styles are inspired by fashion styles such as ›Punks‹ or ›British Elegance‹, which were worn by models and taken as photo images. The person wearing these models addresses the identity and story that each style contains. Considering the aging of the population and the amount of noise we are exposed everyday, it is realistic to expect oneself as a future wearer of a hearing aid.

Figure 1: A sketch of a construction plan and Realized models of ›H+‹.



Design: Mika Satomi.

Figure 2: Images of models wearing ›H‹ hearing aids.

Photographer: Michaela Riess, Models: Didi Bruckmayr, Monika Pesendorfer.

Considerations on Designing Wearable Extentions

Considerations on body ergonomics, perception, functionality, materials, and technology for wearable extensions are the basis for design strategy and its construction. These considerations are structured in the design process to develop applicable and usable wearable extensions.[10] Table 1 shows a diagram of the main factors and considerations regarding the design of wearable devices.

10 Martin, T.; Jones, M.; Edmison, J. & Shenoy, R. (2003): »Towards a design framework for wearable electronic textiles«. In: ISWC '03: Proceedings of the 7th IEEE International Symposium on Wearable Computers, IEEE Computer Society, p. 190.
Gemperle, F.; Kasabach, C.; Stivoric, J.; Bauer, M. & Martin, R. (1998): »Design for wearability«. In: Proceedings of Second International Symposium on Wearable Computers, pp.116-122.

Table 1: Design considerations for wearable extensions.

Factors	**Considerations**
Body ergonomics	Placement, form language, human movement, proximity, sizing, attachments, weight, accessibility, heat
Perception	Perceptions by the wearer and the environment, aesthetics, psychological function
Functionality	Interaction with the system (e.g. inputs), practicality of daily use (e.g. washing/cleaning)
Technology	Ubiquitous computing, sensor technology, embedded systems design
Materials	Type of material, textile, transformative, interactive, reactive

The ›H+‹ project addresses questions on the role of design and fashion in the personal sphere of wearable technology, without mentioning the technology of the device. Reducing the problem to an aesthetic and social issue was necessary for this project. However the concept of the project is also to propose an extended functions for non-medical users, and the use of smart materials for both functionality and its esthetics.

Future Vision

The advances in wearable technology, smart materials and e-textiles enable various future visions. Such technology as flexible ferroelectret technology[11] or soft piezoelectric materials[12] may allow the creation of a soft flexible hearing aid that can even be embedded in clothing. This will give wider possibilities for placement and the form language of the devices. This goes well with a recent trend in technology that is shifting from »Let's put computers into clothing« (hardware/wear) to »Let's

11 Graz, I., Kaltenbrunner, M., Keplinger, C., Schwdiauer, R., Bauer, S., Lacour, S. P., Wagner, S. (2006): »Flexible ferroelectret field-effect transistor for large-area sensor skins and microphones«. In: Applied Physics Letters, Volume 89, Issue 7, d. 073501.

12 Edmison, J.; Jones, M.; Nakad, Z. & Martin, T. (2002): »Using Piezoelectric Materials for Wearable Electronic Textiles«. In: ISWC '02: Proceedings of the 6th IEEE International Symposium on Wearable Computers, IEEE Computer Society, pp. 41- 48.

make the cloth itself compute« (software/wear)[13]. This shift is giving more opportunities to the designers to embed the technology and its functions into their creations.

Additionally the aesthetic of the devices may even be able to react/correspond to the environment or biological state of the users. Shape memory alloys allow for example changes in shapes according to various inputs from the environment or the personalization of the wearer. Light-emitting materials allow communication with glow of light and embedded biofeedback sensors could add biological inputs of the wearers to bring the unique personalizations of the device. The silicon sleeves of ›H+‹ could for example contain thermochromic or photochromic inks reacting to the environment without having extra electronics. In future, clothing made of organic photovoltaics could generate enough electricity to feed the battery of hearing aids and other wearable device may engage in closer symbiotic relationships between fashion and technology.

Conclusion

As Clark stats in his book, humans are »natural-born cyborgs: beings primed by Mother Nature to annex wave upon wave of external elements and structures as part and parcel of their own extended minds«[14]. Our adaptation of this idea in the ›H+‹ project enables us to extend our function and perception of our body by means of technology, and let us become non-penetrative cyborgs in some way. Parallel to the technological development, the social context needs to mature and get accepted as well. Approaching the cyborg idea from an aesthetic and fashion point of view brings new aesthetic and artistic possiblities. An interdisciplinary approach towards wearable devices enables the combination of art and design to create new aesthetic images.

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ACAR2: THE SEQUEL

MISCHA SCHAUB

»For the past ten years, the Institute HyperWerk for Postindustrial Design has been inventing strategies, methods, and tools to deal with the transformations through which our society must evolve on its way from an industrial to a postindustrial setting. HyperWerk regards this activity of inventive process design as the foremost design task of today.«

This is the story of an intensive kind of interaction with the strangely evolving world of design. I will try to report on some of these developments because I feel that what is happening right now is greater than anything I have witnessed during the past 35 years of working as a designer. This new design business is definitely not concerned anymore with streamlining bumpers of cars or creating black razors; rather, it is about spaces and shapes within and for a dynamic world, using its rapidly evolving tools and materials, developing not only the next opportunities for business but also the vision of a sustainable equilibrium and of as yet unseen expressions.

The groundwork for this amazing development has been available for some years, but only now first objects are rising from the ground to transform the skylines of our world. And this is not just about the transformation of architectural space – this is, once more, about a great new world. In this world refreshed there will be products created with new tools, materials, and processes of design and production for purposes and processes, which in turn will form and transform the following generation of tools for creation. And all of this will take place in a post–industrial culture beyond the outdated recipes of mass production.

For a long time, many designers felt humble in front of the beauty of natural shape, and rightly so – it was not until the general availability of cheap computing that the basis for achieving shapes of comparable logic and consequence has become accessible. Nowadays we begin to understand what we only felt intuitively as long as we were still confined to rather simplistic imitations of nature. In his book »A Generative Theory of Shape«[1], Michael Leyton explains on a mathematical level the laws of a coherent transfer of shape information, from the smallest surface detail up to the full object. My professional background as a sculptor and designer always told me on an intuitive level to respect such similarities between surface, structure and shape, but now Leyton's concepts, which are based on the transferability of shape information, seem so much more coherent – no wonder that he equates the maximization of transfer with aesthetics.

Such vast opportunities and challenges call for powerful measures. A radicalized kind of design, which we denominate as post-industrial, may offer the mental space necessary for action. Design should be understood not so much as decoration of consumer goods but as bold art trying to keep our planet together against all odds. Whatever we design, be it product or process, should be thoroughly checked for its sustainable qualities. As a culture, we must appreciate that our products affect their environment even before they are produced: already as raw materials deep in the ground they cause large-scale mining activities and even wars, they demand logistics and open up markets – and even when their lifespan is over they will continue to influence our world for a very long time. Under such circumstances design should extend its range of consideration as far as possible. In our view, the highest level of design is designing design itself – this kind of meta-design will have the greatest impact on the world. This is not to say that the footprint of our activities should become even bigger but that designers should at least take the responsibility for creating their own tools. We think that today's main objectives of interaction design should be less about designing games and mice, manuals or machines but increasingly about understanding and modelling interaction. As many digital products are increasingly transforming our very means of interaction and therefore our scope for action, feedback loops are in store for us – don't worry, I will not bore you with the old story of the mobile phone changing communication itself. The dangers as well as the opportunities are much greater in the design of tools for design since these new tools of creation permit the creation of new tools of creation.

So let us look at interface culture not within the limits of screen space but on the level of world space. Then we will understand that the strange notion of the interface seems to behave similarly to the famous laughing cat – once it is everywhere it becomes so transparent that it disappears. All of a sudden, every action seems to become an action of de-

1 Leyton, Michael (2001): »A Generative Theory of Shape«, Berlin.

sign – with the paddles of design we are creating worldwide waves that will rock our very own boat.

Such steps on shifting ground should only be undertaken in appropriate shoes. Our boots are called HyperWerk and acar2.

In times of a post-industrial globalized economy, the mass production of European consumer goods has become a difficult venture since our continent is characterized by rather high wages. But not only our mass production seems to be threatened lately – the crafts are an endangered species as well. To avoid the collapse of crafts culture, France for instance decided to protect several hundred craft professions as national cultural heritage, which by law have to be kept alive artificially before they die out.

On the other hand, Europe has a leading culture of industrial design and an impressive crafts heritage. Furthermore, a growing number of creative students are entering our design schools. These schools teach a basically interdisciplinary art for creative team players, who are looking for entrepreneurial opportunities for real-world products. To support their entrance into the evolving market of post-industrial consumer goods, we need to take pragmatic steps to find solutions to the well-known recurrent problems our students will face on their way towards their own design agency.

To meet the conditions of a post-industrial economy, industrial design ought to be invented anew in order to ensure a competitive production of European consumer goods in the future. New forms of customization will empower consumers to influence more than just the basic dimensions of a product. Its volume, texture, matter, and graphics may be conceptualized as one mix of algorithmically interwoven qualities, and this will provide a range of highly attractive products. Many questions remain – it is especially unclear which one of the many new freedoms the consumer will actually appreciate and what kind of interaction she will find rather useless. A well-known mental trap of designers should be avoided: the idea that everyone else would just love to be a designer. I think that such attitudes are a bigger problem than the technological issues involved. But are not long-established and deep-rooted mindsets the standard problem once a society is confronted with some new technology?

Since the first days of computing there have been attempts to create computer art. One of the major research topics was the confrontation with fractals, yielding a fascinating understanding of common laws behind the organic and an–organic world. Procedurally defined shapes have been around for some time now, but only through the attractive language

Figure 1:

Picture: Mischa Schaub.

»Processing«[2] developed at the MIT this potential exercises a significant influence on design culture – this high degree of acceptance and accessibility may be explained through the fact that the inventors of Processing come from the arts. With a similar tool called »ParaCloud«[3] architects are creating the landmark buildings of our cities. These approaches are related by the quest for procedural design solutions, and new tools are continuously entering the market. For instance, I myself enjoy very much experimenting with the rather overwhelming evaluation version of »GenerativeComponents« from Bentley Systems.[4] Its attractive blend of scripting and graphics might well represent the current cutting edge of procedural design; at any rate this is my impression after my first attempts. The program's Web site promises great pleasures for designers:

»GenerativeComponents is an associative parametric modeling system used by architects and engineers to automate design processes and accelerate design iterations. […] With a hybrid approach, designers who use GenerativeComponents can model geometry, capture relationships, and generate forms using scripts and/or direct manipulation for unrivalled creative flexibility. This combination of accelerated iteration, flexible modeling, and automated process, means that a GenerativeComponents design can be highly efficient, benefiting from a combination of intuition and logic.«[5]

2 http://en.wikipedia.org/wiki/Processing_%28programming_language%29 (November 20, 2007).

3 http://www.Paracloud.com (November 20, 2007).

4 http://www.bentley.com/en-US/Products/MicroStation/GenerativeComponents-Extension.htm (November 20, 2007).

5 Ibid.

This tool, which has been developed by the SmartGeometry group, might be a bit complex for the layperson – should anyone print out its help file of about 2.500 pages, the toner cartridge would have to be replaced.

However, not only the new software dimension is providing a lot of fun; there is also a new generation of really affordable CNC routers and oversized laser cutters helping to establish high-tech crafts companies. Based on such machinery, fresh and courageous high-tech ventures become a valid economic option for young designers. This option seems all in all much more realistic than the rather boring pseudo vision of a rapid prototyping centre in every home.

Will we just live through another wave of dot.com euphoria or are we actually on the threshold of a new economic reality? I think that the time has come to find that out.

A major argument for fabrication lies in the fact that, over the coming decades, raw materials will become more expensive while the costs of CNC robotics will continue to diminish.[6] So the best way of adding value to a product will be through customization, with thorough consideration of the growing demand for sustainability: The personal touch of the customized product will enhance the pride of its owner – if such a personal relationship will prolong the life cycle of the product, we might very well have found a valid approach to fight some major problems of pollution. We hope furthermore that our neocrafts exhibition in 2008 with its demonstration site will strongly inspire young entrepreneurs to start their own business of customized design production. The success of the Swiss watch industry demonstrates that Europe still has an excellent chance in the production of high quality goods where wages are less important than innovation, communication skills, crafts tradition, and high-tech culture. Combined with the proposed forms of generative product customization, this market could evolve dramatically. Therefore, we are interested in using this cultural background as a valuable resource. At present, we are evaluating the concept of creating an up-market watch company within the politically correct context of post-industrial research – this might be rather similar to the claim of Max Havelaar.[7]

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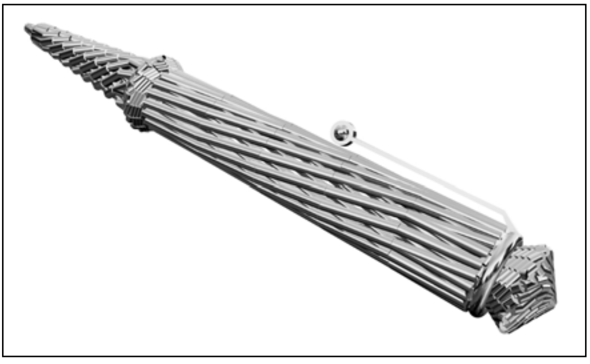
6 http://iehk.net/ is one source for highly affordable CNC machines (November 20, 2007).

7 http://www.maxhavelaar.ch/de/maxhavelaar/fairer_handel.php (November 20, 2007) »Der faire Handel fördert durch seine Tätigkeit eine nachhaltige Entwicklung. Das heisst insbesondere, dass er die soziale Gerechtigkeit, wirtschaftliche Entwicklung, den Schutz der Umwelt und den Erhalt der kulturellen Vielfalt anstrebt und zur Stärkung der lokalen Märkte beiträgt. / Fair trade promotes a sustainable development. This means in particular that it strives for social justice, economic development, environmental

We all know that there are incredible riches in our society; it might well be up to creative design to associate a new generation of seductive luxury goods with the image of responsible capitalism. This might bring some relief from the great distress occurring in the current transformation towards post-industrial conditions. To combine this strategy with the visual qualities of generated jewellery might just do it. We think that the field of jewellery design might be highly suitable for the application of generated visual and tangible expressions. The close relationship between the human body and its jewellery explains why jewellery designers are fascinated by all kinds of »natural« expression. With the help of fractals and generative design tools, the sad imitation of nature may be raised towards meditation about its rules. We are convinced that from this kind of approach unprecedented products with a unique identity will develop. Another small mill of ours with four axes is suitable for jewellery waxwork. And of course we will use our beloved laser cutter. To round this mix off, we are pleased to find inside the walls of our abbey a company specializing in laser-cutting steel with absolutely amazing machines.

Figure 2:



Picture: Mischa Schaub.

protection, preservation of cultural diversity, and that it helps to strengthen the local markets.« (Translation by Mischa Schaub)

Figure 3:

Picture: Mischa Schaub.

Through our use of such basic materials as wood, stone, and steel, we try to express our fundamental shift of focus – our design research is much less about the fascination with the magic qualities of smart materials than it is about smart shape.

Through this marriage of the crafts' experience with today's technological intelligence we hope to find answers to a number of questions. Will the generative methods with their astonishing expressive qualities help us shift away from the sad fate of the throwaway object? Will they even provide another level of intuition for interface design? Will the need to design our post-industrial realities lead us towards a »soziale Plastik/social sculpture« (speaking with Beuys[8]) and thus towards an understanding of design as a balanced fusion of overlapping realities from education, research, technology, and economics, yielding a model of sustainability?

In addition to exploring the expressive spectrum of generativity under the constraints of different materials, we put the design of a sustainable and at the same time socially and economically attractive post-industrial reality at the heart of our research. It is time for a fundamental change in the roles of academia and business. We ought to develop strategies empowering design schools to cooperate and create production and distribution opportunities for placing the work of their students in the market. We may even ask ourselves if, through such a production service, schools for industrial design might safeguard their post-industrial future. How can young designers or artists reach out efficiently towards

8 cp. the definition of »Soziale Plastik« by Joseph Beuys.

their globalized public – and why should this silly exercise of setting up a Web site be repeated over and over again individually when the impact could be so much greater through collaboration? What might be the very forms of interaction, and to what extent is the public truly interested in this interaction? What should a production infrastructure be able to achieve in order to facilitate an economic fabrication of customized products, so that such entrepreneurial attempts may be successful?

We will have to answer a lot of further questions: What should suitable forms of online exchange with customers look like? With what kind of experimental setup will we find out what our customers want – where and when do they want to guided by the designer, and what shall be the rules of this new design game? Will the designer be mainly responsible for creating clever sets of rules for creation, so that the customer may design according to such rules, safely guided along her own path of exploring beauty? Where should we draw an organic line between robotics and crafts – what should be the function of the crafts(wo)man′s finishing hand? We will need a continuous process to implement the vision behind acar2 as an economically viable system; on our shaky bridge towards the unknown, our expectable mistakes may be excused as an expression of the pragmatic–experimental and entrepreneurial attitude which defines the very best of applied academic research.

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Tactile Temptations: About Contemporary Art, Exhibitions, and Tactility

Erkki Huhtamo

The museum institution as we know it emerged in the nineteenth century as a response to the challenge of »educating the masses.« This was also a disciplinary gesture: the new urban masses had to be »tamed« so that they would not revolt and overturn the existing order. Although the museum may not seem to have had anything to do with such institutions as spectator sports or the circus, parallels can be found. Participants were kept at one remove from the action. They were positioned as spectators rather than as (co)actors. At the stadium or in a circus tent, a paying audience observed a spectacle given by professional trained performers. The museum was somewhat different. While spectator sports and the circus may have been considered pure entertainment, the museum had an educational mission. The visitors had certain possibilities of negotiating the experience – deciding their routes, speeds, and what to watch. Instead of live performances, the museum offered pre-arranged exhibits with ›cultural value‹ and ›elevating potential‹. Unlike earlier ›curiosity cabinets‹ and other proto–museums that had only been visited by members of the upper classes who knew how to behave, and were thus even allowed to physically touch the objects, the new museums did not tolerate tactility. The objects were there for the eyes only. To make sure no misunderstandings would happen, objects were placed in display cases and paintings displayed in massive frames (segregating them from ›real life‹), increasingly behind protective glass. Even lightly touching a statue, as in earlier religious practices (kissing the foot of the statue of a saint, for example), was forbidden.

Today's art museums and exhibitions also face the challenge of the »masses«. However, these masses are different, having been educated in the ›open universities‹ of global tourism, mass immigration and the omnipresent media culture. While the classical cinema and even television broadcasting still emphasize distanced and physically non–active forms of spectatorship, video game consoles, mobile phones, laptops, iPods and other ›handy‹ electronic devices have familiarized millions to the »tactile dimension«. The borderline between public and private gets blurred, so do the distinctions between behavioral modes. It is becoming increasingly difficult to decide when touching is allowed, when forbidden. Touching can be used as a deliberate »tactic« by the subject to negotiate one's relationship with the »strategies« used by the exhibiting institution, to follow Michel de Certeau's famous distinction.[1] To make things more complicated, today's art exhibition audiences are heterogeneous and multicultural. Although the world may be turning into a global village, as Marshall McLuhan famously predicted, local habits persist. And as the writings by Edward T. Hall already demonstrated in the 1950s and 1960s, behavioral differences are not easily erased, particularly when they are defined along deeply rooted cultural and ideological lines.[2] In today's world, global phenomena like the ubiquitous use of mobile phones are mixed with local customs and practices in intricate ways. The tensions this creates can be inspiring, but they can also create anxiety.

It could be argued that the art museum simply does not cope with the situation any longer without posting instructions, warnings and apologies on the walls. Too much is at stake; artworks damaged by a visitor's seemingly innocuous touch is a museum director's nightmare; being sued by an injured or insulted visitor may be even worse; scandals easily ›echo‹ in the media, damaging the institution's reputation. But is everything correct when notices begin to accumulate to such an extent that they start competing with the artworks themselves for attention? In the United States, in particular, this is often the case. At the most recent Whitney Biennial (2006) there were no interactive works on display, and numerous guards were standing in the halls »pre-empting« even the possibility of misguided behaviour. Still, the works on display had been provided with detailed explanations about their subject matter and their social, philosophical and cultural significance. One might expect these issues to be something the visitor him/herself should decipher from the

1 Michel de Certeau: »The Practice of Everyday Life«, Trans. Steven Rendall, Berkeley & Los Angeles: University of California Press, 1984, xix.

2 See, for example, Hall's »The Hidden Dimension«, Garden City, N.Y.: Doubleday, 1966.

work; of course, theoretically one can still enjoy the works without reading the descriptions. Unfortunately, many of the works on display at the Whitney Museum were so introverted or blunt that they only seemed to reveal their ›depths‹ through the metalanguage of the notices, probably written by the curators acting as ›secondary creators‹. While there was little to persuade the visitors to touch, there were many reasons for bewilderment. Bewilderment could be a source of discovery and learning as well, but it may also lead to coldness and indifference.

Slippages

Most contemporary art museums and exhibitions identify themselves as »touch–free« zones, although slippages have begun to take place. A good example of this was *Game On*, an exhibition on video games shown at London's Barbican Gallery (Barbican Centre), The Helsinki City Art Museum and elsewhere (2002–03). The majority of the exhibits consisted of commercially released video games, flanked by a few game–inspired interactive artworks, such as Thomson & Craighead's *Trigger Happy* (1999). While the youthful audience wholeheartedly enjoyed playing classic arcade games like *Space Invaders* (without having to add coins in the slot), the artworks were nearly ignored by them. Compared to the games, they probably seemed dull, over–theoretical and alien. Indeed, their main *raison d'être* in this context may have been to convince sceptics that games *do* inspire artists, they *are* culture, and that the exhibition therefore belonged in the art gallery. Exhibitions like *Game On* can be justified by the need for the art institutions to »keep abreast of times», but in an era of shrinking public support it would be naive to ignore the economic interests underlying such endeavors. Profit, and in some cases survival, has motivated prestigious institutions like the Franklin Institute in Philadelphia to move most of their priceless historical exhibits into the storage. They have been replaced by interactive hands–on exhibits that provide easy-to-digest-family-oriented entertainment in the guise of education. The way some art museums are occasionally trying to attract new visitors is not all that different.

The uncertainties about touching or not touching an artwork also arise from the ›nature' of contemporary art itself. The academic art of the nineteenth century was self–evidently »untouchable« – even raising the issue would have been absurd. The idea of aesthetic experience itself was associated with ›keeping the distance‹. Early twentieth century avant–garde art began calling for the destruction of the barrier separating

›art‹ from ›life‹. Although ›classic‹ works of the avant-garde, such as Duchamp's *Bicycle Wheel* (1913), Man Ray's *Object to Be Destroyed* (1923–32), and Meret Oppenheim's *Breakfast in Fur/Fur Teacup* (1936) only implied the act of touching, tactile art was called for by the Futurists and anticipated by dadaist and surrealist actions, as well as by the experimental exhibition designs of Frederick Kiesler and others.[3] The Happenings of the 1960s, and actions, such as Valie Export's *Tapp und Tast Kino* (1968) and *Action Pants: Genital Panic* (1969), as well as the early works of Marina Abramovic, Orlan and others, were signposts along the route toward a more tactile relationship between the visitor, the work, and in some cases the artist–performer his/herself. In contemporary exhibitions, as well, one encounters works that encourage visitors to adopt an active, physical stance. A case in point, at the Venice Biennale 2005 the Brazilian artist Rivane Neuenschwander presented at the Arsenale a piece enigmatically titled *[...],* (2004). The visitors were encouraged to type messages with old mechanical typewriters and post them on the walls. What made the work engaging was a clever little detail: the letter keys only produced dots. This led many visitors to use the machines to produce random abstract forms. Many, however, went further. To compose messages or representational images (in the style of »ascii art«) with the »prepared« typewriters, one needed planning and drafting, which often led to interaction between visitors. Some of the results were impressive and surprising. Although most of the other works were not–to–be–touched, Neuenschwander managed to communicate the tactile nature of her work without posting instructions.

This is not always the case – confusions occur, as I discovered at an exhibition called *Ecstasy: In and About Altered States* shown at the Museum of Contemporary Art (MOCA) in Los Angeles (2005–06).[4] While the exhibition contained no explicitly tactile works, it provided ample evidence about the issues raised by the desire to touch and the forces trying to control or contain it. Significantly, issues like temptation, resistance and submission were at the core of the exhibition itself, which dealt with the artists' interpretations and uses of ›altered states‹ (including drug–induced ones). Carsten Höller's *Upside–Down Mushroom Room* (2000), a brightly lit room with gigantic red fly–agaric

3 For more, see my »Twin-Touch-Test-Redux: Media Archaeological Approach to Art, Interactivity, and Tactility«, in »MediaArtHistories«, edited by Oliver Grau, Cambridge, Mass: The MIT Press, 2006, pp.71-101.

4 For a more detailed »exhibition anthropological« reading of this exhibition, see my »This is not an Interactive Piece: Freedom, Control and Confusion in an Art Gallery«, Framework. The Finnish Art Review, Issue 5 (July 06), pp.110-113.

mushrooms hanging from the ceiling, upside down and rotating slowly, is a good example. It took a real effort to ›navigate‹ through the room without, accidentally or intentionally, touching their deceptively ›real–looking‹ surfaces. This was, of course, intentional: one was supposed to be traversing a space of hallucinations and secret temptations. Ironically, ›real life‹ interfered not just by means of a notice prohibiting touching (placed at the entrance), but also in the form of a guard permanently positioned inside the installation space. Confusions are unintentionally raised by exhibition design and institutional policies. A note taped next to a 16mm EIKI projector which used to project a film by Paul Sietsema, *Untitled (Beautiful Place)* (1998): »This is not an Interactive Piece. Please do not play with the Projector.« Because the film was only shown at certain times and there was no guard permanently standing in the room, the temptation to switch on the projector or just to play with the knobs may have been irresistible for some visitors – they could not really have thought that the old projector was there to be operated by the visitor, or could they?

Works that explicitly invite the visitor to enter into a tactile relationship are still relatively rare in the mainstream of contemporary art. An Internet search for the words »tactile art« produces mostly results that refer to something specific: aesthetic experiences for the blind. There are exhibitions and even museums of tactile art, usually offering 'touchable' replicas of well-known sculptures or embossed, relief-like versions of famous paintings. The sense of touch is meant as an *Ersatz* to the missing visual channel. While it can be argued that a faithful replica of Rodin's *The Thinker* could indeed give some kind of an idea of the artwork itself (sculpture itself can be seen as potentially tactile, although this possibility is negated by institutional restrictions), tactile translations of paintings and other two–dimensional images are more problematic. A relief-like copy of Duchamp's *The Nude Descending a Staircase* may transmit some idea of its representational content to experienced hands, but other levels are lost. There are, however, artworks meant both for the visually impaired and for people with normal sight. The Japanese artist Takayuki Mitsushima, whose works were recently shown at the *Touch, Art!* exhibition at the Kawagoe Art Museum in Japan, was weak–sighted at birth and lost his sight completely by the age of ten.[5] His collages use

5 »Touch, Art!«, Kawagoe Art Museum, January 7 – March 26, 2006. I visited the exhibition on the opening day. It featured works by six Japanese contemporary artists. While some of the works were genuinely tactile (meant to be touched), touching certain works was forbidden. The exhibition thus shared the problematic relationship to touching often encountered in contemporary art exhibitions.

delicate paper cuttings to create relief–like surfaces that appeal both to blind visitors and those with normal sight. The artist also uses color, resorting to the visual memories from his childhood. Mitsushima took part in *Tactile Renga* (1998-), a collaborative networked painting project he created with media artists Toshihiro Anzai and Rieko Nakamura. As part of the project, new kind of printer and plotter technology was developed for the creation of embossed images.[6]

Tactility in Interactivity

The quest for tactile experiences in the art world ›proper‹ makes one think of interactive media art that appeared in the 1970s and has been evolving ever since.[7] An interactive artwork, often an installation based on the creative application of digital technology, *requires* the user's physical (inter)action. The work then responds in some way, and a ›conversation‹ with the user develops across an ›interface‹. This is, of course, a very rudimentary definition, a generalization that hardly accounts for the richness and variety of the artists' approaches. Although interactive artworks are occasionally shown at major art museums and international exhibitions like the Documenta and the Venice Biennale, their status as a recognized genre of contemporary art is far from being firmly established. This has to do with several factors, including persisting prejudices toward bringing high technology to the art museum. This issue has been discussed since the 1960s, often in negative terms, and never fully resolved.[8] However, in the contemporary context it may be less the resistance to technology *per se* that counts than more practical questions. Interactive art requires maintenance, expertise and funds that many museums are unable/unwilling to provide. Another issue has to do with the confusions discussed above. Including interactive artworks in exhibitions that mostly contain non-interactive and non-tactile works

6 For more information about this ambitious project, see http://www.renga.com/tactile/ (April 13, 2008).

7 For more, see my articles »Seeking Deeper Contact. Interactive Art as Metacommentary«, Convergence, Vol.1, N:o 2 (Autumn 1995), pp. 81-104 (University of Luton & John Libbey, U.K.), and »Trouble at the Interface, or the Identity Crisis of Interactive Art«, Framework: The Finnish Art Review, 2/2004, pp.38-41.

8 An interesting self-critical review of the early events is Jack Burnham's »Art and Technology: The Panacea That Failed«, Video Culture: A Critical Investigation. Ed. John Hanhardt, New York: Peregrine Smith Books, 1986, pp. 232-248.

may seem a call for trouble, potentially adding to the workload of the curatorial and surveillance personel. Concerns like these often prove futile; the work runs without ›crashing‹, and the audience knows how to behave. It is the »if factor« that bothers the institution.

Not all interactive artworks are »tactile«, at least if the concept is understood to imply a physical contact between the visitor and the work. The interaction often happens remotely (without a physical contact), via a video camera, infrared or motion sensors, etc. However, works that are actually touched may not always qualify as »tactile« either. A mouse, trackball, touch screen or some other interface device often merely has an intermediary role. Touching is not important as such; it is the outcome that matters. Still, the tactile experience of ›feeling‹ the interface can be an integral part of the significance of the work.[9] This is often the case in the interactive installations by Christa Sommerer and Laurent Mignonneau. In their early *Interactive Plant Growing* (1992) the user caresses actual living plants. The data produced by this encounter triggers digital growth processes; a constantly transforming virtual garden appears on the screen. The interplay of nature and culture, the biological and the digital, is at the heart of the work, and materialized at the user's fingertips. Similarly, feeling the water in a pool seemingly inhabited by evolving creatures is central to *A–Volve* (1994). More recently, *NanoScape* (2002) uses powerful magnetic forces to ›tactilize' invisible nano–level phenomena. The user wears a ring–like device; by moving one's hand above a special table one feels the forces without actually touching the surface. *Mobile Feelings* (2001–) explores wireless communication between two participants by using Bluetooth–technology and advanced micro–sensors. Wireless pulsating objects held in the hand allow the users feel each other's heartbeats. While the first versions were hidden inside actual pumpkins (an organic interface evoking the plants in

9 Two very different examples: in Bernie Lubell's *Cheek to Cheek* (1999) the interactor sits on a specially built wobbly wooden stool; the gyrations of one's bottom part are transmitted through pneumatic tubes to one's cheeks, leading to an uncanny »autoerotic« experience. Lubell's amazing installations show that it is possible to create interactive art without resorting to any digital technology (see http://blubell.home.att.net/ text.htm, November 13, 2007). Volker Morawe's and Tilman Reiff's *Painstation* (2001-) is a kind of arcade game machine for two players that punishes them by whipping their hands. A more advanced version is under development. Being fully playable the work raises interesting questions about the borderline between media art and gaming (see www.painstation.de, November 13, 2007).

Interactive Plant Growing), the later egg-–shaped objects evoked more directly the human heart.[10]

Mobile Feelings raises the issue of tactility over a distance, an idea that has been explored in very different ways in projects like Kit Galloway's and Sherrie Rabinowitz's telematic art workshops (1980s), Paul Sermon's *Telematic Dreaming* (1992), Stahl Stenslie's and Kirk Woolford's *CyberSM* (1993) and the MIT Media Lab's Tangible Media Group's *inTouch* (1997-98). Works like these raise interesting questions concerning the definition and range of tactility as well as the modalities of the sensory experience in general. How does physical touching differ from »telematic» remote touching? Is a physical interface – such as the pumpkin–objects in *Mobile Feelings* or the synchronized wooden ›massage rollers‹ in *inTouch* – always needed to transmit a tactile sensation? Does tactile art aim at the ›purification‹ and segmentation of the sensorium by separating touch from the other sensory channels, or, rather, to their synthetic integration? Can a tactile work also serve the interchangeability of the senses, or the simulation of other senses? In other words, can visual or auditive cues represent the sense of touch, and *vice versa*? Answering these complicated questions falls outside the scope of this article. That telematic communication indeed can transmit and represent tactile sensations has been claimed by media pioneers like Marshall McLuhan (for him, the 'touch' of electricity was the clue) and Roy Ascott, whose volume of collected writings even bears a metaphorical tactile title, *Telematic Embrace*.[11]

The Consequences of Erasure

Will tactile art conquer and transform the art world, like daily communication with tactile interfaces is conquering the increasingly mediated world at large? There are reasons to be sceptical. Art museums

10 The idea behind *Mobile Feelings* can also be read as a topos going back all the way to early the seventeenth century proposals for intimate (wireless!) distant communication by means of magnetism. Interestingly, the interface object itself reminds one of Constantin Brancusi's *Sculpture for the Blind* (Philadelphia Museum of Art). Another work that measures the visitor heartbeat is Rafael Lozano-Hemmer's *Pulse Room*, shown at the Mexican Pavillion, Venice Biennale 2007. The visitor holds handles for a moment, after which his pulse is transferred to a network of electric lightbulbs hanging from the ceiling.

11 Ascott, Roy (2003): »Telematic Embrace«, Ed. Edward A. Shanken, Berkeley: California University Press.

are profoundly conservative institutions, mainly because of their multiple dependencies on wealthy sponsors and trustees, the commercial art market, the civic authorities and the mainstream values of the bourgeois society. Although they take occasional risks, these never go beyond pre-calculated boundaries, except by accident (public apologies provided). Tactile art does not fit easily into a system, where artworks are evaluated by their monetary value (defined by auction houses and collectors), their longevity and their ›untouchability‹. Tactility necessarily implies an intervention by a ›dirty‹ hand, a potential disseminator of viral agents. The art institution must be instantly ready to spray desinfectant to neutralize the potential harm it does. Of course, tactile and interactive works will certainly be seen in the museums and exhibitions from time to time, but within strictly defined confines, as tokens of the »progressiveness« of the institution. The future of the mainstream art world will, however, belong to works that are observed from a distance, secured by guards and beeping signals. In this sense, all the manifestoes of the avant-garde about removing the barrier separating art and life seem to have had little effect.

But of course, there are other, alternative venues for displaying non-conformist art, including the Internet. Networking will potentially enhance its visibility; a ›niche‹ is no longer what it used to be. Of course, one might also ask, whether maintaining the integrity of the notion of Art as something separate from design and popular culture makes sense anymore. Japanese media artists, device artists and neo-pop artists have already drawn this conclusion. It was easy, because the Japanese never had a clear distinction between »art« and »applied art« in the first place. The numerous museum exhibitions of Impressionism and other Westernisms one can experience in Japan are based on imported, not indigeneous, aesthetic values. It may not be a coincidence that interactive art has become very popular among Japanese young artists. Their clever and imaginative creations often recall games and gaming, but with a difference. Exchanging and merging influences is extremely important, but perhaps it would not be wise to efface the difference altogether. This is why one of the most visible and popular exhibitions of interactive art so far, the *Play Zone* which was part of the Millenium Done, London (2000), may have done the genre a disservice. The artworks were arranged side by side as essentially an alternative game arcade, which was reflected in the comments. According to one, »the Play Zone has a variety of family oriented games that delight most children.«[12] The

12 Tom Buerkle, »After All the Hype, It's a Disappointment: A Peek at the Millenium Done,« *International Herald Tribune*, January 28, 2000 (online at www.iht.com/articles/2000/01/28/trdome.t.php, November 18, 2007).

interactive artworks by noted artists like Toshio Iwai and Paul Sermon had been stripped off any claims for being art and were simply defined as games, family fun.[13] As this is the case, it is not surprising that such works have been seen in mainstream art museums only sporadically and have had little or no impact on the art market. Should we regret – or rejoice?

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Huhtamo, Erkki (2004): »Trouble at the Interface, or the Identity Crisis of Interactive Art«, Framework: The Finnish Art Review, 2/2004, pp.38–41.

Huhtamo, Erkki (2006): »'This is not an Interactive Piece': Freedom, Control and Confusion in an Art Gallery«, Framework. The Finnish Art Review, Issue 5 (July 2006), pp.110–113.

According to the website of a company called Electrosonic, the Play Zone has »fifteen separate interactive games, several of them making use of Electrosonic ESLINX show control equipment«. (online at http://www.electrosonic.com/view_profile.asp?id=178, Nov. 18, 2007).

The demo-DVD »Projects« by Land Design (2003), the company that designed the Play Zone, does not even mention the names of the artists in the Play Zone demonstration, giving the impression that the works by the artists were designed by Land Design itself.

Huhtamo, Erkki (2006): »Twin–Touch–Test–Redux: Media Archaeological Approach to Art, Interactivity, and Tactility«, in »Media ArtHistories«, edited by Oliver Grau, Cambridge, Mass: The MIT Press, pp.71–101.

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»NOT JUST ART« – FROM MEDIA ART TO ARTWARE

CHRISTIANE PAUL

Software always has to be seen as cultural construct, and the creation of artware addresses this construct from various angles, including the enhancement or re–engineering of existing software products; the creation of alternative, community–driven platforms of exchange; and the examination of agency, autonomy, or political agendas in software.

Obviously, artists today are working with different technologies than they did 30 or 40 years ago, but one still has to ask the question, is there anything that fundamentally distinguishes today's endeavors to reconfigure media and establish new cultural systems of exchange from previous ones? I would argue that a fundamental difference lies in the nature and specifics of the technology itself. Previous media, such as radio, video or television mostly relied on a technological superstructure of production, transmission, and reception that was relatively defined. The modularity and variability of the digital medium however constitutes a far broader and more scattered landscape of production and distribution. Not only is there a plethora of softwares, each responsible for different tasks (such as image manipulation, 3D modeling, Web browsing etc.) but also due to the modularity of the medium, these softwares can also potentially be manipulated or expanded. As a result, there are several potential points of intervention for artistic practice. As Saul Albert's diagram (Figure 1) shows, intervention could take place between software and media producers or producers and consumers. In the following, I will discuss some examples of artware or artistic tools that intervene at different points.

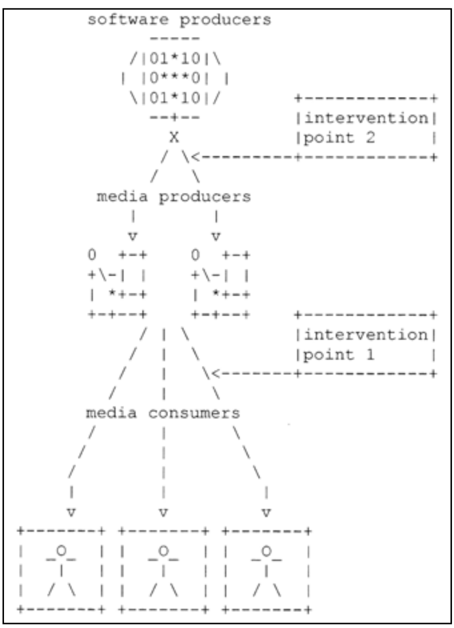
Browser and Search Engine Reconfigurations

Over the past decade, numerous art projects have either intervened with existing browsers and search engines or created applications that expanded these tools' functionalities.

The British group *I/O/D* single-handedly established browser art as artistic practice with their *WebStalker*[1], an application that allows users to draw ›frames‹ in a blank window and select information they would like to display in them – for example, a graphical map of the site that presents all its individual pages and the links between them; the text from an URL and the source code of the HTML page; a ›stash‹ of URLs users would like to save. Although the *WebStalker* did not display graphics, it expanded the functionality of existing browsers in a way that questions the paradigms of the conventional information display and Internet ›architecture‹.

In his essay »A Means of Mutation«[2], Matthew Fuller described the *Web Stalker* as »not just art« - a form of cultural practice that could have an impact outside of the relatively narrow confines of the art world or even sustain itself (although the latter did not quite happen).

Figure 1: Diagram from Saul Albert, »Useless Utilities« in Auto–Illustrator Users Guide.



Signwave: London, UK, 2002.

1 I/O/D: »WebStalker«, http://bak.spc.org/iod/ (March 20, 2008).

2 Fuller, Matthew (1998): »A Means of Mutation« (March 1998), http://bak.spc.org/iod/mutation.html (March 20, 2008).

While the *WebStalker* engages notions of the browser as culturally coded construct, one also shouldn't neglect its distinct aesthetics and their art–historical references. In his essay »Visceral Facades: taking Matta–Clark's crowbar to software«[3], Matthew Fuller establishes a connection between the *WebStalker's* approach to information architecture and American artist Gordon Matta-Clark's technique of literally »splitting« the existing architecture of buildings, an application of formal procedures that would result in a revelation of structural properties. Matta-Clark's as well as the *WebStalker's* »deconstructionism« and »anarchitecture« are as much statements against certain social conditions as they are aesthetic acts oscillating between reconstructions of the destroyed and destructions of closure.

While different in its approach, Maciej Wisniewski's *netomat*™[4] (Figure 2) – a meta–browser abandoning the page format of traditional browsers and treating the Internet as one large database of files that can be searched by typing in keywords or questions – would fall in the same category of alternative browsers. Using an audio-visual language designed specifically to explore the unexplored Internet, *netomat*™ reveals how the ever-expanding network interprets and reinterprets cultural concepts and themes and takes visitors for a ride into the Internet's »subconscious.» *Netomat*™ ultimately came closer to the concept of »not just art« since it now exists as a company (*Netomat Inc*.) that turned the original Web browser's underlying software and technology into a product and alternative model for communicating online.

Browser art has become a broad field of artistic exploration that has produced many well-known interventions, among them Jodi's *Wrongbrowser*, Nullpointer's *Web Tracer* or Mark Napier's *Shredder and Riot*[5], all of which address specifics of the browser in very different ways (from aesthetic to political). An example of the expansion of browser functionalities would be Martin Wattenberg's and Marek Walczak's *Wonderwalker*[6], a project commissioned by the Walker Art Center and

3 Fuller, Matthew: »Visceral Facades: taking Matta-Clark's crowbar to software«, http://bak.spc.org/iod/Visceral.html (March 20, 2008).

4 Wisniewski, Maciej: »netomat™«, http://www.netomat.net (March 20, 2008).

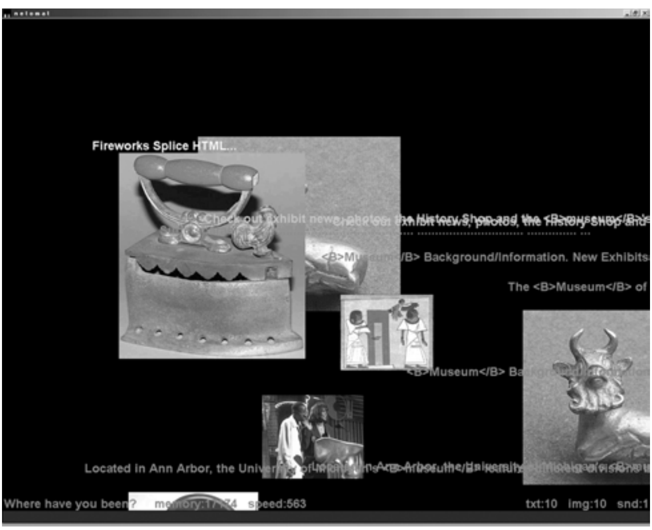
5 Jodi: »Wrongbrowser«, http://www.wrong-browser.org (March 20, 2008), Nullpointer: »Web Tracer«, http://www.nullpointer.co.uk/-/webtracer2.htm (March 20, 2008). Napier, Marc: »Shredder«, www.potatoland.org/shredder/ (March 20, 08). Riot, http://www.potatoland.org/riot/ (March 20, 2008).

6 Wattenberg, Martin and Walczak, Marek: »Wonderwalker«, http://wonderwalker.walkerart.org (March 20, 2008).

alluding to the Wunderkammer or cabinet of curiosities. (Figure 3) The *Wonderwalker* allows users to create a shared, public map of favorite sites and thus turns the Web browser's bookmark function into a participatory space for exchanging sites of interest.

The area of search engine reconfigurations has been equally prolific and has produced a wide array of projects. Andy Deck's *Culture Map*[7] [Figure 4], for example, gives its users a comparative view of the contents of the Web according to certain topics. The project allows users to choose from up to 32 categories (such as News, Shopping, Economy, Arts) and then uses data from different search engines to determine the ›scale‹ of the topics according to the predominance of the term in Web pages. The resulting visualization assigns a colored region to each of topic, its size varying according to the occurrence of the term. Culture Map – a piece of »meta-cartographic information art«, as Deck calls it – critically examines how people find information through the categorical entry points and key themes of search engines and throws light on the bias of the engines themselves.

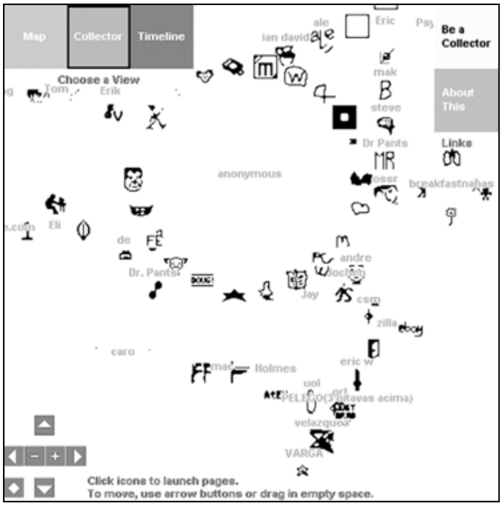
Figure 2: Maciej Wisniewski's netomat™.



Screenshot.

7 Deck, Andy: »Culture Map«, http://artcontext.org/cultmap/index.php (March 20, 2008).

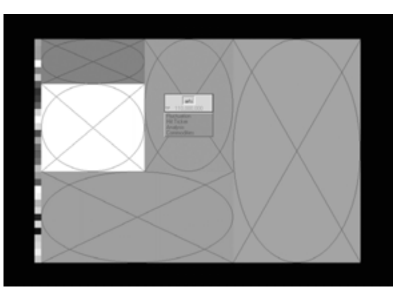
Figure 3: Martin Wattenberg's and Marek Walczak's Wonderwalker.



Screenshot.

TraceNoizer offers a search engine intervention that focuses on privacy rather than data analysis. *TraceNoizer* is a project by LAN, a varying group of students, media workers, artists and designers. Billing itself as »Disinformation on Demand«, the project addresses issues surrounding the »databody« – the accumulated traces of information that people leave on the Web through their homepages, institutional affiliation, participation in conferences etc. While some people consider their databody a useful necessity that provides them with exposure (for example regarding their research and publications), others regard it as an unwelcome nuisance that makes them vulnerable to intrusion by marketers etc.

Figure 4: Andy Deck's Culture Map.



Screenshot.

TraceNoizer is a tool that uses disinformation as a strategy for data protection. The project finds data related to a person's name and / or e–mail address (for example, information connected to people with a similar name and address) and clones it into a number of homepages in a fully automated process. These homepages are then automatically up–loaded to servers that provide free web space and thus become accessible through search engines and other Web surfers. The result is a multitude of data clones for one person that makes it impossible to arrive at valid information about the individual in question. As a combined search, analysis, and publication tool, *TraceNoizer* misleads through a process of open cloning.

Media Production Tools

Apart from artistic expansions of the software utilities that are used by Internet »media consumers« on a daily basis (Web browsers, search engines), there also is a large body of artistic tools that establishes a framework for the production of media content. Some of these works explicitly allude to or transform the standards of commercial software for drawing or image manipulation. Andy Deck's *Open Studio*, for example, a multi–user online »drawing board«, offers its user a palette of options for »spray–painting« with their mouse. What most radically distinguishes this application from any of its commercial counterparts is the ability to draw together with multiple people in remote locations in real–time. In most cases, the focus of users shifts from the creation of their respective painting to »responding« to the other people simultaneously occupying the space. The experience becomes closer to a live, graphic jam and constitutes a break with the usual context of computer drawing applications.

One of the most well known artistic graphic design applications remains Adrian Ward's *Signwave Auto–Illustrator 1.1*[8], developed on the basis of his earlier project *Autoshop 1.0*.[9] Both applications obviously allude to and parody *Adobe™ Photoshop™* and *Illustrator™*, respectively. *Auto–Illustrator* is an explicit statement about the conventions and standardization of commercial graphic design applications and at the same time explores the beauty and elegance of generative graphic design. As opposed to most other artistic tools, *Auto–Illustrator*

8 Ward, Adrian: »Signwave Auto-Illustrator«, http://www.auto-illustrator.com (March 20, 2008), an upgrade to 1.2 was made available in 2003.

9 Ward, Adrian: http://www.signwave.co.uk (March 20, 2008).

deliberately follows a commercial model, being sold as a software package with a limited edition user license – a fact that both highlights its validity as a tool and suggests an alternative model for selling art.

Using an industry standard–interface, *Auto–Illustrator* uses a familiar tool palette – including a pencil, brush, oval, rectangle, and text tools – but extends the regular options by offering sliders that can automatically create a rectangle in a shabby or precise childish or adult design, for example. The filters allow users to generate 1970s boxes or architectures; parody sportswear logos; or insert instant Murakami eyes (with the »SuckMyPixel« filter). Using the »Bug« tool, one can place bugs (with modifiable behaviors) into the document that will crawl around, drawing lines behind them. (Figure 5) In an ironic way, *Auto–Illustrator* »illustrates« the limits of commercial design applications by frustrating the expectations one might have of them and thus highlighting the standardized operations on which they are based.

While automating creativity in a generative process, *Auto–Illustrator* explores the interrelationship and agency of the author / user / software at any given point. As Ward explains, the Artificial Intelligence routines (previously employed in *Autoshop*) »randomly« seed incoming data but then filter this data based on rules of logic established by the author. While the computer uses random data to determine certain factors, these come into play only when they produce suitable results.

Since the role randomness plays in software projects is often overrated and misrepresented, it is important to note that – as Ward puts it – »a computer can only move data about. It cannot – under any circumstances – generate a truly random number by itself.«[10] For Ward, a system's ability to feed data back into itself – thereby becoming chaotic, complex, and dynamical – is comparable to the unpredictability of creativeness itself.[11] In works such as *Auto–Illustrator*, the concept of »feedback« becomes a complex interplay between the author, user, and software. The agency of the code may be considerable but it is certainly not the only party »speaking«.

Ward states »While some consider technology totalitarian, others forge ahead by expressing their creativity as technological tools, treating technology not as a system of control, but a system of growth.«[12] Without neglecting the amount of control that technology in general can exert, programming certainly offers unprecedented possibilities for shaping

10 Ward, Adrian (2002): »How I Drew One of my Pictures« in Auto-Illustrator Users Guide. London: Signwave, pp. 72-73.

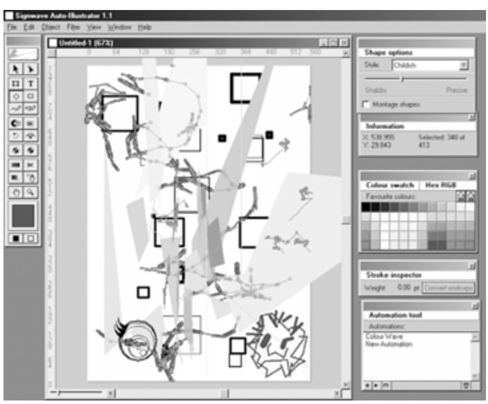
11 Ibid. p. 73.

12 Ward, Adrian (2002): »4x4: Life and Oblivion: Generative Design in Auto-Illustrator Users Guide«, London: Signwave, p. 96.

technology. Code is not only an artistic »medium« comparable to paint or clay; it also allows artists to write their own paintbrushes and chisels.

A considerable body of »media production tools« has been developed within the field of music, DJing and Vjing and often takes the form of interactive sound processors (for example, Netochka Nezvanova's *b1257+1221* or musical »instruments«, such as John Klima's software *glasbead*).[13] Informed by multi–user environments, gaming, and file sharing, *glasbead* is a multi–user collaborative musical interface and instrument that allows players to import and share sound files and create a myriad of soundscapes. The interface consists of a rotating, circular structure with stems that resemble hammers and bells. Sound files can be imported into the bells and are triggered by flinging the hammers into the bells. [Figure 6] While *glasbead* creates a contained world where sounds and visuals enhance each other, it allows up to 20 players to remotely »jam« with each other. The project was inspired by Hermann Hesse's novel *Das Glasperlenspiel* (The Glassbead Game, published in English under the title Magister Ludi), which applies the geometries of music to the construction of synesthetic microworlds.

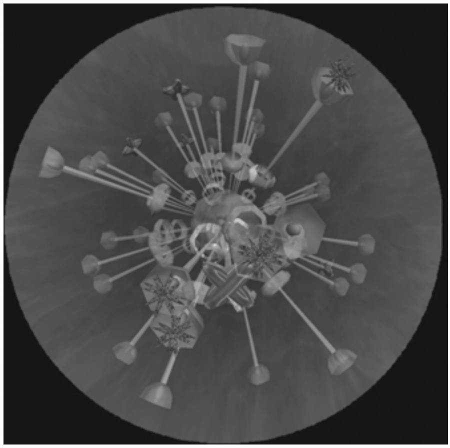
Figure 5: Adrian Ward, Signwave Auto–Illustrator 1.1. Screenshot: Generated architecture (green) and 1970s boxes; instant Murakami eye (bottom left); shabby childish oval (bottom right); red bugs.



Screenshot.

13 http://en.wikipedia.org/wiki/Netochka_Nezvanova (March 20, 2008). http://framework.v2.nl/archive/archive/node/actor/default.xslt/nodenr6625 (March 20, 2008). Klima, John (1999/2000): »glasbead«, www.city-arts.com/glasbead/ (March 20, 2008).

Figure 6: John Klima, glasbead.



Screenshot.

A wide area of artware consists of »social software« – tools that are aimed at providing platforms for community-based exchanges and publishing. An example of this type of project would be *Nine(9*) by the British collaborative Mongrel. *Nine(9*) is a continuation of Mongrel's project *Linke*r and was created by Mongrel member Harwood while he was artist-in-residence at the WaagSociety Amsterdam. The project is an open-source software structure that allows individuals and communities to »map« their experiences and »social geographies«. *Nine(9)* consists of a server–based application that can incorporate 9 groups x 9 archives x 9 maps = 729 collective knowledge maps. An important part of the project as »social software« is an ongoing dialogue between users and programmers in order to transcend standardized social relations. In a very different way and context, both *Nine(9)* and *Auto–Illustrator* play with limitations – in structure or functionality, respectively – to test and explore possibilities of software.

Other projects, such as *Liken* by criticalartware (core developers Ben Syverson, Jon Cates, Jon Satrom and Blithe Riley) investigate community-driven interfaces for social software.[14] *Liken* is a Web interface (with various different manifestations) to criticalartware's database of shared resources that present themselves as self-connecting nodes to which users can contribute. The pathways connecting the nodes change on the basis of usage, with more »traveled« paths growing stronger and paths attracting less interest fading away. Criticalartware's approach is

14 Criticalartware: »Liken«, http://www.criticalartware.net (March 20, 2008).

that of hybridization, a self-reflexive crossbreeding of interfaces and connected threads that becomes a social document in itself.

An excellent portal for exploring free software tools for collaborative networking and media production is the DIVE CD–ROM, which was created by <KOP> (Kingdom of Piracy) and commissioned by the VirtualCentre–Media.Net and FACT, UK. The CD–ROM includes projects such as Mongrel's *Nine(9),* Radioqualia's *Frequency Cloc*k, and *LAST.FM*, a peer–to–peer network for streaming customized selections of music.[15]

The »re-mediation« unfolding in the above–-mentioned projects takes the form of models for mediated exchange that transcend simplistic receiver / transmitter structures. These models explore inherent possibilities of media systems and offer alternatives outside of the media industry. The new »art media« may not radically redefine connections between art and media but they certainly have opened the field of artistic engagement and agency. Whether alternative media systems and artware projects will have a mass appeal and profound impact on existing structures remains debatable. While they are mostly community–driven, they certainly can make use of a distribution system of unprecedented scale, and there is no doubt that art projects have been noticed by the industry. The rise of Linux (a topic in itself) is an indication that open–source systems can offer alternatives that are taken seriously and implemented on a larger scale. Even if the impact of artistic media reconfigurations remains limited, they are a much needed »reality check« – a critical examination of today's media and proposal for alternatives.

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Opus Ludens – Towards an Aesthetics of Interactivity

Katja Kwastek

›Water‹ by Stefan Schemat

The project entitled *Water* by Stefan Schemat (2004) was created for Cuxhaven, a coastal town in the north of Germany. The visitor is provided with a daypack (inside a Notebook attached to a GPS-device and headphones) and asked to walk along the beach and the adjacent areas, an abandoned harbor, the boardwalk. (Figure 1) The GPS-device transmits its actual position to the computer, which activates sound files according to the position. Depending on the directions, movements and endurance of the visitor, the voices of different narrators create a story, even if not a linear one, it is rather a network of situations, memories and actions surrounding a woman that disappeared. The visitor gets involved, is addressed as a blind detective, who is asked to seek her. Sometimes the voices accost him or her directly, like »Come on, move« or »as a blind detective, you should have brought a photo of her«. Sometimes, they seem to go back into personal memories (»But why did you run away?«). At other places, they present scientific or philosophic statements about the weather or underwater phenomena. Often they then pass into thoughts about transformations or metamorphoses like »As a shell, I am blind and deaf«.

The voices may personate distanced observers, protagonists of the scene, or even compete with each other (»Don't trust them«). The story oscillates between fact and fiction, dream and reality, present and past. At the same time the voices are tied closely to the landscape, talking about the sand and the shells the visitor encounters, about the weather at the seaside. And they talk about events that have happened, or are happening, at the visitor's location. The site thus becomes the setting of the plot, provides the images for the text. The visitor has the impression of walking within a film, being actor and audience at the same time.

Figure 1: site of 'Water' by Stefan Schemat (2004).

Photo: Cuxhavener Kunstverein

Analyzing Interaction

This essay explores the aesthetics of interactive artworks. Due to the limited space, it confines itself to a double case study: Schemat's project is taken as exemplary object of investigation; and an exemplary model for analyzing processes is used to investigate its aesthetic characteristics. The underlying assumption is that – given the huge variety of interactive artworks – every single work deserves close interrogation concerning its aesthetic strategies, and accordingly various methods of process-oriented analysis have to be consulted to investigate the aesthetics of interaction.

In Schemat's case, the work could be identified as (immaterial) software, ›filled‹ with sound files, related to GPS-data. But there is also a materiality, a spatial dimension, which is determined by geographic coordinates. They link the data to a definite piece of land, which becomes part of the work, in a physical sense. But the visitor can not explore the work by simply looking at it, as one would do with a painting, which has a materiality, even in absence of any beholder. Schemat's work is also permanently existent in terms of data and landscape, but it shapes only occasionally: through the action of the visitor. His or her movement creates the spatial and temporal composition of the piece, determines the order and speed in which text and landscape interweave to become the work. The visitor becomes the physical and mental center of the work, even if its fictional center, the missing woman, remains hidden.

Of course the art historian, trained in the analysis of composition, can investigate the arrangement of the texts in relation to each other and to the landscape: There are centers featuring an agglomeration and superposition of texts; contrasts like short, irritating statements; and calmer zones with less information provided. There are positions where the text refers directly to the site, and others where it associates more freely. These compositional effects are an important element of the piece, concerning the aesthetics of representation. But the artist did not create a static environment, he wants us to move, to explore it, not only intellectually, but physically, he wants to provide us with an embodied experience.

Aesthetic experience through viewer participation has been propagated and practiced by artists since the 1960s. The humanities have formulated the respective theories, naming them ›reception aesthetics‹, ›process aesthetics‹, ›responsive aesthetics‹ or simply calling the works ›open works‹ as Umberto Eco did. Nevertheless, attempts to actually describe these processes within an aesthetic analysis of individual artistic projects are still rare.

Enacting Aesthetic Distance?

Traditionally, aesthetic distance is considered to be a fundamental condition of aesthetic experience. Hans Robert Jauß, one of the pioneers of reader.response criticism, puts it as follows: »Aesthetic pleasure differs from simple sensuous pleasure by means of differentiation between the ego and the object, or the aesthetic distance.«[1] As soon as the visitor is not only expected to visually perceive a representational piece, but to actively realize an interactive artwork, the question of aesthetic distance becomes critical. The embodied action of the participant is mandatory for the realization of the piece and the artistic concept. By means of its realization the piece wants to be explored and reflected at the same time. Moreover, in Schemat's work the participant has to move within an environment that is not denoted as an art venue – and this is of utmost importance for the piece: The passer-by will not be able to distinguish the participants from ordinary flaneurs. The participant himself, though, will soon realize his double role as flaneur, immersed within the leisure–activities on the beach, and as participant of an artwork that demands reflection. It is the ambivalence between reflection and immersion that dominates his experience.

1 Jauß, Hans Robert (1991): »Ästhetische Erfahrung und literarische Hermeneutik«. Frankfurt: Suhrkamp, p. 83.

As this ambivalence is also an important feature of contemporary performance and theatre, it has recently been subject to various investigations.[2] In contrast to performance and theatre, interactive art does not depend on the presence of the artist. Therefore this essay suggests the comparison of interactive artworks with another form of aesthetic experience: gameplay.

Interactive Art and Gameplay

The game also does not call for the co-presence of producer and participant, it seeks contemplation within action and shares the ambi-valence between real action and the aesthetically motivated immersion in an illusory world.

The comparison of play and aesthetic experience is not new, neither is the comparison of game and art.[3] But it is the merit of Hans Scheuerl to have established a theory of play[4], which focuses neither on the production process nor on the reception process of games as autonomous phenomena, but on the action of gameplay itself. He compares it to the artwork equally being the mediator between production and reception processes. He parallels the game to the work of art, as both »follow the same structural laws in the formal reciprocity between form and development«.[5] This corresponds to the philosophical aesthetics of Hans Georg Gadamer, who draws on the notion of play to examine aesthetic experience. For him, play is the mode of being of the work of art. Also for him, the game is not characterized by the player as subject, but by the

2 Cp. Fischer-Lichte, Erika (2004): »Ästhetik des Performativen«. Frankfurt: Suhrkamp; Frasca, Gonzalo (2004): »Videogames of the Oppressed: Critcal Thinking, Education, Tolerance, and Other Trivial Issues«. In: Noah Wardrip-Fruin and Pat Harrigan (Eds.): First Person. New Media as Story, Performance, and Game, Cambridge, MA: MIT Press, pp. 85-94.

3 See a more detailed account of this relation in an earlier German essay on these topics by the author: Kwastek, Katja (2005): »Opus ludens. Überlegungen zur Ästhetik der interaktiven Kunst«. In: Lars Blunck (ed.): Werke im Wandel? Zeitgenössische Kunst zwischen Werk und Wirkung, Munich: Schreiber, pp. 155-171.

4 Scheuerl, Hans (1965): »Das Spiel: Untersuchungen über sein Wesen, seine pädagogischen Möglichkeiten und Grenzen« [1954]. 5. ed. Weinheim et. al.: Beltz. The German language does not distinguish between ›play‹ and ›game‹, both subsumed under the term ›Spiel‹. Concerning Scheuerl, the term ›gameplay‹ seems to be the adequate translation in most cases.

5 Ibid. p. 104.

play itself, the to and fro: »In the analysis of aesthetic consciousness I pointed out, that the idea of a vis–à–vis of aesthetic consciousness and an object does not meet the situation. This is the reason, why the notion of the game is so important to me.«[6] The analogies of art and gameplay become even more obvious concerning interactive art. In the following, the validity of Scheuerl's characteristics of gameplay for an analysis of interactive artworks will be investigated.[7]

To begin, Scheuerl identifies *freedom* as the basic condition of gameplay. It does not have any goal beyond itself and is not predictable. Being purposeless is not so much a characteristic of an action itself, but of its contextualization. An action is understood as play, an idea or composition is realized within the artistic context. Only by means of this self–definition, they come into being as such. The feature of freedom thereby is sine qua non and for the game and for (modern) art. It is this autonomy that usually suggests an aesthetically motivated reception.

The concept of unpredictability is particularly valid concerning interactive arts. Whereas traditional works of art leave only the cognitive process of reception to the beholder, an interactive artwork has an ever-varying structure, concerning each realization of the piece. The piece itself is not predictable.

Scheuerl's second characteristic of gameplay is *inner infinitude*. He thereby indicates that of course a game can be ended, but it has no predetermined result. The interactive artwork also always wants to be experienced again notwithstanding if this realization is headed towards a solution or not. Just inasmuch as one can decode some paintings or allegories to a certain degree, there are games and interactive artworks that imply a goal or solution, whereas others encourage free exploration. Nevertheless none of the works allow for an ›exhaustive perception‹, which would lead to an expiry of the motivation of the visitor.

6 Gadamer, Hans-Georg (1965): »Wahrheit und Methode«. Tübingen: Mohr, p. 97.

7 Scheuerl (1965). The actuality of these criteria is revealed a. o. in Hohlfeldt, Marion (1999): »Grenzwechsel: Das Verhältnis von Kunst und Spiel im Hinblick auf den veränderten Kunstbegriff in der zweiten Hälfte des zwanzigsten Jahrhunderts mit einer Fallstudie : Groupe de Recherche d'Art Visuel«. Weimar: VDG; or Sutton-Smith, Brian (1997): »The Ambiguity of Play«. Cambridge, MA and London: Harvard University Press. See also the recent publication of Katie Salen and Eric Zimmerman (2004): »Rules of Play. Game Design Fundamentals«, Cambridge: MIT Press, that offers an excellent and exhaustive overview of the field, though concentrating on games rather than play.

The next feature is the *closeness* of a game. Scheuerl hereby refers to the rules of the game and its playing field. The space occupied by a game does often not differ physically from our everyday environment. Rather, it obtains new meaning through rules set up by the inventor and players. The boundaries of a game are defined by the game-action itself. The borders of a traditional work of visual art are defined on a material basis, through framing, material unity or spatial delineation. The spatial extension of interactive artworks, though, is often not immediately evident or can not be distinguished from our everyday environment. Instead, the space it occupies obtains new layers of meaning by the superimposed flow of data and its reception or activation by the participant. As in games, the rules of interaction define the radius of action effective for the piece. This can be done materially, by means of a seat assigned to the participant, or by means of the radius of a mouse or joystick-cable. But often, it is defined by invisible components, like a motion-sensitive field, the coverage of a transmitter or – as in Schemat's case – the arrangement of GPS points. But the importance of rules for the closeness of the game is not limited to the spatial design of the interaction. Rules also define the conceptual framework, the possible actions of the visitor, to which he may relate, but which he may also try to ignore or trespass.

This leads directly to the next characteristic: the feature of *ambivalence*. Scheuerl uses the notion of ambivalence to refer to real movement, but also to movement in the figurative sense, between rule and chance, seriousness and amusement, nature and intellect.

As stated above, in interactive arts, due to the fusion of the piece and the participant, the latter wavers between identification with the action demanded by the artist and self-reflection, or ›reflection of his action‹. Though the wavering between identification and reflection is principally also possible concerning traditional works of art, it becomes observable only within interactive and participatory art forms, as it manifests itself by means of bodily actions, from mouse-clicks to extensive spatial movements. Furthermore the participants of interactive artworks are often observed by other visitors, thereby becoming exemplary participants. Being conscious of this, they will start to observe themselves.

A look at Grahame Weinbren's interactive installations may help to clarify this point: In his installations, the visitor can manipulate sequences of sound and film by means of a touch screen or a motion sensitive projection. The installation setup, though, does not only offer a determined seat for the participant who realizes the piece, but also provides a place for those who observe the interaction as audience. (Figure 2) Thus the different modes of perception are physically staged.

The setup already shows that the interaction is part of the work, but should also be reflected upon.[8] The ambivalence between immersion and reflection is one of the key features of the aesthetic experience within the interactive arts, regardless if it includes the observation of and by other visitors or the self-reflection of one participant.

The next feature identified by Scheuerl is *virtuality*. It characterizes gameplay as not being part of real life. In the arts virtuality qualifies a pictorial representation as different from its subject. In interactive art, both characteristics – not being part of real life and representing something – intermingle. The participant performs an action that differs from everyday activities (even if it takes place within an everyday-environment) and he becomes actor and audience at the same time.Virtuality allows for different modes of perception: The illusionistic effect of a piece can be so strong, that the beholder does not recognize it as such, takes the representation for real. Even if some forms of digital art may aim for such effects, the idea of perfect illusion can be realized only as a momentary effect that is soon revealed, and is therefore mainly a topic of art theory. More likely the viewers will realize the illusionary quality of the artwork, they will enjoy it, without reflecting on it too much. This mode of perception is very frequent within the history of the arts and can be applied to interactive artworks, too: The participant explores the creatively designed technical environment and follows the invitation to interact, without reflecting on its virtuality. But the perception of art does not necessarily stop at this level.

A large number of – historical and contemporary – artworks explicitly invite the audience to reflect upon their virtuality and mediated quality.[9] It is this level of reflection that separates art from gameplay. It is exactly the relation of virtuality and ambivalence, understood as mode of representation and its reflection, that is the key concerning the analysis of the aesthetic experience. Even if Scheuerl, by introducing the term of ambivalence, also detects a certain degree of reflexivity within gameplay, this is mainly an oscillation between the first and second level of perception (e. g. the realization or disregard of the illusionary quality of play), but not a reflection on the gameplay per se. Many interactive artworks explicitly seek a reflective attitude of the participant.

8 cp. Dinkla, Söke (1997): »Pioniere interaktiver Kunst«, Ostfildern: Cantz, pp. 199-200.

9 cp. a. o. Stoichita, Victor (1998): »Das selbstbewusste Bild : Vom Ursprung der Metamalerei«, Munich: Fink; Franz, Erich (1992): Die zweite Revolution der Moderne. In: exh-cat. »Das offene Bild: Aspekte der Moderne in Europa nach 1945«. Stuttgart: Cantz, pp. 11-23.

Figure 2: Grahame Weinbren & Roberta Friedman: The Erl King, 1983–86 Installation: Los Angeles County Museum of Contemporary Art, 1986,

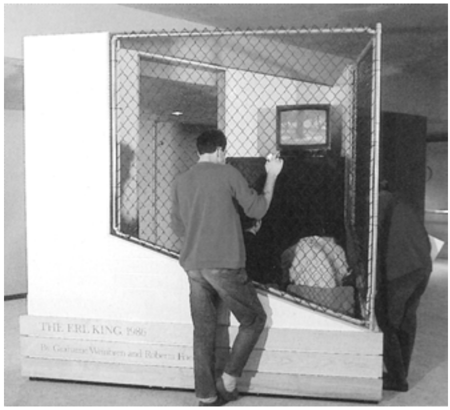

Photo: Grahame Weinbren

The work of Grahame Weinbren provokes a reflection on the different modes of perception by staging the possibilities of engagement of the visitors. Stefan Schemat chooses a less direct way: he addresses the participants at one time as audience, at the next time as actors – a subtle invitation to reflect about their status.

However, also the notion of virtuality itself is not equally important for all variations and directions of interactive arts. Concerning performatory art, Erika Fischer–Lichte observes precisely a weakening of the aspect of virtuality, in favor of the constitution of reality. Contemporary theatre often does not want to primarily mediate symbolic content, but to sensitize the audience for the actions actually conducted. The situation of presentation is used to sharpen the senses of the audience.

The piece of Stefan Schemat uses narration and fiction. It constitutes reality insofar as the participant is actually moving within public areas, but his role is mainly a fictional one. Even if the ambivalence between the concrete being within the landscape and the fictional character of the narrative is emphasized, the focus nevertheless lies on the illusionary power of the work.

On the contrary *BumpList* by Jonah Brucker Cohen (2003), relies on pure presence. It is a mailing list, only allowing six subscribers. As soon as a new subscriber enters the list, the oldest is bumped out. (Figure 3) Usually, mailing lists are public, or they serve as communication medium for a special group which is defined by selection criteria or through editors. Bumplist however is dependent on purely quantitative criteria. The tackling of the participants through this fact creates the piece.[10] It challenges a reflection of the existing as opposed to the possible mechanisms of electronic communication. The subscribers started a competition for the longest presence in the list and used the list itself to discuss its mechanism. This piece is neither fictional nor narrative. It exists within the realm of the World Wide Web and does not signify anything but its own mechanism. The only reason for its presence is the reflection on its condition of existence. Nevertheless, it fulfills all but one of the above mentioned criteria: freedom (being purposeless an open ended); inner infinity (providing no final solution); closeness (having fixed rules and site) and ambivalence – as it invites the wavering of the participant between real communication and reflecting critique of the latter. The only category it does not meet is virtuality. It does not establish a virtual world apart from real life, it infiltrates real life itself.

At the same time, the example of the *Bumplist* shows, how the function of participant within the realization of the piece may vary: Whereas in Schemats work, the participant's role lies in the selection and composition of pre–produced texts, Jonah Brucker–Cohen allows his audience to change the piece itself through the addition of commentaries and data. Whereas *Water* offers the same conditions for any visitor, *Bumplist* is a work–in–progress, an experiment by the artist. Moreover, it is not realized at certain times by different visitors, but it is steadily present. Even when no user is actively participating, the piece itself evolves by the sheer duration of its existence.

Figure 3: Jonah Brucker–Cohen: BumpList, 2003, screenshot.

10 Jonah Brucker-Cohen: »BumpList«, since 2004.

The question of duration leads to the last feature of gameplay, the *timeless presence*. Scheuerl himself makes use of this feature for a comparison of gameplay and the arts. He points out, that often the claim for eternity of the arts is opposed to the volatility of playing. From his mid 20th century perspective, he identifies parallels between the visual arts and the game only in its effects, and sees a greater similarity of musical and dramatic performance and improvisation to gameplay. From today's perspective though, the transferability of his statements to interactive arts is downright intriguing: »There are other games, that are only conditionally improvising: Their players combine the function of actor and audience of works – they follow the instructions, improvise only partially. By means of making float the Given in a fruitful moment, they seem to trace the lines of more or less definitely presaged forms and fill a predetermined framework with life«.[11] This is exactly the role of the participant in interactive arts. Like such a player, the visitor of Schemats work makes the piece float and creates a surplus concerning form and content. Just like such a player, the subscriber of the *BumpList* of Brucker–Cohen creates its actual Gestalt by animating it.

The terms suggested by Scheuerl are not so much distinct categories but an open field of notions valuable for an aesthetic analysis of interactive artforms. As stated above, his approach offers one possible perspective on interactive processes that should be accompanied by others. Already within the realm of game studies, one would for example also have to consider the writings of Rogier Callois, distinguishing between competitive games, chance games, masquerades and frenzies and making up different scales from delightful ›paidia‹ to rule–based ›ludus‹. And this is not to mention various other possible approaches, from systems theory, performance studies and semiotics, to name just a few.

The purpose of this case study was to show one possible way to analyze aesthetic experience within the interactive arts. It should not be mistaken as a plea to confine media art to its aesthetic value. Any extensive case study of media art works has to take into account their political intentions, philosophical background and technological and social concepts. Nevertheless, the questions of how these ideas are mediated, which role interaction processes play within the work and how they actually come into being, is of crucial importance for an understanding of interactive artworks.

11 Scheuerl (1965): p. 103.

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Research of the Motifs in Interactive Media Art concerning the Visual Aspect

Penesta Dika

The visual aspect has a long tradition and historically we are a part of this tradition, we are developing it further. But for creating the future we have to think of the contemporary in the context of the past. This is one reason why one should research the visual motifs in interactive media art not just in the context of interactive media art globally, but also in the context of traditional art. This would produce at least one direction of development (or several directions of development) and a suggestion could be made as to further developments in the future. To conduct this kind of research methods from art history are required as well as comparative examples from traditional art. Consequently a historical background for the interactive artworks will be created and illustrating how these already existing visual motifs are used and represented in interactive media art.

Digital Art and Interactive Media Art

Digital art is a kind of art that is based on digital technology.[1] It includes any kind of art produced with the support of digital technology such as software art, computer art, new media art, interactive media art, animation art, virtual reality, web art, and music visualizations.[2] »Traditional forms of digital art include prints, photography, sculpture, installations, video, film, animation, music and performance. New forms that are

1 See Wands: »A more complete understanding of digital art will emerge as we examine its relationship to technology and contemporary art, the way in which these artworks are created, and the inner make-up of the digital artists.« in: Wands, Bruce (2006): »Art of the Digital Age«, New York: Thames & Hudson, p. 11.

2 See Paul: »Among the forms that a digital artwork can take are installation; film, video and animation; Internet art and software art; and virtual reality and musical environments.« in: Paul, Christiane (2003): »Digital Art«, London: Thames & Hudson, p. 70.

unique to the digital realm include virtual reality, software art, and net art« (Wands 2006: 11). Interactive media art, which is part of new media art, developed from art forms that dominated the 60s, for example installation, happening, fluxus, and conceptual art.[3] It is also inspired by art forms such as futurism, constructivism, Dadaism and surrealism, which dominated the first half of the 20th century. Additionally, kinetic art (including perpetuum mobile), land art and environmental art played an important role in the genesis of interactive media art. Interactive media art was also influenced by photography, video art[4] and film. As a result the literature about interactive media artworks gives different points of views.

Visual Motifs

The visual motifs used by artists both in the past and the present to represent different artistic themes generally are in a developing process. In interactive media art, which is an art form including computer-graphics and animations, net–based artworks, telematic artworks, genetic ar–works, video-installations and virtual–reality–installations, the development process of the visual motifs not only depends on the aesthetic requirements, but also on the technical evolution. For example, animals were already used as motifs in art in caveman paintings. But now with digital technology it is possible to represent the animal not just as static, but in motion, in its living environment and not just this, it is even possible to represent its creation process. Furthermore, it is possible to create the virtual life of a virtual animal, artists can define the parameters of it,

3 See Paul: »Digital art did not develop in art-historical vacuum either, but has strong connections to previous art movements, among them Dada, Fluxus, and conceptual art. The importance of these movements for digital art resides in their emphasis on formal instructions and in their focus, event, and audience participation, as opposed to unified material objects.« in: Paul, Christiane (2003): Digital Art, London: Thames & Hudson, p. 11.

4 See Wenzel/Wirths: »Keine neue künstlerische Entwicklung und mediale Aussageform ist losgelöst von vorherigen zu sehen, vielmehr bauen sie aufeinander auf, haben mannigfaltige Bezugspunkte, ergänzen und erweitern das Alte, ohne es abzulösen. Die Videokunst, und auf ihr aufbauend die gesamte Medienkunst, ist in sich facettenreich und einer extrem virulenten Entwicklung unterworfen, die den darstellenden institutionellen Strukturen in großen Sprüngen voraneilt.«, in Wenzel, Jacob/Wirths, Axel (Hg.) (1998): »Der elektronische Raum. 15 Positionen zur Medienkunst«. Bonn: Cantz, p. 9.

but their definitive shapes can be given by the user/observer. Although designing in interactive media art is a process which depends on the possibilities of the state-of-the-art in current digital techniques, its concept is based on the real world of the artist (his experiences with different subjects, his handling of the problems of everyday life, his impressions about different things in his life and around him), even if it is represented in an »unreal« (fantastic) way. So the motifs that the artist chooses for designing his works are visually based on his or her life, although they can be represented as altered (processed) or created by using an algorithm.

Motif Categories

Interactive media art generally is a category that does not really distinguish between works created for artistic, scientific, or simply entertainment purposes; here not just artists with proper training, but also scientists, technicians or programmers create art.[5] Consequently each of them has different goals in interactive media art: in some works the aesthetic intent is more present, in others the idea, or technological innovation. The visual motifs in these works differ not just from one artist to the next, but also within one single work we can recognize different design styles, exists e.g. as different modules. In some interactive works the artists show more visual aspects, respectively different aesthetic styles. Some artists use only one artistic style, which is continued throughout the entire interactive process. An analysis is needed to research the works with different aesthetic aspects so that each style within the same work can be depicted separately. Furthermore, the overall impression resulting from these different styles should be analyzed.

In general, we could say that the motifs used by artists can respectively be classified in two categories: objective (figurative) and non–objective (abstract) motifs. Objective motifs include humans (also the motif of the visitors), animals and plants. Furthermore also places, architecture and objects of utility can be included in this category. Non–objective motifs are abstract structures, shapes and lines, which can further be classified in geometric and amorphous motifs.

5 See Hünnekens: »[…] Dabei kristallisiert sich auch ein neuer Typus des Künstlers heraus, bei dem die Grenzen zwischen technischen Wissenschaften, Informatik und der philosophisch-ästhetischen Ausrichtung des Kunstschaffenden zunehmend verschwinden.«, in: Hünnekens, Annette (1997): »Der bewegte Betrachter. Theorien der interaktiven Medienkunst« in: Wienand, p. 8.

Objective Motifs

In interactive media art, objective motifs are present in many works. For example, the representation of the human being can be considered as an objective motif and is a relatively frequent motif in this kind of art. The representation of the human being includes portraits and busts. In interactive media art, these motifs are represented in a virtual way, or in a physical–sculptural way (as in the Ken Feingold's work *Head* of 1999). The human motif has been used in interactive media art not just in the form of portraits, but also in treating body parts and even the inside of the body as a theme. For example, the Ars Electronica Futurelab represented the human body, particularly from the inside; in the 1996 work *Visible Human in the Elevator*. Representations of animals and plants, which include the representation of evolutionary created living things, can also be considered as objective motifs. Furthermore, places and architecture, which can also be considered objective motifs and are used in interactive media art, include presentations of buildings, claddings, interiors, environments, specific countryside, or abstract and symbolic places and spaces.

Human Motifs

In interactive media art humans as motifs are designed as a portrait (realistic, processed or distorted), sculptural (three dimensional), plain or mixed (some parts sculptural and some parts two dimensional), also as communication objects (interacting with the observer in different forms), as an anatomical–biological object (the bodily function, the inside of the body is represented as a motif). Robots, avatar, and cyborgs are also represented with human–like characteristics, such as the contour of their »body», their physicality or other features. The human motif is designed in a virtual environment, or in a natural environment, in a dynamically changing process, or partially changing.

The genre of portraits can be divided into visitor-portraits (as in *Rigid Waves* (1993) by Monika Fleischmann and Wolfgang Strauss), or a kind of author-visitor-portrait. It can also be divided into a realistic-portrait (as in Luc Courchesne's work *Portrait One* of 1990), or a collage-like representation (as in Alba D'Urbano's work *Touch me* of 1995). The motif of portrait has been used to provide a sort of communication with the visitors or to present a specific treat of human character.

Animals and Plants as Motifs

While in digitalized art plants or animals have been designed through algorithms imitating the natural rules of creating a living being, in interactive media art their virtual development, their growth and dying are simulated depending on the visitors' interactivity. In 1988, in Edmond Couchot and Michel Bret's work *Le Pissenlit* visitors were even given the power to make dandelion seeds fly on screen by blowing at the screen. The direction and the duration of breathing captured by a microphone were the parameters that controlled the interface.

Animals and plants are created not only as accompanying motifs, but also as independent motifs, their *life* is even treated as a main theme in the works of interactive media artists. The animals and plants are designed on the basis of their real visual characteristics, in a surrealistic way (real objects are brought in an unreal context), or in an abstract way. They have a symbolic value (as in the work *Subject: Emotions Encoded*, 1997, by Merel Mirage, where a butterfly was represented as a symbol of the emotional state), or a decorative purpose (as the nature–elements in the *Well of Lights* 1992, by Toshio Iwai). The symbolic value of plants and especially of animals with generally a long tradition in arts is maintained also in interactive media art. Of course, the symbols or allegories for animals change depending on our engineered civilization form. Animals, plants, and nature are designed mostly through the rules of the artists, which are then combined and recombined by the users, respectively observers (see here as example the work of Christa Sommerer and Laurent Mignonneau, *Interactive Plant Growing* of 1992, Figure 1).

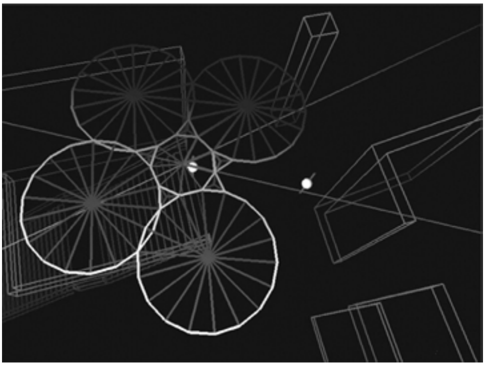
Figure 1: Interactive Plant Growing, 1992.

So a virtual world is developed which through the rules included by the artists enables a redefining of the rules through the users. The users can create virtual worlds that even the artists have not yet imagined.

Places and Architecture as Motifs

In interactive media art the artists present places that they have found impressive, or places that are known as specific experience-places. Artists also depict places that only exist in their minds. They want to visualize these places of their fantasies, particularly render them visitable for the audience. It is possible for visitors to experience these places; they can surround them from all sides. Visitors can even be in them. There are also examples, where the visitors navigate in places, recordings of which have been manipulated by the artist, so that the artistic value of the work and not just the experience of a specific place have been pointed out.[6] Architecture, including claddings and interiors, has been used as motifs for exploring different cultures, particularly finding out the analogies between different cultures (see the work of Rafael Lozano–Hemmer *displaced emperors, relational architecture 2* which was presented in Ars Electronica Festival in Linz, Austria in 1997). But there are also examples using abstract motifs to constitute a place, particularly a space, which has to be explored (as in the work of Ulrike Gabriel *Perceptual Arena* of 1993).

Figure 2: Trace Pattern I, 1997



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6 Here Michael Naimark's work *Karlsruhe Moviemap* of 1991 can be mentioned as an example.

Abstract Motifs

In interactive media art we find abstract motifs as background–motifs and as leitmotifs. Abstract motifs are represented in geometric shapes or amorphous shapes. They are represented as monochromic objects or multi–colored objects, in different material–simulations. They are also constituted as three-dimensional or two-dimensional (constructed as flat surface or just with lines, as opened or closed shapes (Figure 2)). Abstract motifs in interactive media art are represented as symbolic motifs, for example, in works, which visualize music–compositions, or they are presented as decorative motifs. They appear as abstractions, which are constituted through overlaid shapes or fluid simulations, or shapes/fluids that intersect each other, or are placed within each other. Concerning the geometric shapes, fractals can also be considered as abstract motifs. Fractals are also used as motifs in interactive media art. For example in the work of Joachim Goßmann *Audio Fraktal* of 2004, or in the work of Zack Booth Simpson *Fractal Zoom* of 2006 fractals appear as main motifs of the work.

Conclusions

The motifs in interactive media art are on the one side unique and specific and on the other side they are based on motifs which art history knows already before. It is difficult to make a general conclusion about the usage of different motifs in this kind of art, but certainly it is correct to say that the motifs in interactive media art are treated and created so that they represent an actual (modern) aesthetic requirement of the artist, respectively of the audience. In response to the comment which has been made about interactive art (installation and cinema), that »several examples of viewer participation with the machine have existed in the canon of contemporary art since the last century« (Rush 2005: 222.), we can add that also several visual motif examples have existed in the contemporary art and in traditional art in general for many centuries (also before the invention of machines). The development of this aesthetic need is a long process, as long as the development of the representation of different motifs. Designing interactive artworks should be understood not just as simple intuitive design; it has to be understood also as a historical approach to the motifs that artists want to use for treating their themes, as an exploration of already existing forms and arts for the designing of these motifs in the past. The intended representation has to bring something innovative to this area, so as to let this kind of art, concerning its visual design, evolve further.

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Decoding Gaze in Immersive and Interactive Media Arts

Dorothée King

Historically, one of the primary motivating factors in art production and technological development has been the desire for creating human–like machines and the exploration of new territories. Mythical figures like the Greek *Prometheus,* creator of humans made out of clay, or the Jewish legends of the animated *Golem* figures influenced later ideas of human–like machines from Wolfgang von Kempelen´s chess–playing Turk (1760) to the humaoid robots like *Actroid ReplieeQ1* (2004)[1] by Hiroshi Ishiguro. Outlooks on new territories were introduced as Trompe–l´œil landscapes in Roman villas[2], outer–space panoramas in natural science museums or immersive and interactive settings (for example *Terra Vision*, ART+COM, 1997[3]). Though the realization and production of those visions changed with advances in technology, the messages remained fundamentally similar. Also recent interactive media art projects focus on exploration and replication of the human body. With *Arduino Earth Walk* (2006), Thomas Gläser and Jens Franke invite the audience to navigate with their feet on a google earth projection on the ground. The artist group »Institute for Applied Autonomy« is convinced, that their artistic (and at the same time humanoid) robot *Little Brother* (1998), supports interaction among the people on the street.[4]

I am interested in the question why certain perspectives on approaching new territories, and interaction–patterns with human–like

1 Hiroshi Ishiguro from the Osaka University developed this highly realistic looking humoid robot with silicone skin for the Expo 2005 in Aichi.

2 f.e.Villa dei Misteri, Room 5, Pompeii, 60 B.C.

3 ART+COM, *TerraVision*, 1999. Interface to zoom into the surface of the earth. Artists and designers developed a couple of technologies like this in the nineties of the last century to be replaced by commercial companies, like google-earth nowadays.

4 Cp. IAA Research http://www.appliedautonomy.com/lb.html (March 12, 2008).

machines seem to be repeated within information visualisation and interactive media art.

The underlying gaze on space and the presented interaction possibilities seem to replicate ideas of exploration and annexation of new territories. The interaction with humanoid machines and other social and electronic devices seem to follow certain strategies. The designs of the apparatuses change with time, but the implied perspective on and interaction with the easy-to-dominate other remains similar.

To analyse the question of repetition of perspectives and interaction patterns in media arts I would like to confront recent media art pieces, with the notion of *gaze* as used in cultural studies. *Gaze*, as a term used in cultural and image studies, operates on the distinction between a (supposedly) objective perspective or look, on the one hand, and, on the other hand, a culturally informed and selective *gaze*. For example, the reductive depiction of Muslim women in the media as wearers of a chador or headscarf involves a culturally pre–programmed view that identifies these women by an article of their clothing. I employ the term *gaze* in the sense in which it is found in Foucault´s *Birth of the Clinic* (first published in 1963), in which the author attempted to identify the reductive perspective of medical doctors on human subjects as mere bodies, and not persons. (The concept was originally introduced in Lacan´s *Mirror Stage* (1936) in order to describe a stage of self–consciousness attained in children through visual self–perception.) The term became current in studies of visual media in the seventies of the last century with Laura Mulvey's essay »Visual Pleasure and Narrative Cinema«[5], in which she used the term gaze for the male perspective on female actors in film. Laura Mulvey described *gaze* as »to–be–looked–at–ness.« She argued that cinema creates sexual difference in the way we look, fostering female passivity and male actors as drivers of the narration.[6] The distinction between look and gaze can be applied to other media as well. In 2006 Laura Mulvey connects the idea of gaze to technological settings in general: »While technology never simply determines, it cannot but effect the context in which ideas are formed.«[7] I want to apply her idea of a culturally and by medium determined *gaze* to multi media experiences. In this short essay I want to show that certain cultural strategies of exploration or hierarchical structures in social interaction are not only reproduced in images, but are also strengthened in technology-based, interactive environments.

5 Mulvey, Laura (1975): »Visual Pleasure and Narrative Cinema«, Screen 16, 3.

6 Ibid.

7 Mulvey, Laura (2006): »Death 24x a Second«, London, p.9.

The notion of *gaze* is analyzed through observing the pre-codedness of the receptional strategies in *Run Motherfucker Run* by Marnix de Nijs (2004). In this interactive media installation the user is asked to take the position of a running protagonist in a frightening suburban setting of a video game. The user is challenged to navigate the video game by running on a unpredicitable tread mill.

Further I would like to focus on *gaze* in the user / art work relationship in Naoka Tosa´s *Neuro Baby* (1993). A TV-screen shows an animated baby that reacts to human gestures. For example laughing can stop the Baby´s crying. A caring, but also hierarchical relationship is created.

Lastly strategies on how we could learn to meet our environment with an un–coded look are illustrated through interactive art projects that differ from the commonly practiced approach to technology and the exploration of abstract outside data, and use the whole sensual capacity of the body to focus on emotion as an embodied experience to set up new hierarchies in the art work – user relationship. An example of this phenomenon is Nicholas Stedman´s *Blanket Project* (2000–2004), in which a sensor–based, moving blanket dominates the interaction with the user, who is invited to share the bed with this comforting art piece. Another example is Aya Tsukioka´s *Urban Camouflage* (2007) project. She designed a transformable skirt for shy pedestrians. The skirt can be transformed into a box that looks like a vending machine or a flexible shelter to hide in urban environments.

Explorative Experience in Interactive and Immersive Arts

Shortly after humans first explored extraterrestrial space in 1965 the scientist and artist Frank Malina created a kinetic mural called *Cosmos* for the Pergamon Press Building in Oxford, England. In *Cosmos* outer space can be experienced and explored as three–dimensional space. Not only since then have visualizations of scientific disciplines like biology, astronomy or space science been used as sources for technological and virtual art.[8] In his overview on immersive settings in the visual arts the media–art historian Oliver Grau states, »the desire to be in the picture, in

8 cp. Wilson, Stephen (2002): »Information Arts: Intersections of Art, Science, and Technology«, Cambridge.

both the metaphorical and nonmetaphorical sense, did not disappear with the panorama but lived on in the twentieth century.«[9]

The desire to access the unknown, to be part of historical settings, or to explore extraterrestrial space or the world of microorganisms can be a motivating factor to design immersive environments. The devices to access such environments change with technological progress and Zeitgeist. The idea of immersion in and appropriation of (unknown) territory seems to be repeated. In 1962 Morton Heilig designed *Sensorama*, a booth in which virtual motorcycle rides through New York City could be experienced with sound, moving images, smell and even wind[10]. In the 1990s Peter d'Agostino constructed *VR/RV: A Recreational Vehicle in Virtual Reality*[11] where users could drive virtually through a theme park; Sophie Lavaud created *Centre/Lumière/Bleu*[12] in which the beholders navigate through the layers of a virtual paining, and the Canadian Artist Charlotte Davies produced *Osmose, Subterranean Earth*[13] an immersive interactive environment, in which the audience navigate through subterranean spaces through their breathing. More current projects like Marnix de Nijs´ *Run Motherfucker Run* (2004), a virtual suburban environment accessible via a treadmill interface, still focus on the idea of exploration, even though a critical approach can be observed in the choice of uncomfortable input devices as interfaces and unpleasant scenarios, as in the chosen example.

Marnix de Nijs is a Rotterdam based artist who explores the relations between bodies, machines and media. *Run Motherfucker Run* (Figure 1) is a video game with images of empty streets, frightening alleys and spooky industrial areas. The player, who should be in good physical condition, has to operate the game. The scenery is projected on a 8x4 meter large screen from an ego-shooter perspective. The player has to run on a treadmill facing the projection screen. The distance the player runs on the 5x2 meter conveyor belt is the same distance that she/he will cover in the virtual city projected in front of him. The direction she/he takes on the treadmill is the direction, in which she/he will move in the video game.

9 Grau, Oliver (2003): »Virtual Art – From Illusion to Immersion«. Cambridge, p.141.

10 Heilig´s novum was to include smell, noise, wind and vibration in his immersive setting.

11 Peter d´Agostino: *VR/RV: A Recreational Vehicle in Virtual Reality* (1992/1993) produced at the Banff Centre for the Arts.

12 Sophie Lavaud: *Centre/Lumière/Bleu* (1995).

13 Charlotte Davies: *Osmose, Subterranean Earth* (1995).

Figure 1: Marnix de Nijs: Run Motherfucker Run, 2001–2004

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The faster the player runs, the clearer and brighter the image in front of her/him gets. The unpredicatable movements of the conveyor belt makes it even more difficult to navigate. Marnix de Nijs art piece plays with the joy of navigating through unknown territority, despite aspects that could be viewed as unpleasant such as, the exhausting physical activity and the unsteady ground, that may trigger negative feelings like anger, frustation or even fear. He still uses contemporary technology to create immersion. In a new world, a new territory has to be discovered and made accessable. The user immerses him/herself in the unknown.

Exploration, Extension and Recreation of the Body

»If man wants to understand himself, he needs to replicate his acting body in a machine.«[14]

In science and art there has always been an interest in the reproduction of the human body. From Leonardo da Vinci´s robotic ideas of a humanoid automaton in 1495 to Mark Tilden's toy-like humanoid biomorphic robot design in 2004. Ever since researchers seemed to be obsessed by the idea of creating machines not only to help managing tasks but also to represent the scientists and designers themselves. Contempoary results from this research area are not only on-screen avatars that are improved variations of our real space self[15], but also physical objects that try to imitate human beings and animals in biological, comprehensive and

14 Bolz, Norbert (2002): »Brother Robot«, p.83 in: Anna, Susanne (Edit.): »Ex Machina – A History of Robots from 1950 to the Present Day«, pp.72-89. Ostfildern-Ruit.

15 Cp. Lister, Martin; Dovey, Jon; Giddings, Seth; Grant, Ian; Kelly, Kieran (2003): »New Media: A Critical Introduction«. New York.

emotional ways. Human body parts are reconstructed. The artist *Stelarc* experiments with duplicates of his face or ear. The *Symbiotica* research lab at the University of Western Australia focuses on art works based on human tissue. Art exhibitions use presentation techniques from biomedical conferences. The boundaries between scientific research and artistic practice blur. Genetics as a still unexplored microcosm became a topic in the visual arts; the body itself is replicated. An example could be the interactive database–based artwork *Artificial Sculpture* (2002) by Michael Rees that includes physical modules (outputs of a CAD software) shaped like fingers, legs, and bodies, which the audience was invited to assemble. With her art and research project *Neuro Baby* (1994) Naoko Tosa focuses on the exploration of the expansion of human emotions and sensibilities to interactive interfaces. The art work synthesizes voice analysis and facial expressions. Neuro–Baby is an installation comprised of a TV-screen fixed into a baby bed. On the screen the user sees a baby head that reacts to his/her voice. The baby reacts with smiles to gentle noises, with anger to loud noices; it reacts with yawns, cries, and hiccups. Naoko Tosa writes about her project: »I created a new creature or a piece of work that can live and meaningfully communicate with modern, urban people like ourselves, people who are overwhelmed, if not tortured, by the relentless flow of information, and whose peace of mind can only be found in momentary human pleasures. Neuro Baby was born to offer such pleasures.«[16] In this project the artist emphasises the emotional relationship between the projected baby and the beholder. Like interacting with a chess–playing automaton or a humanoid robot, the baby on the screen reacts to the beholders action, in this case parental mimics. By interacting with the *Neuro Baby*, we do not see the monitor in the bed as what it is, observing the baby on the screen initiates a culturally-precoded relationship. The beholder starts to take care of the baby, and at the same time a hierarchical pre-determined relationship establishes as soon as the *gaze* on the smaller, easy-to-handle other, but at the same time human-like being, kicks in.

16 Naoko Tosa on her website (http://www.tosa.media.kyotou.ac.jp/nb/nb_paper.html, March 13, 2008).

Decoding Gaze in Immersive and Interactive Media Art – Perspectives

»When I wake up in the morning and see her face over there, it makes me feel so nice, like somebody is watching over me.«[17]

It is one option to use scientific or technological tools to expand human territory by moving our outer landmarks or extending our own bodies. But nothing will change as long as new technologies (for examples for prostheses, advertised in movies like *Terminator2*[18] and current marketing campaigns[19]) represent progress and enhancement only while the question why we need these technologies, body extensions or replicates remains unanswered. The brief notion on the following art projects shall show how artists put the focus on strategies that are not based on the idea of expansion, exploration or appropriation, but foster confrontation that put user and art piece on a par, or even reverse the artwork – user hierarchy. In recent years young fashion designers focused on interactive and intelligent textiles. In 2007 the Japanese fashion designer Aya Tsukioka, designed the *Urban Camouflage* gear. Martin Fackler from the New York Times describes the work as follows:

»Ms. Tsukioka [...] lifted a flap on her skirt to reveal a large sheet of cloth printed in bright red with a soft drink logo partly visible. By holding the sheet open and stepping to the side of the road, she showed how a woman walking alone could elude pursuers — by disguising herself as a vending machine. The wearer hides behind the sheet, printed with an actual–size photo of a vending machine. Ms. Tsukioka's clothing is still in development, but she already has several versions, including one that unfolds from a kimono and a deluxe model with four sides for more complete camouflaging.«[20]

Aya Tsukioka created *Urban Camouflage* not only to prevent burglaries on the streets of Tokyo, but also to give the users the opportunity to hide and shelter in embarrassing or uncomfortable situations. She satisfies user needs that have nothing to do with enhancement, but with rescue, hold and safety. A new way on interaction with clothing, but also with vending machines is presented here.

17 Andy, 74, speaking about »My Real Baby robotic infant doll«. Notes Sherry Turkle, 2006.

18 James Cameron (1991): Terminator 2

19 E.g. »Quality for Live«: the 2007 campaign of the Austrian prosthesis producer Otto Bock

20 New York Times (October 20th, 2007) by Martin Fackler.

An interactive art project that deals with the idea of shelter as well is the behavioral sculpture *THE BLANKET PROJECT* (2001–ongoing, Figure 2) by the Canadian artist Nicholas Stedman. On his website Nicholas Stedman states

»The Blanket Project is an ongoing effort to create a fully autonomous robotic blanket, able to navigate through a bedroom or similar environment seeking out people for intimate encounters. The blanket is intended to be a subtle companion, not demanding much attention, rather quietly nestling its way into one's personal space to provide comfort and physical stimulation, especially when a person is in need.«[21]

The electronic blanket gives the users the impression of knowing their needs. Here the interaction focuses not on the exploration of new territories, but on the establishment of emotional and physical comfort of the user. Introducing a new relationship between blanket and user interrupts the usual gaze on a blanket.

A notion of »letting go« of control can also be experienced within the *Sonic Bed_London* (2005), a sound based and interactive art project by the English artists Kaffee Matthews and Annette Works. The audience is invited to lie down on the mattress inside a bed. The sounds from twelve different loudspeakers underneath the mattress create vibrations of different spots on the users´ bodies, offering relaxation and warmth.

The short presentation of the above mentioned projctes might show possibilities of »rupture d'évidence«[22] in the visual and sensoric strategies applied in interactive arts. The artists refuse to reproduce common explorative and approriative gaze on the interaction devices and in the interaction itself, but open up new audience/user/art piece - relationships. The outcome is neither the typical enhancement of the human body nor the expansion of the users playground, but a respectful acknowledgment of technological possibilities and human limitations.

21 Nicholas Stedman: *THE BLANKET PROJECT* Behavioral Sculpture (2001-ongoing): http://nickstedman.banff.org/blanket.html (November 19th, 2007): »The Blanket contains 31 motorized joints that are connected together in an XY grid by aluminum linkages. This motorized skeleton enables deformation into different shapes. In turn, the shapes are coordinated into patterns by an attached computer creating kinetic motion. Some of the patterns are gaits that move the device from one place to another, and some embrace and stimulate a person«.

22 Michel Foucault was interested in »rupture d'évidence«, breaking with the evidence, our knowledge our practiques we have in relation to the surrounding phenomena.

Figure 2: Nicholas Stedman: The Blanket Project, 2001–...

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Why Do We Need New Interfaces to Understand Cities Better?

Mahir M. Yavuz

Part I

»Now the people in the city have something to teach me, but the fields and the trees won't teach me anything.«
Plato, *Dialogues*

The Space that We Live In

A city, where a large number of people live in close proximity to each other, is an urban area that is differentiated from a town or village by size, population density, importance, political and administrative functions or legal status. In contrast to a rural area, urban area is a term used to define an area where there is an increased density of human–created structures in comparison to the areas surrounding it. An urban area is frequently called a city or town. Although the term varies from country to country, as an inseparable part of the modern city, suburbs are inhabited districts located either on the outer edge of a city or outside the official limits of a city or the outer elements of a metropolitan area.

There are numerous terms and concepts developed throughout the ages in relation to the city. A metropolis is a major city generally with a population of at least one million, which is a significant economical and cultural centre for a country, and usually an important hub for international connections and communications. The word metropolis is derived from the combination of two Greek words: *metera* (mother) and *polis* (city/town). In modern usage, the word is also used for a metropolitan area, a set of adjacent and interconnected cities gathered around a major urban centre. A metropolitan area refers to a large population centre consisting of a large city and its adjacent zone of influence, or of several neighboring cities or towns and adjoining areas. The peripheral zones connected to the urban centre are closely bound to the centre usually by employment or commerce. A mega-city, on the other hand, is typically defined as a recognized metropolitan area with a total population of more than 10 million people. In some definitions, a minimum level for population density (at least 2,000 persons/square km) is set for mega-city. A mega–city can be a single metropolitan area or two or more metropolitan areas that come closer to one another. The term metroplex also applies to the latter. In some cases, the terms megapolis and megalopolis are also used synonymously with mega–city.

Cities are sometimes classified by roles: cultural, economic or administrative. These categories enable us to see obvious differences among most cities. For example, Chicago, São Paulo and Bombay are clearly economic or industrial cities. Boston, Benares and Rio de Janeiro have primarily cultural roles in their respective countries. Washington, D.C., New Delhi and Brasilia assume roles of governance.[1] Cities may also be distinguished in terms of social history. Although there are various opinions on whether any particular ancient settlement can be considered to be a city, the first true cities are usually regarded as large settlements that assumed specialized occupations, and where trade, food storage and power was centralised. Especially with the growth of ancient and medieval empires, not only the population of the cities were increased but also cities began to evolve noticeably according to the social conditions. During the Middle Ages, cities became a political entity of their own especially in Europe. From the late eighteenth century onward, the Industrial Revolution led to massive urbanization resulting in the rise of new great cities. The impact of modern industry on the formation and life–style of the city was first felt in Europe and then in other regions, as new opportunities brought migrants from rural communities into urban areas. As a result of both the Industrial Revolution and especially the earlier discovery of the ›New World‹, a new type of city called planned city, new town or planned community emerged. A planned city is designed from scratch and grows up more or less following the plan. Many of the cities established during the European colonisation of the Americas as well as most of the world´s capital cities are planned cities. The most recent terminology regarding the cities includes global city, also known as a world city. Appearing with the rise of globalisation, a global city has a direct and concrete effect on global affairs through socio-economic, cultural, and/or political means. Far

1 Bakke, Ray (1984): »Evangelizing World Class Cities«, http://www.urbana.org/_articles.cfm?RecordId=317, (November 11, 2007).

beyond our control, cities are too complicated and affect too many people who are subject to numerous cultural variations. As Kevin Lynch also points out, cities, like continents, are simply huge facts of nature, to which we must adapt. We, as ordinary people, study their origin and function only because that is interesting to know and handy for making predictions. Someone might say »I like Boston,« but we all understand that this is merely a trivial preference, based on personal experience. Only a Sunday journalist would rate Boston in comparison to Atlanta. Scholars, on the other hand, analyze hard data, such as population, dollars and traffic flow.[2]

As stated in the quotation by Plato at the beginning of this part and elaborated by Lynch afterwards, cities assume a key role in our lives as well as our civilization. We ›somehow‹ create/design the spaces that we live in and afterwards the space that we created shapes or reforms our reality. It is basically a loop with an unknown starting point. In this respect, the quest to find new ways to understand, perceive and represent the reality of the cities is quite crucial for us.

Perception of the City

Most of the time, the perception of the city depends on its physical condition. The terrain, buildings, roads and districts may be enumerated as the basic components of the city. There are various theories on forms of the cities based on the physical conditions of a city. According to one approach, the basic function and the form of the city is determined by the transportation structure. City forms may be distinguished into three archetypes based on the dominant transportation technology: the walking city, the transit city and the automobile city. Another approach to the city form is the Central Place theory developed by Walter Christaller. According to Christaller's approach, selling of goods and services determine the size and spacing of the districts as well as the cities themselves.

The physical condition of the cities is determined by their type and functions. For example, if a capital city is also a metropolis, its physical conditions differ from the other capital cities. Cities may have been established around a particular function or they may assume one or more functions during their developments. The functions of a city include the following: political function (the seat of local, regional, national government), educational function (the location of the university), industrial

2 Lynch, Kevin (1984): »Good City Form«, Cambridge, Mass.: MIT Press, p. 1.

function (the site of a particular process or activity), commercial function (a port, market place or crossroads), strategic function (a place of safety and security), recreational function (a place of sport and entertainment), religious function (the home of the religious centre). Functions and physical conditions constitute the most vital role in the construction of a city. The game entitled Simcity reflects the vitality of these components for the construction of the city even according to urban planning theories. However, it is certain that the concept of city cannot be explained merely by the physical structure and face of the city. As Lynch mentions:

»The city may be looked on as a story, a pattern of relations between human groups, a production and distribution space, a field of physical force, a set of linked decisions, or an area of conflict. Values are embedded in these metaphors: historic continuity, stable equilibrium, productive efficiency, capable decision and management, maximum interaction, or the progress of political struggle. Certain actors become the decisive elements of transformation in each view: political leaders, families and ethnic groups, major investors, the technicians of transport, the decision elite, the revolutionary classes.«[3]

A city is complete only with its inhabitants. The ongoing interaction between the people and the city results in a bilateral effect: the city affects the way people live, think, etc. whereas the people who live in a city manipulate the formation of the city. As Daniel Berrigan puts it forth: »Well, I think I was always sort of reflecting where I was and my sense of surroundings and ecology, urban or country, or foreign, living in Europe, very affected by all of that.«[4] All inhabitants of the city have a personal perspective that defines their perception of the city. Regarding the perception of the city, in his *Semiotics and the City*, Roland Barthes argues that »the city as a text, as signs and inscriptions by human beings in space, so that users, people moving through the city, can be seen as readers of poems.«[5]

In relation to both formation of the city and the perception of the inhabitants, Jonathan Raban has coined one of the most important concepts: hard city and soft city. According to Raban, there are two different

3 Lynch (1984), p. 38.

4 Berrigan, Daniel (1988): »To Dwell in Peace: An Autobiography«, New York: Harper Collins, p. 237.

5 Barthes, Roland (1986): »Semiology and the Urban« in »The City and the Sign: An Introduction to Urban Semiotics«, ed. M. Gottdiener and A. Lagopoulos, New York: Columbia University Press, p. 90.

dimensions of a city: physical data and perceptional reality of the city. In his book entitled *Soft City*, Raban states that »The city as we imagine, the soft city of illusion, myth, aspiration, nightmare is as real maybe worse than the real city we can locate on maps, statistics, monographs on urban sociology, demography and architecture.«[6]

Part II

»Never confuse the map with the Territory.«
J. G. Ballard, *Empire of the Sun*

Representation of the City

The ›ideal‹ way to reflect and represent a city, as a whole is to produce a map of that city. Maps are employed to convey depictions of a place as well as reflecting the relationships among the objects and data in a certain space. As cities are preliminarily perceived as spatial places and geographical locations, they are visualised by cartographic maps. City maps may indicate roads, streets and other important physical information like an ordinary tourist map or they may depict various social data that the city comprises as is the case in the project entitled the *Social Explorer*.[7] There are three different types of geographical maps that display cities according to their general physical characteristics: topographic, planimetric and topological maps. A topographic map is primarily concerned with the topography of a place, and is typically different from other maps by its use of contour lines showing elevation. A planimetric map is like a topographic one but without elevations: contour lines or spot heights. A topological map, on the other hand, is a very general type of map like a sketch.

Thematic maps or data maps are maps, which express the relationship among and the spatial distribution of specific data themes through a certain navigation and symbolization system for standard geographic areas. These kinds of maps come in diverse forms depending on the information they contain. They may bear different names: special–purpose, single–topic, or statistical map. Thematic maps display statistical data so as no other data representation method is capable of displaying so much

6 Raban, Jonathan (1984): »Soft City« London: Collins Harvill, p. 10.

7 For the description of the project, see http://www.socialexplorer.com, (Nov 11, 2007).

information and thousands of numbers within such a small space. Thematic maps can be very useful in exploratory spatial data analysis, confirming hypotheses, revealing trends and patterns as well as data presentation. Data patterns are much easier to spot on a thematic map than on long spreadsheets of numbers.

Although there is in fact no limit to ways data may be presented on a map, there are a few defined standards: a choropleth, dot density, chart, and scaled symbols map; the data are represented by colours, dots, charts, or symbols respectively. Sometimes more than one theme is displayed at a time. In that case, these maps are called multi–variable thematic maps, and they are usually more difficult to understand. As the volume of geographic data has extremely increased over the last century, thematic cartography has become ever more useful and necessary to interpret spatial cultural and social data. Different thematic maps of Switzerland and its cities under the title *Mapping Switzerland* realised by Hosoya Schaefer Architects in Zürich,[8] *Mobile Landscape: Graz in Real Time* by MIT SENSEable City Laboratory,[9] and *Selkirk Jabberwocky Cartography of/as a Little Mind* produced by Wilfried Hou Je Bek and Orkan Telhan[10] may be enumerated as examples to contemporary thematic maps (Figure 1).

Another mapping method to represent a city is cartograms. Cartograms are »diagrammatic maps« that were structured around Waldo Tobler's theory, »everything is related to everything else, but closer things are more closely related.«[11] Since cartograms depict attributes of geographic objects by changing the size of objects depending on a certain attribute rather than depicting geographic spaces, some people argue that a cartogram is not a true map. There are three main types of cartograms, each has a very different way of displaying attributes of geographic objects: non–contiguous, contiguous and Dorling cartograms.

8 For the description of the project, see http://www.hosoyaschaefer.com/seedamm_exhibition.htm, (November 11, 2007).

9 For the description of the project, see http://senseable.mit.edu/projects/graz/graz.htm, (November 11, 2007).

10 For the description of the project, see www.orkantelhan.info/selkirk/ (November 11, 2007).

11 Tobler, Waldo (1970): »A Computer Movie Simulating Urban Growth in the Detroit Region«, Economic Geography, 46: 2, p. 236.

Figure 1: Mobile Landscape: Graz in Real Time by MIT SENSEable City Laboratory.

Another method in the representation of cities that stands in the foreground due to developing computer technology is geographic information systems or geographical information systems (GIS). Geographical information systems is a computer technology that employs a geographic information system as an analytic framework for managing and integrating data, solving a problem, or understanding a past, present, or future situation. In a more generic sense, GIS is a »smart map« tool that allows users to create interactive queries, that is to say, user created searches, analyze the spatial information as well as editing data.

Figure 2: Portions of London and Sao Paolo city maps from Google Maps.

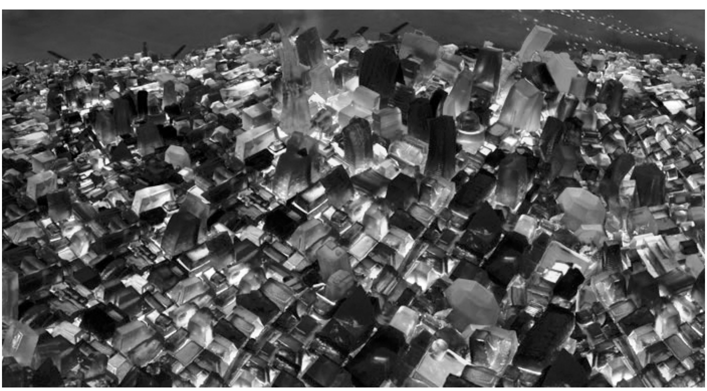
Part III

Understanding the City

However all of these analytic – and mostly geographic – interfaces and representation methods are not helpful for us if we really want to realize what is special about the city that we have chosen. Considering the city as a spatial place may only mislead us to some common results we may acquire by analyzing a similar spatial place (Figure 2). Every city lives in its own context, which includes a unique ratio of different social, political and cultural specialities. When we strip off these aspects and just focus on the spatial data we gather from the geographical area of the city, we would see the reality only from a simple geographical perspective. Moreover, it would be appropriate to say that a city is a living organism, rather than a pre–defined computer software. Like every organism it has aspects, problems, complications and adaptations immanent to itself. All of these create a unique condition for that particular city and its inhabitants.

From an artistic point of view, cities constitute an important field of work and usually the art pieces based on cities are very much related to unique and local values of the city. However, they are often not very informative about the city itself. Almost all of these kinds of works are representations developed through personal experiences and perspectives.

Figure 3: San Francisco in Jell–O by Elizabeth Hickok.



Copyright Elizabeth Hickok.

For example, Elizabeth Hickok introduces a new perspective to the representation of a city in her project entitled *San Francisco in Jell–O* by the dramatic visuals obtained through abstracting and restructuring the landscape of the city (Figure 3).[12]

Another project entitled *Searchscapes: Manhattan* claims that the collective data on the Internet regarding Manhattan may be employed in structuring the physical elements in the representation of the city.[13]

On the other hand, if we remember the statement of Plato at the beginning of this paper, we may say that the cumulative information that led us to today's civilization has always been produced in cities. They are the headquarters of information production. And in today's world, especially contextualized, analyzed and refined information is becoming much more important. All of contemporary technological developments are evolving in a way that makes it easier to access this kind of information. The global representation of this evolution is quite visible on the web as social networks, online communities that create, map and share information. It is certain that merging this creative common infor-mation and the physical location or source of this information will be quite useful. A potentially reasonable solution for a better city display would be developing new interfaces where the artistic point of view and analytic power of science merge together – something new and more communi–cative than mere maps or spatial representation of the cities: A display where we can see the role of the city, functions of the different dynamics as well as its recent social and political context. With a new interface approach we may also find a way to present Raban's »Soft City« or the abstract stories of the city or even the invisible socialization. It is so obvious that we need to find different solutions to represent the complex cultural and social life and interaction as well as the complexity of architectural structures. However, before displaying them, we first need to understand cities better and in order to do so we need to create new tools, new mediums, and new interfaces. In order to be able to establish a new interface solution for the representation of the city, we need to think in a multidimensional way rather than the two dimensional representation of maps. In doing this, there are four important aspects to consider which would help us improve the interfaces of city display. These are:

12 For the description of the project, see http://www.lizhickok. com/statement.html, (November 11, 2007).

13 For the description of the project, see http://www.searchscapes.net, (November 11, 2007).

- Displaying different datasets:
  As we have already discussed in length, cities are not only spatial units. Cities are communal living spaces that include numerous socio–political data. In this respect, it is vitally necessary to display these data sets in their integrity. As it may be seen in similar examples such as the Google Earth with the layer systems or the Wikimaps that supports user generated content, relating datasets to geographical data is important in revealing the attributes of cities.[14]

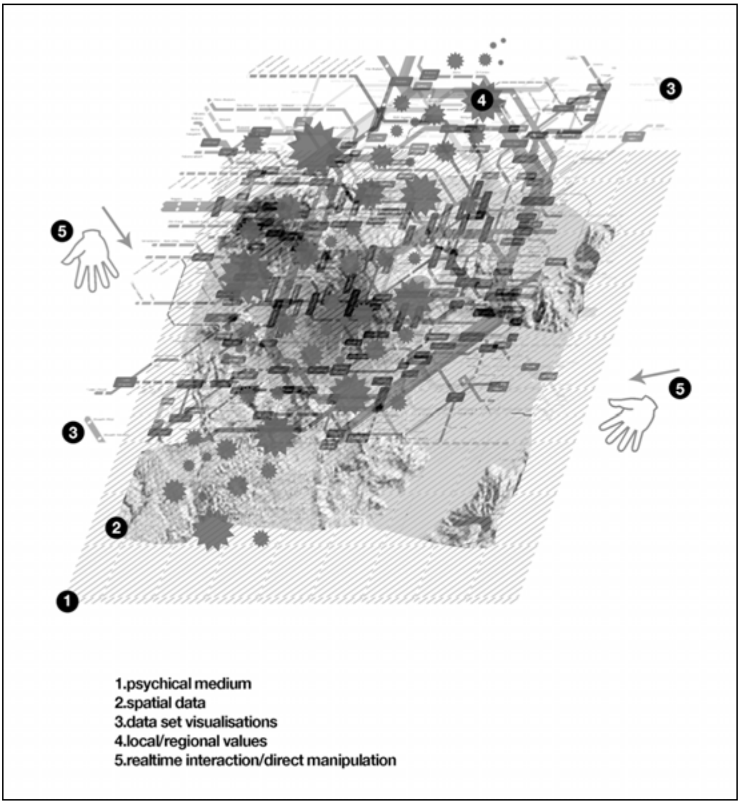
- Local/Regional Values:
  Every city or even every district of a city has specific characteristics immanent to itself. This might be the frequency of the museums in that district, the number of art viewers or totally diverse information such as the armed crime rate. In order to distinguish between the cities, this kind of information that is unique to that specific area should be demonstrated so that it is noticeable within the interface, it should be iconised and even displayed more dominantly than cartographic_data.

- Real_Time_Interaction/Direct_Manipulation:
  Another important necessity is that the interface should have a real time interaction function and should enable the user to modify the data, the map and the interface through his/her hands or another input device. It is highly possible that this kind of interaction would create a better user experience in terms of both the use of the navigation system and browsing the different datasets and local values.

- Psychical Input/Output:
  Today, technology is about leaving the screen and becoming more and more concrete and three dimensional. In this respect, using a physical interface for both input and output in displaying a city is important as this would be a three dimensional space and at the same time also a tactile environment would be created. This physical space could be a table/surface that can change its shape or a more fluid material such as mercury or liquid magnet.

14 For Google Earth, see http://earth.google.com/gallery/ and for Wikimaps, see http://www.aec.at/en/archives/center_projekt_ausgabe. asp? _projectID =13196, (November 11, 2007).

Figure 4: New schemes for city display



Design by Mahir Y.Yavuz.

In the light of these arguments, new interface propositions might be visualised as shown in Figure 4.

In conclusion, converting maps, which until today were the interfaces of cities for us, into new interfaces would enable us to understand the places we live in a better way as much as the versatile data accumulation produced by the inhabitants of a place. Understanding the cities in a better way would in turn enable us to solve their current problems more easily and provide us the opportunity to construct cities that would become the manufacturing establishments of civilisation more consciously.

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WORKING ON AND WITH EIGENSINN A NEGLECTED CONCEPT AND ITS IMPACT ON MEDIA, ART AND ART EDUCATION[1]

GIACO SCHIESSER
TRANSLATED BY TOM MORRISON

Eigensinn – Meaning and Potential of a Concept

At a time when the major narratives to which we had bid conclusively farewell have become possible once more, I wish to begin with a small but magnificent story:

»Once upon a time there was a child who was wilful, and would not do as her mother wished. For this reason God had no pleasure in her, and let her become ill, and no doctor could do her any good, and in a short time she lay on her death bed. When she had been lowered into her grave, and the earth was spread over her, all at once her arm came out again, and stretched upwards, and when they had put it in and spread fresh earth over it, it was all to no purpose, for the arm always came out again. Then the mother herself was obliged to go to the grave, and strike the arm with a rod, and when she had done that, it was drawn in, and then at last the child had rest beneath the ground.«

This »tale« (no. 117) is by far the shortest of those included in the 1819 collection of fairytales by the Brothers Grimm. It is entitled *Das Eigensinnige Kind*[2] (»The Wilful Child«, Grimm 1884, p. 125).

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1 The English version, which is published here in print for the the first time has been revised German publication: »Medien | Kunst | Ausbildung – Über den Eigensinn als künstlerische Produktivkraft«, in, *Schnittstellen*, ed. by Sigrid Schade, Thomas Sieber, Georg Christoph Tholen. (= Basler Beiträge zur Medienwissenschaft. Bd. 1). Basel: Schwabe 2005.

2 The celebrated Brothers Grimm (Jakob and Wilhelm) collected a wide range of German fairy tales in the early nineteenth century, and published them under the title of »Grimms Märchen«. The collection immediately became famous, and has since been a standard on the bookshelves of every German-speaking household. Just as most British children will have heard

More than 150 years later, that particular fairytale was the subject of a lucid interpretation in *Geschichte und Eigensinn*, a book co-authored by the renowned writer, filmmaker and television producer Alexander Kluge and the sociologist Oskar Negt (Klege/Negt 1981, pp. 765-769). Kluge and Negt worked out the rich lexical substance of the term »Eigensinn« (along with the adjectival noun »Eigensinnigkeit« – a word and motif core existing solely in the German-speaking countries – and made the extended, transformed term the strategic pivot of their individual- and species-historical developmental analysis. They define »Eigensinn« as 1) a focus in which history can be comprehended as the centre of conditions of dialectic gravitation, 2) as a result of dire distress (»bitterer Not«), 3) as a reaction to the duress of a given context, 4) as the protest, condensed in one point, against the expropriation of one's own senses leading to the external world, and 5) as the further working of motifs expelled or retired from society at the place where they have most protection, namely in the subject (see Kluge/Negt 1981, p. 765ff.).

For Negt and Kluge, the *Eigensinn* of individuals represents an intertwining of two different processes: on the one hand, it is the *place of repressed desires that have not been lived (Ort der verdrängten, nicht gelebten Wünsche)* that accumulates in the course of an individual and social life. Of something yet to be settled (»ein Unabgegoltenes«), which - because unable to be stifled - insidiously and recurrently makes itself noticed (the hand of the obstinate child that repeatedly emerges from the grave after the child's death, because the child finds no rest). On the other hand, *Eigensinn is the point of departure of all social and individual processes (Ausgangspunkt aller gesellschaftlichen und Individuellen Prozesse)*: social starting point for every political and cultural project, individual starting point for a self-determined life lived according to its own sense (eigen-sinnig). Eigen-Sinn, »own *sense*, ownership of the five senses, through that capability of perceiving what happens in the world around oneself« (Kluge/Negt 1981, p. 766) is the place which must recurrently be worked out in the course of an individual biography and from which a life of one's own can and/or must develop under the given conditions of a historical conjunction. In everyday life, people fulfil not only externally imposed requirements but also pursue their own objects by evading – sometimes consciously, sometimes unconsciously – with surprising, peculiar (»eigen-artig«: of its own kind) and obstinate attitudes those things which they are economically, politically or culturally

episodes from »Alice in Wonderland« over and over again, children in Germany, Switzerland and Austria are familiar with »Grimms' Fairy Tales«.

required to do, undermine them, ignore them, trample them underfoot, oppose and transverse them.[3]

The *Eigensinn* of individuals is best described by this conscious-unconscious, sometimes bizarre and often contradictory will to do that which they want to do, under whatever conditions, by their self-determined actions, their mentalities and their recalcitrance, and by the desires recurrently articulated in a form that goes against the grain.[4]

Due to the semantic richness of the words *Eigensinn / Eigensinnigkeit*, I have proposed that they be adopted as loan words in English.

Excursus: The two paradigms of the concept Eigensinn / Eigensinnigkeit - superbia vs. productive force

In German, the words *Eigensinn / Eigensinnigkeit* possess a lexical aurora encompassing at least four layers of meaning:

- in the most current everyday usage, with clearly negative connotations: stubbornness, headstrongness, obstinacy, wilfulness, sometimes madness;
- the literal meaning is »with the specific *sense* a person gives to him or her self and with which he or she interprets/maps their environment»;
- again, literally: with one's own five *senses*, that is to say with one's own sensibility/sensuality (in German, sense *Sinn* and sensibility *Sinnlichkeit* share the same common etymological root), with the logic and/or structure according to which a person behaves;

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3 Eigensinn / Eigensinnigkeit is one if not the main focus of the whole work of Alexander Kluge. See e.g. his early works Lebensläufe (Kluge 1962) and der Luftangriff auf Halberstadt (Kluge 1977) as well as his recent works Chronik der Gefühle (Kluge 2000) und Die Lücke, die der Teufel hinterlässt (Kluge 2003).

4 The concept of Eigen (one's own) and its compounds is mostly understood – even with Negt / Kluge – in an essentialistic way. In this understanding Eigensinn becomes the archimedic point of the unquestionable authenticity of individuality. I propose to think of the notion of Eigen and its compounds in a non-essentialistic way: The Eigene, Eigensinnigkeit of a person is effect of conscious and unconscious agencies and experiences. A person has to work off his agencies and experiences again and again, she or he has to construct and organize his/her Eigensinn again and again in a new way – in the sense of Michel Foucault's »aesthetics of existence«.

- as positively connotated attributes, *Eigensinn / Eigensinnigkeit* mean independence, originality, perseverance, self-confidence, an original way of looking at things.

The subdominant, repressed and suppressed tradition of the conception of *Eigensinn* as positive, as a productive force was disclosed only in the 19th century, with the Grimm brothers' transcription of the tale of The Wilful Child. The conception which appears here deserves to be worked out in more detail - because of space limitation I can only mark the direction here - by linking it to Sigmund Freud's conception of »extrusion« / »condensation« (Verdrängung/ Verdichtung) (Freud 2001), to Jacques Lacan's conception of the »split subject« (gespaltenes Subjekt) (Lacan 1975, 1991) and to Antonio Gramsci's concept of the »bizarre«, highly contradictorily composed »everyday mind« (Alltagsverstand) (Gramsci 1970, p. 130f.)

The predominant, opposite tradition, which stresses the negative meaning of the conception of Eigensinn, goes back a long time and can be found very early in the antique and the German languages.[5] Augustine's more ambivalent concept of »voluntas propria«, lat. »cosilium proprium« (a person's own will) becomes definitely a negative concept under the influence of the neo-platonism. From that time on »voluntas propria« became the origin of the original sin and the concept has become a battle concept (*Kampfbegriff*) to fight for the order willed by God. In the mysticism of the late middle ages the concept was translated as »eigen meinunge« (a person's own opinion) by Meister Eckehard and Tauler. Luther became the first to translate it with »Eigensinn«. For both, for Luther's Protestantism and for the Catholic spirituality of the 16th and 17th century (e.g. Ignatius of Loyola, Teresa of Avila), »voluntas propria« became the marking for the totality of individual existence and was therefore to be rigorously fought against. Rousseau takes this thread by secularising the term but still using it in a negative way (volonté particulière vs. volonté génerale).

This secularised tradition is taken up, transformed and reformulated, in the work of G.W.F. Hegel[6], which had a great impact on subsequent times. For Hegel *Eigensinnigkeit* is a level of the Unhappy Consciousness of the servant, which has to be sublated (*aufgehoben*). »Der eigene Sinn ist *Eigensinn*, eine Freiheit, die noch innerhalb der Knechtschaft stehen bleibt«. In the framework of her *Theories of Subjec-*

5 For this and the overview up to Rousseau, see, Fuchs (1972); completions by the author.

6 See especially the Chapter »Lordship/Mastery and Bondage/ Servitude« in his »Phenomenology of Spirit«; Hegel (1977), pp. 178ff.

tion Judith Butler has recently picked up the negatively connotated concept of Eigensinnigkeit uncritically approving with direct references to Hegel, (Butler 1997, Chapter 1): »Indeed self-feeling (of the servant, G.S.) refers only and endlessly to itself (a transcendental form of *Eigensinnigkeit*), and so is unable to furnish knowledge of anything other than itself.« (Butler, 1997, p. 47)

The history and development of the dominant conceptions *Eigensinn / Eigensinnigkeit* make clear that the individuality of a person that is rooted in his or her sensibility (Sinnlichkeit) – his or her own senses (Sinnen) – and in his or her own, developed meaning (Sinn) of being in the world has been excluded first under the verdict of the pregiven order willed by God and then subjugated to the majestic-dignity of the (world-) mind. End of the excursus.

Eigensinn of the Media as Productive Force

I have proposed that the notions of *Eigensinn* and *Eigensinnigkeit* be used in analyzing media and the arts, as well as in producing art (Schiesser 2002, 2003a,b, 2005). In other words: I propose to consider the *Eigensinn / Eigensinnigkeit* of media as a productive force of its own.

It is this collision of the *Eigensinn* of the media with the *Eigensinnigkeit* of creators that initiates and perpetuates a significant and paradoxical process. The artist is subjugated to the *Eigensinn* inscribed in the media, yet as a creator who is him-/herself eigen-sinnig, the artist also incessantly tries to make the *Eigensinn* of media yield to his own will. Art has always derived its subjects, aesthetics and future from this process, which, because it cannot be resolved, is interminable. I am proposing, in other words, that we talk about the *Eigensinn* of the media as a productive force.

Everything we are able to say, apprehend and know about the world is presented, recognized and known with the help of media. Ever since the half-blind Friedrich Nietzsche clear-sightedly found that the typewriter was »also working on our thoughts« (an understatement, from the contemporary stance), or at the latest since Herbert Marshall McLuhan's much-quoted aperçu that »the medium is the message«, we have known that media do not merely serve to convey messages but are – somehow – involved in the substance of the message. It is therefore necessary to ascribe to media the power of co-producing, and not just transporting meaning, if not to join Roman Jakobson in declaring meaning to be product of the material (sensory) attributes of the medium itself. In other words, media (by which, in the present context, I mean merely those media which have historically earned special significance for art production, that is to say: literature, music, theatre, photography, film, video, television, computer and networks) possess a meaning of their own (einen eigenen Sinn) – *Eigensinn*.[7]

The talk of the specific *Eigensinn* of different media initially makes it clear that media and their codification are never neutral tools for transporting ideas, images and sounds, especially when these media and codes are being used for academic or artistic purposes. They are inscribed with material, semantic, syntactic, structural, historical, technological, economical and political Eigensinningkeiten and their history (one need only think of what we have learned about the Eigensinn of language from writers like Saussure, Nietzsche, Freud, Marshall Mc Luhan, Lacan and Laclau), of which their users have only partial conscious command. In every contemporary medium being used for artistic purposes, then, its entire cultural history is inscribed, sometimes as »dead labour«, sometimes as »living labour« (Alexander Kluge in taking up a notion introduced by Karl Marx). Every medium possesses a specific materiality, specific technological prerequisites, specific structural attributes, different traditions, semantic charging, and requires different techniques and modes of proceeding of which the artist is only partially aware. Therefore, every medium contains different potentialities and boundaries, and is furthermore defined in its type and effect by economic, political and cultural factors. What can be written in a literary work differs from that able to be shown in a film. That, which photography records or places in scene, is different from that, which is expressed by a piece of music.

Each of these mediums is unique and irreplaceable. The history of each medium saw the development of an ongoing repertoire of aesthetics often strictly separated from, or in contradiction to, those of the others. In

7 Sibylle Krämer gives us an impressive analysis of these facts in »Das Medium als Spur und Apparat« (Krämer 2000). In opposition to Marshall McLuhan (»the medium is the message«) and to positions referring to Niklas Luhmann (»the medium is nothing, it does not inform, it contains nothing«) she argues that »the medium is not simply the message; rather the message keeps the trace (die Spur) of the medium« (Krämer 2000, p. 81, my translation). This trace, which in everyday life we perceive only in the case of disturbances, is a crucial part of every artistic production – facts that amazingly Krämer is not aware of.

A thoroughgoing theoretical connection of the conception of Eigensinnigkeit of media (rooted in the framework of Cultural Studies, media and discourse analysis) with the conception of the Trace (rooted in linguistics and psychoanalysis), as a »present absence« in the sense of Derrida, has yet be accomplished.

film, for instance, this repertoire ranges from the silent-film aesthetic of somebody like Georges Méliès over the first and second French avant-garde movements and Italian Neo-Realism to the contemporary splatter movie. In literature it stretches from the *aventure* novel of Walther von der Vogelweide (or, in the Anglo-Saxon context, from *Beowulf*) over Dadaism and the *écriture automatique* of the Surrealists to the collaboratively authored Net literature of the present. In music it ranges from medieval pentatonics and Italian opera over twelve-tone music and jazz up to punk, hiphop and ambient – to name but a few examples.

Let me specify a few aspects of the *Eigensinn* of a medium on the basis of three mediums subject to extensive artistic usage, and using the examples of literature, Net art, and painting. The basic material processed by literature is language. Language is a time-based, mono-aesthetic medium. Whatever literature wishes to express must be presented in linear, sequential form. As a general rule, the reader reads literature in the form of a book, linearly, from top left to bottom right, page for page. A very different situation applies in the case of works of Net art: they too are time-based media, but they are synaesthetic as opposed to mono-aesthetic, since text, image and sound can be present *in equal measure*. Second, works of Net art are a polyphonic medium: text, image and sound may also occur *simultaneously*. And, third, Net artworks are fundamentally non-linear in design. Therefore, they demand from the spectator what I call »structural interaction«, which may differ in quite a number of ways from the »interaction» of somebody who is reading a book or looking at a painting. Imagine, as the third example, that you enter the Louvre armed with a paintpot and brush, place yourself in front of the painting entitled *Mona Lisa* and attempt to actively alter the painting with your brush and paint. At the very least, you would have to reckon with legal proceedings and a psychiatric assessment.

These examples must suffice as demonstration of the fundamental differences in materiality, authorship, status of the artwork and the necessary behaviour of recipients in such cases. In one case we have an individual authorship, a finished work of art, and a recipient who, in order to enjoy the art, must read a book or view a picture, while in the other case we often have in front of us a collective, sometimes collaborative, authorship, an »artwork in movement« (Umberto Eco), along with, ideally, recipients who – translocally distributed and synaesthetically solicited – must actively first co-create the work of art as actual co-authors, for if they do not act interactively, nothing happens: no work of art comes into being. And the converse holds true: If the artwork comes to a standstill, if there is nobody interactively manipulating it, then it might be »completed«, but is dead at the same time.

I must immediately stress the fact that from the historical perspective the *Eigensinn* specific to a particular medium – which was always a central theme of artistic production – has always emerged in a process of disassociation *combined with* reciprocal influence. The separation of established media from new mediums always entailed the transformation of the former. After the invention of photography, for example, the genre of portrait, important until then, receded into the background. Photography was now the medium of portraiture – until, after a renewed transformation, portrait painting became current once more in an innovative form, as for example in Cindy Sherman's untitled photo-portrait series in the 1980s. As a second example I would point to montage – techniques filmmakers adopted from literature and, having further developed it in the film medium, differentiated and transformed to produce a process of reciprocal interaction, which has endured up to the present day.[8]

Influences | Demarcations | Transformations – On the History of the Media and the Arts

The varied history of the media and the arts makes more clearly discernible, at least since photography was invented, the following processes:

- Artists working in and with the newly emergent medium must initially take recourse to established aesthetics and the methods of old media.[9] They try out, experiment, and only gradually work out the potentialities of the new medium. In some cases – like literature – the development of adequate, media-authentic aesthetics takes centuries, whereas in other cases – like film – it takes merely a few decades. In the early days of film, for instance, the medium as a matter of course took up established aesthetic elements of literature (such as the narrative structure of the story or the figure of the hero), of theatre (ac-

8 See, in terms of literature, the work of writers so dissimilar as Alfred Döblin, John Dos Passos, Alfred Andersch, Alexander Kluge, as well as the books of Marshall McLuhan, which by all means can be regarded as literature, and in terms of filmmakers for instance the work of Sergei M. Eisenstein, Dziga Vertov, Jean-Luc Godard or Alexander Kluge.

9 An example that speaks for itself is the title of Walter Ruttmann's effective article »Malerei mit Zeit« (Painting with Time) of 1919, in which he tried to catch the new of the new art form film through an impressive formula (see Goergen 1989, p. 74.)

tors, dialogue, set), of dance (choreography, rhythm), and of fine art (panorama, close-up, long shot).[10]

- »Old«, that is to say established, media are plunged into crisis by the emergence of a new medium, and are required to alter their focus and differentiate their strongpoints and unique attributes in a new way within the *dispositif* of their particular, historically different media and art productions.[11] I have pointed out the altered focuses in the case of portrait painting in the field of fine art. Since the mid-1990s, it has been possible to witness a clear demonstration of the same process in the case of the theatre.

Due to the rise of the new media, the theatre has been in crisis for several years, and has recognized this situation. What answers has it found so far? On the one hand, we have seen the emergence of theatre that radically returns to and brings into focus one of its specific attributes, its physicality (as in the work of the Catalonian group La Fura dels Baus, or in contemporary post-dramatic theatre). On the other hand, theatre has emerged that attempts to reflect upon the new media (computer, networks), and to deploy them not merely as tools but as mediums for renewed, transformed theatre forms (for instance, the Japanese group Dumb Type, the Canadian director Robert Lepage, the Swiss director Stefan Pucher, or the German playwright Ulrike Syha or, within the last few years, also Fura dels baus).[12] In art-historical terms, the alternatives

10 Photography furnishes a further example. »In early photography, the shots were often composed like paintings [...]; the ›random‹ appearance of the snapshot, the caught moment, were not yet used.« (Bell 2001, p. 116).

11 The catalogue *Autour du Symbolisme* (2004) yields the impressive evidence for that thesis where the interplay between the art of painting and photography in the early days of photography is worked out in detail. The interplay expands from the legendary reaction of the painter Paul Delaroche in light of photography, »La peinture est morte«, to the poignant similarity of Gustave Courbet's *Origine du Monde* and the stereoscopic photography of Auguste Belloc.
Furthermore, every given historical cycle is characterized by articulation through media with a dominant factor or dominant factors. At present, television remains the dominant factor.

12 Fura dels baus have started to discover the net as new platform for their interactive street theatre. See e.g. their interactive audio-net project F@ust 0.3 of 1998. (Further information and links concerning this project can be found on: http://www.swr.de//swr2/audiohyperspace/ger_version/ interview/jorda.html). The example of Furas dels Baus shows that a realisation

grasped are recurrently either to recall or focus upon a specific attribute of the old medium, or to reflectively integrate the medium, which is new at a particular time. Even if the consequences of either method differ, they both bring about a transformation of the established medium.

- If the *Eigensinn* of a new medium has to some degree been recognized, tried out and developed, the new artistic methods and possibilities have an effect on the old media. Soon after the invention of photography and film, for instance, these media began to exercise a strong influence on literature, and since very recently we can witness a similar influence being exercised by the new media: The attempt to explode the linearity of the language defining the literary work in its four-hundred year tradition can be traced from Dadaism over the montage novel and *écriture automatique* up to Concrete Poetry and the contemporary attempts to make useful for printed literature the non-linear link structure which is fundamental to the Internet.
- Hybrid forms emerge that co-exist with the mono-media art forms. Historical examples would be *ready-mades*, experimental films, Happenings, art interviews, film essays, and video installations.

»Art as Technique« | »Art as Method«

As I will demonstrate, art as technique and art as method are two different aspects of one and the same process. I will begin with »art as technique«.

It would be possible to connect up the following considerations to current art discourse by referring to somebody like the French philosopher Jacques Rancière, a recognized authority on literature and film, who articulated his view on art as follows: »Like knowledge, art (...) creates fictions, i.e. material redistributions of signs and images of the relationships between what one sees and what one says, and also between what one does and what one can do« (cited after David 2001, p. 195). Or by referring to Jean-François Lyotard's thesis: that work of art »tries to present the fact that there is an unpresentable« (Lyotard 1984, p. 101). This attempt – the ultimate driving force in art – is a »task of derealization« (Lyotard 1986, p. 79) of the images, the representations, the ordering frame of reference. However, I wish to go back further in time and de-

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of the two possibilities of dealing with a crisis of an art media does not mean an either – or. The same authors may choose both possibilities.

ploy the historical formula of »art as technique«, which is rhizomatically linked to the analyses of Rancière and Lyotard. The hugely influential notion of »art as technique« dates back to the Russian literary theorist Viktor Shklovsky. In his 1916 essay »Art as Technique«[13] (Shklovsky 1994) he attempted to comprehend the objective of art, and in particular the objective of the image, while at the same time establishing a clear distinction from the aesthetic of mimesis predominant at the time of writing.

» ›If the whole complex lives of many people go on unconsciously, then such lives are as if they had never been.‹ And art exists that one may recover the sensation of life; it exists to make one feel things [and not, like in science, to recognize them, G.S.], to make the stone stony. The purpose of art is to impart *the sensation of things* as they are *perceived* and *not as they are known*. The technique of art is to *make objects ›unfamiliar‹«* [»ostranie«: making strange, G.S.[13], to make forms difficult, to increase the difficulty and length of perception because *the process of perception is an aesthetic end in itself* and must be prolonged. Art is a way of experiencing the artfulness of an object; the object is not important.« (Shklovsky 1994, emphasis G.S.)

Shklovsky is essentially concerned with two things. First, by means of abbreviated (stunted), automated perceptions – »habitual associations« (Brecht) – people rapidly and transiently reduce the wealth of objects and facts in their everyday lives to recognizable schemata (cf. Shklovsky 1994). Art, by contrast, destroys these automatic mechanisms. By various techniques, objects and circumstances are abruptly severed from their customary associations, decontextualized, »made strange«, so that the process of perception is prolonged and/or made more difficult, and the object is not merely recognized, but »felt« and, as if for the first time, »seen«. The core concept in Shklovsky's considerations is that of the necessity to break through the »automatism of perception« by »various means« (Shklovsky 1994). The technique of art stressed by Shklovsky has consequences in regards to the aesthetics both of production and reception; in the present context, the production-aesthetic consequences are especially interesting: If the »making of a thing itself« and the »form made difficult«, that is to say the »making strange« by »various means«, become the central focus of art, then immediately the question about the medium, about its *Eigensinn*, is on the agenda: about the undiscovered possibilities and obstinacies sketched out above. For the »form made dif-

13 Shklovsky, Viktor Borisovic (1965): »Art as Technique« in Russian Formalist Criticism: Four Essays, ed. Lee T. Lemon and Marion J. Reis, Lincoln: University of Nebraska Press, pp. 3-24.

ficult« and the »various means« are directly dependent on the materiality, structure, and technology specific to the chosen medium.

On the Second Aspect: Art as Method

Art as method means to place the experimental in the foreground. But in contrast to the natural sciences, in which falsification and verifiability are the decisive criteria leading to proofs and verifiable results, the ultimate target towards which artistic practice is oriented is not the fixation on results but the process-based character of creative activity. Artistic experimentation is concerned explicitly with the »conditions of what is possible« (Philippe Lacoue-Labarthes, cit. after David 2001, p. 185), not with the foundations of the feasible. As a procedure of artistic practice, experimentation means to develop strategies of innovation. This, however, this presupposes something that might be described as an attitude of inner productivity. This attitude – which any academic media and art education must play an essential role in co-conveying to its students – is expressed in curiosity, willingness to take risks and refusal to compromise in regard to one's own subjects and interests and in regard to the work on and with the *Eigensinn* of the media. Admittedly, it is possible to theoretically reflect upon the possibilities of a specific medium and also, in the case of media whose histories are as long as those of literature, theatre, dance and music, to analytically define them more precisely. However, in order to investigate, try out, test to the limit and transform a medium, in order to undermine it, hybridize it, to go against its grain, in order to make it sensorial possible to experience as an artefact, it is necessary to practice art on and with the particular medium.

Let me illustrate the above on the basis of two examples from film history. In the 1960s, the filmmaker Jean-Luc Godard withdrew to Lyon and for several years (as a member of the *groupe dziga vertov*) was almost exclusively preoccupied with video, at that time a new and exciting medium. The result was a series of videos (*Six fois deux, British Sounds, Pravda* et al.), in which the video medium is investigated experimentally, and new contents, new techniques, new methods and modes of perception are tried out. Finally, Godard put to use in film the experience thus gained by integrating the investigated formats, methods and findings (non-linear dramatic structure, splitting up one large screen into several small ones, aesthetic of the image) into films such as his *Numéro 2* (1975), and so expanded the possibilities of film by transforming the medium. Or take the writer, filmmaker and TV maker Alexander Kluge, who attempts to make the television medium go against the grain, to wrestle from it new possibilities, and in this way enable the viewers to have new experiences, experiences that simultaneously presuppose and promote intense sensorial activity on the part of the audience (of broadcasts such as *News and Stories, 10 vor 11, Bekanntmachung!* et al.). Kluge accomplishes this by using a number of different aesthetic procedures, techniques and structural elements adopted from the rich history of film, music and literature and adapted for television: minute-long close-ups, original sound, slowness, inserted text panels, or the mounting of »classical lenses« on electronic cameras. »We use,« states Kluge, »a Debrie camera from 1923, for instance, and program the electronic computers to obey the rules that long-dead cameramen fed to this Debrie camera. In this way, we recall a piece of dead work from film history, and program it into the broadcast.« (Cit. after Schiesser/Deuber 2000, p. 363f.)[14]

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14 The history of film, like that of all technology-based mediums, is rich in artists who worked not only *on,* but also explicitly *with* the Eigensinn of the medium.

Just some of the many other deserving names not mentioned so far are, with respect to film: Georges Méliès, the filmmakers of the first and second French avant-garde (like Germaine Dulac, Elie Faures), the exponents of the »Absolute film« (Walter Ruttmann, Viking Eggeling, Hans Richter), Guy Debord, the »documentary filmmaker« Chris Marker, as well as Stan Brakhage, the American filmmaker who died in 2002. Concerning music remember, among others, such different artists as Kurt Weill with his »Absolute Music», John Cage, Frank Zappa, Prince, Eugene Chadbourne or Fred Frith; for literature, e.g. James Joyce, the Dadaists, the exponents of the »Concrete poetry«, Arno Schmidt, William Burroughs or Thomas Pynchon; for video art, Nam June Paik, Isidor Isou or Karl Gerstner, just to mention some of the first generation; for computer and networks as art media, among others, Jodi, I/O/D, Margarethe Jahrmann, Knowbotic Research or the Chaos Computer Club.

Television is the only media, which hardly became an art format. »Television is indeed the most hopeless medium of all for the arts. (…) There was scarcely a phase, when everything was open, allowing creative investigation to define the medium.« (Daniels 2004, p. 58). In spite of the experiments of Otto Piene / Aldo Tambellini, Gerry Schum, Peter Weibel, Valy Export and the WHGB-TV station in Boston it remains a »medium without art« (ibid., p. 59) – with the exception of music video clips, which, though, were developed for different purposes.

An impressive insight, rich in its material, in the development of the tight interplay of media and the arts since the invention of the photography in 1939 to the present is given by the German-English omnibus volume Frieling/Daniels 2004.

A Media and Art Education in Pace with the Times

Eigensinn of the mediums, art as technique / art as method - these are the focal themes on which I trained my sights in the foregoing. I chose these aspects of the wide »media and art« field because I consider them to be the strategic factors or problematics in a model of media and art education on a level with the times. Individual, collective and collaborative authorship is the third, and equivalent, factor that joins the two stated already. What would the *Eigensinn* of the mediums amount to without the *Eigensinningkeit* and the *Scharfsinnigkeit* (the acumen) of artistic authorship!

A media and art education in pace with the times, an education thought out in terms of the future and at the same time taking seriously and working through traditional experience, will place territories of experimentation at the disposal of students. In these territories students will be expected and encouraged to carry out curious, radical and uncompromising work – both individually and collectively, and *eigensinnig* at all events – on self-chosen or biographically inscribed interests, contents and subjects, as well on and with the *Eigensinn* of various single and hybrid mediums.

Today, transmedia education is part of media training. Transmedia education means that the students are empowered to work simultaneously in and with one medium, and at the same time to learn how to devise and use artistically the interface to other media. In a media- and technology-based age like the post-industrial present, authorship means not only individual or collective authorship to which everybody contributes his specific components, but also collaborative authorship in which everyone is capable of networking his/her specific skills with those of the others, and over and over again emerges from this process having been fundamentally transformed. However, alongside the development of social, communicative and, in increasing measure, analytic competence, this requires in-depth knowledge of one's own medium and knowledge of the other media. I see the significance of an education that intensifies this mindfulness of the nature of media and simultaneously encourages transmedia networking – and such an education must inevitably extend beyond the subjects offered by an art and media academy – as lying in the fact that it enables the students to make their way as artists on a level with their times or as flexible and versatile media authors of the type increasingly and urgently required by the »information society«. In either case, they will be capable as individuals and as members of a team of assuming the responsibility for content, conception, implementation, production processes and budgeting.

If it is true to say that a new medium exercises a dual influence on old media insofar as it forces the latter to re-assess their possibilities in the light of new conditions, and at the same time transforms them, then an important challenge and chance for media and art education lies also, and particularly, in the enabling and furtherance of hybrid or cross-over artworks, be they interactive audio installations, video essays, media architecture, transmedia interfaces in urban spaces, DJ events, digital poetry, new aesthetics of the performative, SMS visuals for clubs, parties, intercity streams of DJ events, Net TV, cultural software, radio concerts for mobile phones – or, or, or. Transmedia or hybrid art demands – and in the mid-term that is the central challenge for art education – the working out, communication and usage of a series of complex specialist areas like neurophysiology, cognitive sciences, architecture, nanotechnology, theories of information, aesthetics, cognitive and perception theory, life sciences. At present, these subjects are taught at not one, but several different, universities – a situation essentially due to the striking leap forward taken by the media as a result of digitalization, even if they had become increasingly technology-based from the invention of photography onward. Thus, for art too, the *dispositif* has changed fundamentally and dramatically.[15] Some years ago, Hans-Peter Schwarz, the former director of the Media Museum at ZKM Karlsruhe, published a richly informative article in which he reconstructed the changing history of the various arts and of technology since the eighteenth century, and established the inescapable significance of technologies for contemporary and future media arts (Schwarz 1997, p. 11ff.). The linkage of the arts, technologies and sciences – a linkage that during the brief, historic epoch of the Renaissance took place as a matter of course – has today undeniably become a prerequisite for future art and media work, and for that reason also for adequate training in that field.

Literature

»1460 Antworten auf die Frage: Was ist Kunst?«, edited by Andreas Mäckler (2000): Köln.

15 Here it is necessary to recall something »remaining to be settled« (»ein Unabgegoltenes«) in ›materials aesthetics‹, which made strong ›art as a specific mode of production‹. And, in doing so, simultaneously referred art to the fact that it is dependent on the general development of productive forces and would have to reflect upon these for the sake of its own development. Mittenzwei (1977) offers a comprehensive insight into the history and projects of material aesthetics, pp. 695-730.

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Cultural Parasitology: Art in its Sociopolitical Complexity

Hiroshi Yoshioka

The word »parasite« has obvious negative connotations within our normal conversation. For many it is disgusting to know that other organisms live inside their own body. Besides biology, the word is associated with a person or group exploiting others without giving anything in return. Being a parasite means living in unilateral dependence of others. In contemporary Japanese language, the word »parasaito« (which derives from the English word »parasite«) often means a son or a daughter who will stay at their parents' house after they come of age, with no intention to get a job and live on their own. This is supposed to be a social problem. In another context, »parasite« can mean something more harmful. It refers to those who not only rely on, but also cause serious damage to the »host« through their selfish activities. In this sense »terrorists« are sometimes called »parasites« when they attack the very society, which they benefit from.

When we listen to what modern biology tells us, however, we come to understand that the relation between the »host« and »parasite« is not that simple. There are many cases in which we observe complex, mutual relationships between the two in the developed ecosystem, instead of one's total dependence on or exploitation of the other. »Parasites«, if they want to survive longer in the host, come to learn that they should give some benefit to the host and finally make it dependent on them. Tactful fighting and clever negotiations take place before both of them come to a state of symbiosis. But of course this symbiosis is realized as the result of evolution, not of any conscious intention or planning. From our (human) point of view, organisms live as if they had a consideration for the environment, though in reality they just behave to maximize their own benefit. This is the most amazing thing about living nature.

I know there is a certain limitation to employing biological metaphors when we talk of human culture, yet I think it important to pay attention to this dynamic process of symbiotic relations in the context of culture, especially of art, because in many »developed« societies art seems to have been neatly institutionalized and to have lost the transgressive, critical power it used to have. It is also the case with Japan. In the 1950s and 60s, when the society was still poor and confused in many ways, there were radical avant-garde movements. Perhaps the turning point was in 1970, when the country celebrated the success of its post-war economic development. And since the 1980s, art has come to feel comfortable to be established as a branch of culture, though there appear many new, sophisticated postmodern fashions in the world of art. Art has become much »cleaner« than what it used to be. This transformation of art corresponds with the fact that the society has become much more affluent, comfortable and cleaner in many ways than that of more than decades before.

»Cleanness« is what we once aimed to establish, when we still had to live in unsanitary conditions. There is nothing wrong with the ideal of being clean, of course, but the ideal turns to be irrational when the society starts pursuing cleanness for its own sake, to the extent that people try to cleanse their life of every impure, unfamiliar factor. The search for cleanness seems to be an obsession today. But life (both in a natural and cultural sense) needs a more or less »dirty« environment. Contamination is sometimes necessary for growth and change. To paraphrase it in the cultural context, art cannot be a truly meaningful practice if it lives in purely artistic and aesthetic sophistication. This is why I came to believe we should discuss issues of art and culture in a wider perspective including the biological view and social changes.

Enlarging the discourse on art was one of the most important ideas when I started the critical journal Diatxt. in 2000.[1] In the sixth volume of the journal titled »Parasite Paradise«, I interviewed Dr. Koichiro Fujita. Dr. Fujita was then a professor at the graduate department of Environmental Parasitology at Tokyo Medical & Dental University, since 1987. His speciality is parasitology and infection immunology. Besides his academic achievements, he has written many books for general readers. There he argues for a better relationship between humans and parasites, and humans and pets. He has warned of the dangers of people obsesssed with cleanliness in Japan, an obsession driven by a wide range of industries. In the following you will read the excerpt of the interview:

1 Diatxt. (volume 1 - 8), ed. by Hiroshi Yoshioka (2000-2003), Kyoto Art Center.

Figure 1: Hiroshi Yoshioka interviews Dr. Fujita.

In order to join »developed« countries, Japan had to be a »sanitary« state. The negative image of the roundworm was convenient for the government to promote a sanitation policy. Many years before WWII, the Japanese government had warned its citizen about roundworms, and urged them to exterminate the insect. To have no worms meant to be modern. The government utilized such things as a »song for sanitation« or »the exhibition of sanitary life« to push people to be clean. The Pacific War interrupted this policy, but when the War was over, it came back with the American Occupation Army and General McArthur.

Before modern times, there was a deep symbiotic relation between roundworms and people in Japan. In the Edo Period, people thought it normal to be infected by parasites, no matter what the authorities might think. Leyasu Tokugawa, the first Shogun of the Edo Period, promoted the immigration of seventy hundred thousand people to the region that is today's Tokyo, and he tried to establish a self-sufficient food production system. But the land was not fertile enough to supply food to such a large population. So the Shogun decided to fertilize the soil by using excrement. Thus, in the Edo Period, waste from the human body became one of the most important items of distribution. It was even called »Kim-pi (gold manure).« Naturally, in this system, roundworms infected many people. They tried to reduce the chance of infection by keeping excreta in receptacles. During the natural process of fermentation, the heat produced kills eggs of roundworms. There were many other methods, but none of them led to complete extermination. People at that time allowed parasites to enter their body, thinking, »well, it's OK, if its not too many«.

The Japanese language has many expressions using the word »Mushi« (worm): »Mushi no shirase« (›a notice from worms‹ meaning

›a presentment‹), »mushi ga sukanai« (›worms dislike' meaning ›unpleasant‹), »mushi no idokoro ga warui« (›worms are in a wrong place‹ meaning ›to be in a bad temper‹), and others. I heard a theory explaining that the animal, which the word »mushi« originally referred to were roundworms, which people felt quite familiar with. As you know, the Japanese word »mushi« has so many meanings: »worm«, »insect«, »small creature« and so on, but if you look up the word in a dictionary published in the Edo Period, you will find, perhaps in its fifth definition, »mushi is a creature you have in your bowels. You may not like them, but you cannot get rid of them.«

I think Japan was the only country that used human excrement to fertilize the soil. Because of this, our ancestors refrained from eating raw vegetables. In 1945, the American Occupation Army came to Japan. They ate salads, and naturally got roundworms. Then McArthur complained to Yoshida, the Japanese Prime Minister at the time, the country was unclean. A collective stool examination was initiated in schools, and students were instructed to exterminate all parasites. This began the postwar sanitation policy in Japan. People who used to know how to live with worms, who had established a symbiotic society including parasites, were suddenly told to regard worms as enemies. First the Japanese exterminated roundworms, and then started killing all germs, some of which protect our body. This is what our country has done to parasites.

As a doctor specializing in parasitology, I have seen a lot of cases in which people reacted to parasites in many peculiar ways. In one case, a roundworm came out of the mouth of a young woman, while she was with her fiancé. The man was so shocked that he immediately broke off the engagement and ran away. Seeing a roundworm can sometimes be a trauma. In today's society, few people have ever seen, and know so little about, the worms living in their body. As a result, they imagine it would be a catastrophe to have one. But in many cases, when I explain to them that worms are not as harmful as they imagine and sometimes even beneficial to the body, they feel relieved. Their feelings towards roundworms change dramatically. After listening to my explanation, the patients start thinking of worms as »beautiful«, even though they found them disgusting only a few hours earlier. Young people today, without any personal experience with worms, visit Meguro Parasitological Museum and enjoy looking at worms, even saying »kawaii (cute)« or »interesting.« This is amazing! If you hate snakes, you would still hate them after you listen to a zoologist explain how important snakes are to the environment.

Figure 2: Parasites.

Picture: Hiroshi Yoshioka.

Well, the general view on worms has to some extent certainly changed. But it is still hard to remove the prejudice about germs. I think this prejudice is the result of the influence of industry and commercialism. When you watch TV, you find an enormous number of ads selling soaps, cosmetics, medicines and other items that emphasize the power of killing germs. I think Japan is a nation easily brainwashed by ads, con-vinced by messages that emphasize »clean, clean, clean.« At the same time, manufacturers probably realize that excessive cleanliness can be bad for health. I don't know if the Japanese originally had any love for cleanliness, but consumers like to buy these products, so these products become as germ-free as possible. I keep telling people that it is bad for the skin if they wash their hands with soap containing an antiseptic, and that by rinsing the mouth with a disinfectant they kill germs, which protect the mucous membrane. But people don't listen to me. They are extraordinarily obedient to the propaganda by mass media.

We should stop following this simplistic approach to cleanliness, and reconsider what »clean« and »dirty« really mean. We should pose this question within the wider perspective of symbiosis. I have learned from my study of parasites the true meaning of symbiosis. The word »symbiosis« is used too casually today, without thinking seriously about it. It is often used just as a convenient, or a beautiful word. People like to imagine that we could live peacefully together, if we had a feeling of love and kindness. Not at all! Symbiosis is not such a simple thing. It is something you can attain only through extraordinary struggle and negotiation. Symbiosis is the result of efforts on both sides – the parasite and the host – to find a way to survive in the environment they both share. When a parasite enters your body, your immune system immediately tries to remove it. The parasite covers its body with its excreta, to dodge the attack. The immune system, cheated by this trick, attacks the excreta, but leaves the parasite intact. However, this attack is not meaningless for the host, because it turns out to control unwelcome allergic reactions in its body. You see? This sort of clever mutual relationship has developed as a result of evolution. This is symbiosis. Para-sites never intend to do any good to the host. And in fact, they would die if they killed the host. So they try to find a place where they can live comfortably in the host's body, sometimes struggling with it, sometimes deceiving it.

Studying parasites has led me to worry about education in Japan. Today, teachers as well as parents don't like children to fight. They are afraid of children injuring or being injured by others. But education is impossible if you care too much about danger. Adults are avoiding their responsibility by making safety a top priority in education. This attitude makes things worse, because it blocks the way to true symbiosis between people. To say »Don't fight« or »We should avoid danger« is easy, but it sometimes weakens our ability to find a new way to live with others. You can fight, when necessary, say what you want to say to others, see how they respond, and look for a way to live together. But you shouldn't fight too much, shouldn't try to exterminate the enemy. If you try to kill the enemy completely, you will be killed. A fight for symbiosis is not a fight to destroy, but a fight to make the other tolerate your existence. And you, in return, learn to tolerate the existence of the other.

This is why »culture« is necessary. Culture sometimes conceals the animal side of the human. But I believe true culture should acknowledge the human as animal. Such a culture will last much longer, I think. Unfortunately, the tendency to excessive cleanliness that we find in contemporary Japan shows our culture to be too one-sided, too inclined to suppress our animal nature. This is the true danger...[2]

I have to say the »danger« that Dr. Fujita worried about still remains, not only in education, but also in contemporary Japanese society in general. The tendency to avoid »fighting« or conflict has become widespread and reinforced in many different aspects of society. »Self-control« is admired as the most important virtue to live in »harmony« with others. Even art seems to be deprived of its power to provoke radical questions. Art has been reduced to commodities, whether they sell in a large commercial market or in a smaller art field. Culture itself seems to have lost its critical potential and is regarded as cleanly packaged »contents«.

2 »True Symbiosis« (2002): an interview to Dr. Koichiro Fujita, in Diatxt.06, Kyoto Art Center, pp.38-48.

In other words, it is culture as a »property« or a »heritage« with its already established value, which is only to be preserved and studied. This is exactly the point where we have to remember what Fujita calls »culture« in the last paragraph. »Culture«, as he defines, doesn't mean any artifact, but an interface, so to say, between humanity and animality. I think this unconventional understanding of culture is crucially important to reflect radically on our situation today.

I think art should be the very core of culture understood in this sense. Art, in the enlarged sense of the word, means an activity to create a new discourse, a discourse mediating between our animal nature and rationality, and encouraging us to continue to live. New media art, which works in close relation to digital technology, is no exception. Life today is more and more penetrated by the logics of technology, and we are urged to dream that every aspect of our life could soon be pre-programmed and controlled. In the present situation, this dependence on technology is also motivated by the fear of possible terror attacks, and people believe that establishing perfect security is the most urgent business. Security, security, security. Attempting to exterminate terrorism, we ourselves come to live in a kind of an anonymous, internalized terrorist order. We do need more art. I hope media art, by an inventive use of technology, awakens our power as an animal to cope with the unknown. I hope it reminds us of the fact that life is meaningful because the future is always more or less unpredictable.

In the globalizing industrial society, art and culture are sometimes treated as less important, or even »parasitic« activities because they don't directly contribute to prosperity.[3] What has happened under the name of »university reformation« in Japan for the last two decades is the introduction of market principles into academic institutions. As the result, technology and business have been dramatically reinforced while humanities have been »restructured« in many universities. It is a pity. The most serious influence of this »reformation«, however, is the standardization of any kind of academic knowledge according to the productivity model of technology. That's why we, those who work on art and culture, have to develop »parasitic« strategies, I think. There is nothing shameful about being a parasite, as every life is more or less parasitic. What is really shameful is sticking to the false image of a solid, independent »self«. From a parasitological point of view, »self« is nothing but a construct created through interaction of a lot of »others« inside us.

3 Maybe I should say that the contribution of art and culture to society works in such slow and complex ways that it can never be estimated in the same way as in technology.

Figure 3: Diatxt Cover.

Placed in the cultural context, parasitology not only teaches us tolerance with others. It can suggest an alternative way of understanding ourselves in the universe. Modern western civilization has developed on the basic assumption of human beings as lords of the planet. If we regard the earth as the host, however, all the organisms including us are like parasites. Humans can only survive in multiple and complex inter-dependence with countless other creatures, and we know this not through any religious teaching for modesty, but as a simple scientific fact. We should throw away the image of ourselves as agents living totally on our own. In this way, culturally understood parasitology may come close to (at least the best part of) Buddhist insight.

In modern times, technology has often tempted us to dream of becoming a super-human being. I would call this an old-fashioned hyperbole. Instead, I recommend looking at us as a parasite living both in a physical as well as a cultural universe. I expect this view will blur the line too sharply drawn between nature and culture, deconstruct the long-standing anthropocentric worldview, and finally lead to new ethics in the technological future.

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Blurring the Boundaries - Interactions between Choreography, Dance and New Media Technologies

Scott deLahunta

The connections between dance and technologies can be looked at from five fundamental perspectives:

- Historic: Separate but often overlapping contemporary arts practices; modern/ post-modern dance having evolved alongside the electronic and media arts
- Creative: An artistic tool in particular in the form of the digital computer; technology integrated into a variety of genres such as music, film, graphic arts, etc. and to an increasing extent in the creation of dance
- Inter-disciplinary: A field that encourages collaborations between programmers, media and performing artists to which radically different skills and approaches are brought
- Aesthetic: adding to the lexicon of contemporary arts practice concepts such as ›real-time‹ and ›interactivity‹ which link technologies and performance
- Symptomatic: As rapid societal changes, information and communication technologies provoke questions and interactions that may be reflected in performing arts practices.

In this paper, I draw on only some of these connections: primarily on the notions of creative/artistic tools and interdisciplinary practices to examine what might constitute an artwork in which both dance and technology may feature. Using examples of several practicing artists, I hope to elucidate a diverse field of arts practice defined neither by adher-ence to tradition/convention nor its opposite avantgarde/ experi-mental, but more by the capacity for switching between modes of practice and artistic media/ materials. This capacity is one that I will refer to as *blurring boundaries*.

The Artwork
imagining a set of open-ended relationships

To illustrate how artworks that involve dance and technologies might occupy various positions within this concept of blurring boundaries I will use some of the following works of artists Klaus Obermaier, Mark Coniglio, N&N Corsino, Rosemary Lee/ Nic Sandiland, Prue Lang, Scott Snibbe, Marie Sester and Blast Theory.

Body Scenography: Klaus Obermaier transforms our perceptions through media performance

The performing arts have traditionally relied on a clear separation between the stage and the spectator; where the performers remain on one side of the proscenium arch (or the idea of this arch) and the audience on the other. The integration of media technologies in the framework of this convention is dependent at least partly on the knowledge of how projections and lighting work together on stage scenographically. The work of Vienna based director/composer Klaus Obermaier provides us with a good example of this.[1] Obermaier has developed and produced two unique dance works that have used the dancer's body as the primary video projection surface. The first of these, *D.A.V.E.,* which premiered in 2000, was created with collaborator/dancer Chris Haring and has toured in over fifteen countries. However, despite many audience members being convinced they were seeing a ›interactive‹ media dance piece, the production of *D.A.V.E.* involved no such technology. Obermaier intended only that the relationship between body and projected image would successfully drive the linear narrative of the piece on stage. The timing and location of the projections on the stage is all pre-choreographed, so for the visual effects of the ›moving body projection‹ to work, Haring has to be able to perform the same movements at the same place on stage every performance.

Following the success of *D.A.V.E.*, Obermaier and Haring created another piece using body projection titled *Vivisector*. Obermaier's aim this time was to generate a more abstract perception of the body in the mind of the audience, so *Vivisector* uses fewer literal images projected on the body, often using the projector only as a light source.

1 Klaus Obermaier website: http://www.exile.at/ (April 14, 2008).

Figure 1: Klaus Obermaier: D.A.V.E. (2000).

Credit: Klaus Obermaier.

As with *D.A.V.E.*, the success of the piece relies on the performers/dancers being able to be in the correct place on the stage at the right time to become canvasses for the projections. *Vivisector* also takes the ›moving body projection‹ concept further by working simultaneously with four dancers on stage rather then one. And, as with *D.A.V.E.*, the aim of the work is not to emphasize the wonders of technology but to foreground the body in a media landscape, and, in *Vivisector*, to reflect something fundamental about the nature of perception.

For the next work in this series of moving body projection projects, Obermaier collaborates with technology specialists of the Ars Electronica Futurelab to develop a piece for the stage that uses sophisticated motion tracking and real time video synthesis and pro-jection technologies to enable the performers to move freely about the stage while still serving as the surface for the image. The result of this collaboration premiered at the Ars Electronica Festival in September 2005.[2]

Isadora Software: Mark Coniglio puts interactive media creation in the hands of the dancer

Partly due to the technical challenges of the project, partly because of his artistic approach, Obermaier's interactive project for the stage relies on a successful collaboration between specialists in specific domains. Until

2 Obermaier's new work is partially supported by DAMPF, a European joint performing arts/ technologies research project: http://dampf.v2.nl (April 14, 2008).

recently, dance and technology projects nearly always required collaboration between dance and new media artists/computer scientists partly because the software for complicated interaction and real time digital media processing could take a long time to learn to use. Now that the standard more affordable desktop and even portable computer is powerful enough to be integrated as an artistic tool into a variety of arts genres there are many more choices of creative software available, some of which has been designed for use by the non-specialist. The most important addition to this area is the contribution of performance and media artist/ programmer Mark Coniglio of a non-specialist software programmed specifically for the dance and theater maker named *Isadora*.

Coniglio is co-director with choreographer Dawn Stoppiello of the multi-media performance company *Troika Ranch*, based now in New York City.[3] Founded in 1993, *Troika Ranch* integrates interactive real time systems into their performance work, and Coniglio has written most of the software to support this. Some years ago, he began to develop a program that would combine the functionality of several existing softwares he was using and be simple enough for the non-programmer to work with creatively after only the briefest of introductions. The result is the software program *Isadora* (after the modern dance pioneer).[4] While it was made and priced with the performing artist in mind, *Isadora* is so well designed and multifunctional it is used by many artists working in interactive installation and performance, sound art, mixed media and club culture.

Figure 2: Isadora used in Troika Ranch's ›Future of Memory‹ performance, performer Sandra Tillet.

Photo Credit: Richard Termine.

3 Troika Ranchs website: http://www.troikaranch.org/ (April 14, 2008).

4 Download a trial version of Isadora from http://www.troikatronix.com/ (April 14, 2008).

Isadora features the module and patch cord interface that would be familiar to users of more difficult to learn software (such as *Max/MSP*) [5], but Coniglio has developed sophisticated labeling that explains clearly through text and graphics what each module is doing. This makes it relatively easy for the non-software specialist to quickly and intuitively integrate digital media into his or her creative process. It is this ease with which *Isadora* makes it possible for the choreographer or theater maker to independently make edits and changes to the media in the context of the rehearsal process that makes this software a unique and notable addition to the field of creative software tools for the performing arts. By breaking down distinctions based on expertise and through its increasing use by artists working in different genres, *Isadora* contributes to blurring the boundaries of what constitutes the making of an artwork.[6]

Choreographers making installations N&N Corsino choreograph for 3-D computer environments; Rosemary Lee and Nic Sandiland compel viewers to dance; and Prue Lang transforms the space/ time of choreography via other means

Artworks involving dance and technologies do not always manifest in performances for the stage, but may involve the audience as participants or performers. These projects have tended until recently to be created by those specializing in interactive media, but today one can point towards choreographers who are blurring the boundaries of their disciplines by making non-stage based, installation works.

Combining 3-D motion capture, computer gaming environments and choreography, *Topologies L'Instant* (2002) is an installation work by French choreographers Norbert and Nicole Corsino.[7] In the piece, the viewer/participant navigates freely throughout the five levels of a 3-D computer graphics environment using a standard handheld game controller to accelerate forward or backwards and turn left or right. The

5 Max/ MSP is popular but complicated to learn software for use in interactive art making: http://www.cycling74.com/ (April 14, 2008).

6 For a longer online interview with Mark Coniglio about Isadora and artists using thjis software see: http://huizen.dds.nl/~sdela/sfd/isadora.html (April 14, 2008).

7 N&N Corsino have done some of their past research in association with CICV (Centre International de Création Vidéo – http://www.cicv.fr). (April 14, 2008).

space is comprised of largely flat, desertlike landscapes where one encounters surreal sculptured video walls, modernist semi-transparent multi-level buildings and strange empty structures. Scattered amongst these are dancing figures animated by movement sequences recorded using 3-D motion capture. One can approach these figures from any direction and pause or slow their movement down. This world is there to explore in one's own time from any perspective. It is a significant achievement and a sign of things to come.[8]

Recently commissioned by the Arts Council England through the innovative Capture series supporting choreographers to work in the field of screen based and interactive media, choreographer Rosemary Lee and electronic and media artists Nic Sandiland have created and premiered a new interactive installation based artwork titled *Remote Dancing* (London premiere, February 2004). As described in the brochure the piece is »A video installation where the interaction of the viewer and on-screen dancer becomes an intimate pas de deux. Remote Dancing is an ingeniously simple concept. Rich in possibilities it uses new technology and allows each viewer to experience their own compelling and unique dancing partnership.«

The installation is built around a long corridor that uses ultrasonic sensors to determine the participant's exact distance from the video projection at the corridor's end and uses this information with the *Isadora* software to control the position or key frame of the video image. Imagine you are the viewer/participant: the image on the screen is of a single person dancing towards you as you walk (or dance yourself) down the corridor. When you move all the way to the rear of the corridor it triggers the video to play back the image of another person dancing towards you on the screen. As can be seen in the following picture taken from the publicity for the installation, the dancers are from different generations and if you stay in the corridor long enough you will see all six. As you move forward and back you can slow, speed up or pause the dancers in the middle of a jump or leap. Their exuberant movement encourages an unusually strong empathic connection to the projected image that elicits sympathetic movements from the viewer/participant that begs the question where lies the choreography in this work – with the dancers on the screen or the »dancer« in the corridor?

The following artwork from emerging choreographer Prue Lang, a performer with Williams Forsythe's Ballet Frankfurt, does not use

8 For more information about motion capture technologies used with dance projects see some of these reports on line: http://huizen.dds.nl/~sdela/mcrl/; http://www.dartington.ac.uk/staff/sdelahunta/uci/rivrep.html; http://huizen.dds.nl/~sdela/transdance/report/ (April 14, 2008).

interactive technology, but is worth mentioning because of its contribution to the growing phenomenon of dance artists making installation based work. Lang's Infinite Temporal Series is referred to as »a choreographic installation […] inspired by the writing of Jorge Luis Borges, the work explores performance via experimental narrative structures of simultaneous temporalities«. The set is described as a self-contained performance space consisting of a row of five adjacent rooms each with its own dancers and with a bench for audience seating. From this bench the audience members (maximum 30) are not only sitting in a very close relationship to the performers in their room, they can also see through windows cut into each of the walls to the subsequent rooms. »Spectators can move freely from room to room during the performance to construct their own individual and multi-perspectival experience of the work.«[9]

Media Artists making choreographies: Marie Sester and Scott Snibbe design and merge politics, play and movement

In the non stage-based work mentioned above dance artists explore the freedom to move between roles and genres in the search for the appropriate space/time contexts to situate artworks. But when the relations between these different components of the artwork are mutable then why not reconsider not only what might comprise the dance element of the work (as was the case with *Remote Dancing* mentioned above), but also who might take up the role of the choreographer.

Marie Sester and Scott Snibbe are interdisciplinary artists whose work features not in performing arts contexts, but in interactive media art events such as the annual Ars Electronica festival in Linz, Austria. Neither would refer to themselves necessarily as choreographers, and yet both of the following artworks (which were exhibited at the Ars Festival September 2003) elicit playful and physical responses from those who take part in them.

Marie Sester's *Access* (2003) is described as »a public art installation that applies web, computer, sound and lighting technologies in which web users track individuals in public spaces with a unique robotic spotlight and acoustic beam system. The robotic spotlight automatically

9 Ibid.

follows the tracked individuals while the acoustic beam projects audio that only they can hear.«[10]

Figure 3: Marie Sester: Access, Ars Electronica Festival 2003.

Photo: Marie Sester.

Sester's intention with this work is partly to explore and raise awareness of the politics and implications of surveillance systems through connecting the actions of an anonymous group of web users to a public unaware they are being seen on line. These aims can be understood by taking the work as a whole into consideration. However, much of what takes place only in the focus of the spotlight is spontaneously playful and filled with motion. The spotlight seemingly locks onto someone in the public space, making him or her the center of attention (and the performer). The beam can be difficult to ›escape‹ which inspires all manner of energetic and evasive movements. If there is no one on line, the system reverts to a default automatic system. In both circumstances, it is possible to ›fool‹ the system by moving very close to someone else in the space making the beam jump to them. From this playfulness with the moving beam emerges an unpredictable but conditional choreography partly authored by the machine and/or by the participants on the web and partly by the participants in the public space.

Scott Snibbe's *Deep Walls* (2003) installation similarly inspires playfulness from the participants and this engagement is Snibbe's

10 Marie Sester: website: http://www.sester.net/ (April 14, 2008).

primary aim. He describes his work as consisting »primarily of electronic media installations that directly engage the body of the viewer in a reactive system.« *Deep Walls* is based on a simple but effective concept. It involves the projection of a single frame within which there are sixteen smaller frames. As the viewer moves in front of the screen his or her moving shadow silhouette is recorded and played back in one of these sixteen smaller frames after the viewer moves out from in front of the screen. One after another, each of the sixteen smaller frames is filled with shadow recordings continuously looping until all the small frames are filled, at which point the first to have been filled is replaced and a new cycle begins.

It is possible either alone or with others to enter this installation space and build up a complex choreography that will exist in the relations between the sixteen frames. This can be done to varying degrees by chance; but is likely to evolve into a design choice as one is quickly inspired to fill the small frames with a chosen gesture or movement to interact with those that have already been left. It is possible to watch movements as they are being created or enter at some point when no one is in the space when the recordings of the last group of spontaneous dance makers are still looping in the frames.

Both of these artworks blur the boundaries and beg the question what constitutes choreography and who is the performer and who is the dance maker.

Choreographing the city: Blast Theory challenge and then raise our expections for artworks involving choreography and new technology

It would be negligent to write about artworks that blur boundaries of practices involving performing arts (dance/theater), media artists and computer programmers and not mention the work of the devised theatre company *Blast Theory*. Based in the United Kingdom, Blast Theory has been stretching the definitions of theater and choreography for over a decade. In 1997, they had the initial meeting that lead to a long-term collaborative relationship with the *Mixed Reality Lab* (MRL) at the University of Nottingham out of which several successful artworks have emerged. The first was *Desert Rain*, which premiered in Nottingham in November 1999. This work is often described as a combination of installation, theater and computer game and was created for an audience of six people at a time.[11]

But it is the collaboration after *Desert Rain* between *Blast Theory* and the *MRL* involving mobile and wireless technologies that I wish to mention briefly here in the context of this article. *Can You See Me Now?* is a game/performance that happens simultaneously online and on the streets. First played/performed in the city of Sheffield, UK in December 2001, the game involved members of the *Blast Theory* company on the streets of Sheffield using wireless mobile computers equipped with the global positioning system to pursue on line players who were visible on the virtual map of Sheffield shared by both groups. The objective was for the online players to evade the *Blast Theory* runners for as long as possible. The runners on the ground communicated and shared pursuit strategies with each other using walkie talkies, and this audio stream was available to the online players.

A more detailed description of the work can be found on the Equator website listed in the references, but what is important to consider in the context of this article is the choreography in the city that emerges during a game/performance of *Can You See Me Now?,* one in which both virtual and real participants flow together in patterns of movement constituted by a communication system involving audience, viewers, participants, performers and players.[12]

In this paper, I have examined some examples of artworks in which both dance and technology feature and by implication help to constitute these works now and in the future. In some of these examples, we observe that interactive and media technologies suggest spaces and times that do not conform to the standards and conventions of the stage, contributing to a shift in relations between maker, audience and performer. Now what might be added to this field of blurring is the freedom for the choreographer or media artist to conceive of themselves as makers of and within new realms (sites, spaces and models) rather than solely specialists within a particular domain.

11 You can easily find materials about this work online; in addition to Blast Theory's own site (http://www.blasttheory.co.uk/) I recommend the following links: DEAF discussion notes: http://huizen.dds.nl/~sdela/dr/; eRENA report site: http://www.nada.kth.se/erena/desert.html; and deliverable: http://www.nada.kth.se/erena/doc/aD7b3.html (April 14, 08).

12 »Can You See Me Now« archive website for the first staging of the work in Sheffield in December 2001: http://www.canyouseemenow.co.uk/; Equator website with reports and documentation: http://www.equator.ac.uk/index.php/articles/c62 (December, 2007).

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Body, Space, Movement and Interactive Technologies in the Performance-Installation *Passage*

Martin Kusch

Electronic intermedia art and its interdisciplinary methods of research on interactive design, telematics, and human-machine relationships have changed the nature of the live-event. At the border between installation and spectacle, the interdisciplinary production group *kondition pluriel* is exploring new modes of representation, incorporating choreography and media arts. Its work blurs the boundaries between the performer and the spectator, the author and the recipient, and the virtual and real world. This text will discuss one of kondition pluriel's[1] recent performance-installations, *Passage*, in terms of artistic approach and relationships between body, space, movement and interactive technologies in the work. As a hybrid between performance and installation, *Passage* explores new forms of expressivity and writing, and targets the spectator's role of artistic responsibility.

Context

As a production group, kondition pluriel is interested in the artistic process as much as the artistic product. One of its main objectives is to develop strategies and methodologies for artistic expression using new technologies in the live arts. It aims to foster the integration of expressive *performative systems* as tools for creation in the performing arts disciplines. The group was founded in 2000 by Marie-Claude Poulin and Martin Kusch. Marie-Claude was trained in dance and the science of human movement, then taught movement and worked as a dancer for many years before gearing her career towards interdisciplinarity. Martin studied visual art and media arts. He works in media art as an artist and teacher, and is now mainly involved in performance projects. Based in Montréal and working mostly internationally, the two artists have

1 http://konditionpluriel.org (March 18, 2008).

directed kondition pluriel ever since its foundation. In bringing together their respective disciplines, they have built a new grammar outside of known conventions. For their work, they established two pivotal parameters : the active participation of the public, and, in relation to the physical and socio-cultural context of the place, the configuration of space. They have also focused on two recurring themes, the perception of the human body in contemporary society, and the impact of new technologies on that perception. A constant research into the balance between human and technological factors and the intensive work with new technologies has led kondition pluriel beyond the boundaries of dance and performance. The responsibility of the viewer, who is invited to interact with the performers, has become an essential artistic ingredient in its approach.

The technological research and developments that kondition pluriel has realized over the last eight years can be compared to those made for projects like *T-Garden*, *tx0om* and *whisper*.[2] Similar to these works, wireless technology and wearable computers gather digital body data. However, the singularity of kondition pluriel's artistic proposition lies in the fact that not only the visitors of the installation, but also the dancers in it, are users in the system. The dancers wear a system of wireless sensors and microphones that are linked to a network. Each of their actions has an impact on the elements of the system as a whole. With their movements, they modify and distort the sounds and images, switch live and virtual cameras, change points of view, set off live recordings, alter virtual images and activate mobile projections.

The establishment of causal and non-linear relationships between the living presence, image, and sound is fundamental to the formation of a grammar distinct to kondition pluriel's body of work. By crisscrossing assignations between media-data and control-data, an intricate fabric of relationships is woven, in which all the elements in place resonate and answer in organic ways. The work with distributed and integrated digital systems (from the wireless sensor system to the actual media output, including digital signal processing and modeling) has led the company's approach towards the abstraction of data. Subtle changes in mappings, redundant patterns of processing, multiple combinations of relationships all become extremely powerful statements when delicately integrated into the flow of a performance. Even if the relationships themselves are not always clearly identifiable (we could talk of subterranean relationships as opposed to exposed relationships), the mapping of the relation-

2 http://fo.am/txoom (March 18, 2008), http://whisper.surrey.sfu.ca (March 18, 2008).

ships between media can – to a certain extent and in some cases – become stronger than the media themselves. The format of a performative installation is the ideal context in which to explore this abstracted data.

The artistic directors believe that, over time, the articulation and channelizing of data has led to a new register of expressivity and writing. At the basis of this artistic language, the human presence, the choreography, the electronic media and the installation elements form a whole that extends beyond each part. This leads towards a dehierarchization of all the elements constituting the work. The manipulation of these components, made as subtly as possible, triggers a deconstruction of our habitual way of perceiving reality. The body and time thus seem to remain in a perpetual cycle: alienation, hypnosis, or poetry?

Passage - an interactive installation with one performer

Our work with new media and our multiple experiences creating interactive dance performances inspired us to produce an interactive installation integrating live performance, in which the spectator is invited to actually »use« the body of the performer/dancer as the interface to the media environment. The main idea was to explore the public-performer-environment relationship further than in previous works, and to address the notions of proximity and touch and the relationship between public and private space. We wanted to encourage participation, provoke socialization and collaboration and, above all, attempt to question the spectators' awareness of his/her »artistic responsibility« inside an interactive installation scenario.

Passage is a hybrid work, oscillating between interactive installation and performance. It is accessible to visitors who can enter and exit at their will for a duration of approximately three hours per day. With it, we propose an intimate experience to the visitor, where his/her participation plays a determining role in the shaping of events. By manipulating sensors distributed on the body of a dancer and in the installation space, the visitors are invited to create a sound and image environment.

The spatial layout of the installation is intimate and at the same time stimulates the visitors to circulate. Inside the space they encounter a dancer, who is dressed in a costume that is equipped with multiple sensors. Via this costume, the performer's body acts as the interface to the media environment. Distributed throughout the installation, we have placed additional objects integrating sensors and actuators that provide more playing fields for the visitors.

Figure 1: Passage, Theatre du Casino, Biennale Bains Numériques, Enghien-les-Bains, France, October 2007.

Photo: Martin Kusch.

The dancer is posted inside of an architecture composed of curvilinear-shaped projection surfaces, constructed out of translucent vinyl and aluminum. This architecture creates an intimate space in which the dancer is surrounded by interactive projections and sounds. The spectators enter it in small groups to find themselves face to face with the dancer. The several sensors on the costume react to the dancer's own movements, as well as to the proximity, touch and pressure exerted by anyone else. The viewers are free to circulate throughout the installation, to sit down, or to remain standing, but above all, they are invited to participate and interact.

The dancer solicits the participation of the public with the help of specific actions marked by an attitude of availability, invitation and even at times retraction. By activating the sensors distributed throughout the installation and on the body of the dancer, the visitors influence specific parameters of sound, image and light. These fluctuations in ambiance lead the dancer into another performative state, which she does by drawing from a bank of movements and pre-determined performative modes based on the themes of solicitation, availability, retreat and anonymity. These manipulations contribute to the creation of a poetic experience and have an impact on the development of the performance, as they trigger a change in the behavior of the performer.

The performance–installation is constructed around a set of motifs and ideas, playing with the themes of social interaction, intimacy and surveillance. The aesthetic experience is partly determined by the type of parameters set out for the visitors. These interactive parameters shape the space and experience, depending on the theme or subject of each scene or motif.

Figure 2: Passage, Theatre du Casino, Biennale Bains Numériques, Enghien-les-Bains, France, October 2007.

Photo: Martin Kusch.

For example, in a vibrant and active motif where the dancer is executing very rapid and nervous choreographed movements, and the images and sounds are similarly resonating, the interaction of the visitor's touch may change and slow down the situation and alter the »mood« and rhythm of the environment.

In the absence of intervention on the visitors' part, the environment transforms only in relation to the dancer's movements. However, in response to their interventions, the transformations of the environment are more clearly manifested and the public's actions alter and provoke shifts in the installation.

Via a monitor, the public has access to the *installation-activation-manual* that consists of a graphic representation of the dancer's body, the interactive costume and the sensor network throughout the space. This guide reveals the network to which the sensors are actually connected, and suggests to the visitor different ways of entering into a relationship with the dancer and her environment. The spectators have the choice of participating and collaborating, or of merely positioning themselves more as observers. They can modify the recordings of sound and images, the positions of the projections, lighting cues, the physical state of the images (speed, brightness, distortion, transformation, abstraction..), as well as the parameters of the sound layers. Mobile projections unfold on the architecture of the installation and combine with the spatial quality of the sound to create a lively, transmuting and enveloping atmosphere. Our intention is to have the visitors' actions resonate in the environment, and to have the visitors perceive that they are actually altering the course of events.

Figure 3: Passage, Theatre du Casino, Biennale Bains Numériques, Enghien-les-Bains, France, October 2007.

Photo: Martin Kusch.

With *Passage*, we explore the notions of exchange and collaboration, the boundaries between beings and their environments. We create an interactive situation that questions the visitor on his relationship to his own body, and in offering the body of a dancer as the ground for exploration, plays with the limit of discomfort. By working with the contrasts between solicitation and retraction, *Passage* deals with playfulness and mutuality. The spectator, actively implicated and possibly confronted by our artistic proposition, finds himself at once both subject and object.

We view interactive media installations that engage physical activity from the user as often transforming the user in one way or another into a performer. This physical interaction with the artistic product is, however, not questioned enough as a performance in itself. We feel that the user's situation, physically interacting with the work while at the same time being watched by other visitors waiting to take their turn in the installation, is often overlooked or not deeply enough reflected on or in interactive media work. With the project *Passage*, we question the status of the »watched visitor« and the »watching visitor«, and bring this question to the center of our artistic proposition.

The fact that this creation takes the form of a hybrid between performance and installation forces us to reflect on the notion of temporality. How can we organize the notion of temporality in an interactive installation in which multiple possible users can engage and where, at the same time, a performance takes place? One determining factor for the success of each presentation is the visitor's capacity to listen and to observe, together with the capacity to communicate and to collaborate.

The relationships developed between the visitors, the performer and the environment are one of the central elements of this artistic proposition. The nature of these relationships shifts between dialogue, confrontation, collaboration, domination and game. With *Passage* we create an experience that evokes a sometimes contemplative and other times active participatory state in the visitor.

The situation created by *passage*, where we offer the *body of a dancer as an interface* generates diverse reactions in the public. The status of passive observer or »consumer« is transformed into that of a co-author of the artistic process. The spectator's choices resonate in the environment and create a unique experience for each participant. In the ideal situation, the watched and the watching spectators collaborate together, using the parameters that we place in their hands, to build an aesthetic experience with us.

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Virtuoso Audiovisual Real-Time Performance

Andreas Weixler, Se-Lien Chuang

»In the impossibility of replacing the essential element of color by words or other means lies the possibility of a monumental art. Here, amidst extremely rich and different combinations, there remains to be discovered one that is based upon the principle [that] the same inner sound can be rendered at the same moment by different arts. But apart from this general sound, each art will display that extra element which is essential and peculiar to itself, thereby adding to that inner sound which they have in common a richness and power that cannot be attained by one art alone.«

Wassily Kandinsky (1912)

Nowadays, as different forms of machine musicianship[1], in which computers act like virtuoso musical instruments are blooming, we are focusing on a very specialized form of real-time performance with a computer system: audiovisual interaction with musical instruments. In this article we describe the development of our own audiovisual real-time computer system and document the performances with different kinds of musical instruments. The goal of this project in computer music is to create an interface for visual and musical computing for an associated audiovisual composition and to create a performance in which sounds and visuals participate equally.

To achieve this we combine improvised music and real-time computer processes in an audiovisual real-time composition. The sound of live instruments serves as an interface in an audiovisual interactive concert that merges acoustic instrumental sound and real-time computing

1 Rowe, R. (2001): »Machine Musicianship«, Cambridge: Massachussetts: MIT Press.

into an improvisation. With the combination of intuitive improvisation and real-time computing, we want to create a synaesthetical artwork in which all audio and visual parts contribute equally. While visual images and processes are being generated during the concert, a multichannel granular synthesis fits together minute tonal particles that make up the instrumental sounds into a constantly changing acoustic stream made up of different pitches, durations and positions in the electro-acoustic space. The musical and visual components interact and reciprocally influence each other in order to blend into a unique, synaesthetic, improvisational work of art.

The computer system consists of a pitch and dynamics detection, real-time visual processes and a live multichannel granular synthesis with special controlling and performing methods while the musical instruments are played in the style of contemporary composition/ improvisation. All computing devices, the audio detection, the visual and the audio processing are linked via a wireless Lan to reciprocally influence each other.

History of Audiovisual Instruments before the 21st Century

Historically seen, it seems to be an age-old dream of artists to make music visible and visuals audible. Musical instruments as an interface for an audiovisual system have been created a long time ago, including the perspective-lute of Giuseppe Arcimboldi (1527-1593), the Clavecin oculaire of Louis Bertrand Castel (1688-1757), the ocular harpsichord (1757) of A. Morley, the Clavilux (1922) of Thomas Wilfred (1889-1968), the Optophon (1915) which composer Alexsander Skrjabin (1871-1915) used in his orchestra piece *Prometheus* (1910/11), the optophonic piano (1917) of Vladimir Baranoff-Rossiné (1888-1942), the *Reflektorische Lichtspiele* (1923) of Ludwig Hirschfeld/Mack and Kurt Schwerdfeger at Bauhaus, the Sonchromatoskop (1925) of Alexsander László (1895-1970) and the Optophon (1927) which Dadaist poet Raoul Hausmann (1886-1971) used to experiment with the optical-acoustic montage process to project kaleidoscopic pictures.

The instruments mentioned above are manual, machine, mechanical. Up until 1960, Livinus van de Bundt and Nicolas Schöffer made the first light organs constructed with electronic controls, which later become computer-aided keyboards with sensors and colourful data projections or laser technology. There has always been a desire to stimulate the brain with a combination of audio and visual effects,[2] for example the light shining through coloured glass in the strong acoustic of churches, light organs, hooked up simply by frequency response, in the disco music area up to today's high-tech audiovisual shows of popular music events, and countless more examples of contemporary artwork.

The Computer System in Max/Msp/Jitter

The three modules in our computer system, the audio analysis, the multichannel granular sound synthesis and the interactive visuals, interact with the performers, who are an acoustic musical instrument player and an electro-acoustic hyper instrument player. The computing system exchanges data between analysis, audio and video computing to create a unique, synaesthetic, improvisational work of art.

To turn a musical instrument into an interface we use the information of pitch and dynamics to trigger events in the Max MSP Jitter patch. The fiddle~ object by Miller Puckette serves as a pitch tracker, yin~ by Norbert Schnell at IRCAM or pitch~ by Tristan Jehan would also work for this purpose.

The live sounds from the musical instruments are fed into a multichannel granular sound synthesis, which we understand and perform as a musical instrument of its own, with virtuoso and complex potential. This electronic instrument highly depends on the input from the acoustic musical instrument. The peculiarity of our sound system is not the real-time process and its multichannel features, it is more the intuitive and artistic control and linking of the parameters, in the sense of setting limited randomness and treating the system like a musical instrument, which has to be studied, continuously trained and rehearsed to perform in a virtuoso manner.

A main emphasis of our interactivity is to achieve a synaesthetical effect, in which visuals directly react to the parameter of sounds. The exchange and integration of the various audio and visual data mutually depend on the live action of both performers, playing the acoustic and the electronic instruments.

2 Chion, M (1994): »Audio-Vision, Sound on Screen«, Columbia University Press, New York.

Acoustic Musical Instruments as Interfaces

The acoustic musical instrument not only acts as a musical instrument, but furthermore as an interface for the computing system. We have performed with different musicians with modern western instruments as well as Japanese, Korean and Chinese traditional instruments.

The timbre and style of the musical instrument shapes the appearance of the performance together with the personality of the performing artist. The acoustic musical instrument controls the creation of the visuals in real-time and the instrumental sound feeds the granular synthesis distributed on eight channels depending on the live performance. In our experience the architecture of the concert hall or the performance space also has a strong influence on the sound and interaction, as the loudspeakers tend to feed the processed sound back into system through the microphones, which we sometimes emphasize as a special effect.

We have used various instruments as audio input and controlling devices in performances worldwide: We used the arco-piano and our audiovisual interactive computer system in the improvisational performance *Interlude for Pi and for Io.* Arco-piano is a special contemporary technique of performing the piano with hairs of bows, which gives a very sophisticated sound from the piano. As these instrumental sounds naturally have a very long sustain we implemented a dynamic threshold system to avoid multiple triggering. In marked contrast to this we performed with a yang-qin, a traditional Chinese hammered dulcimer with a nearly square-soundboard, which has strong attacks and a short sustain. Together with our computer system it represents the performance of *Erinnerung in jedem Laut*.

Figure 1: Arco piano in Interlude for Pi and for Io.

© Se-Lien Chuang.

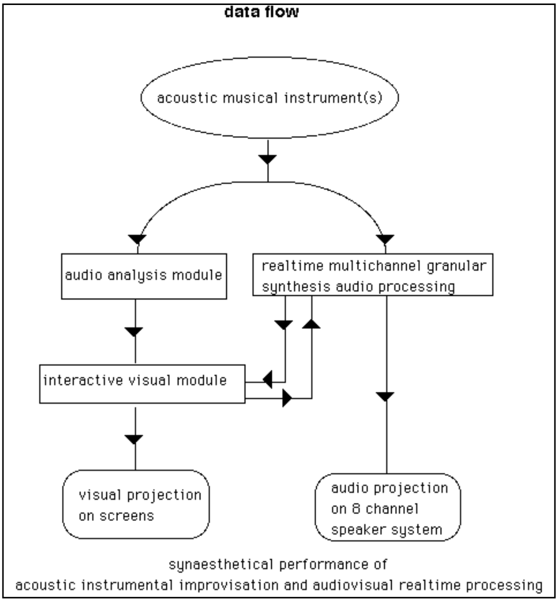
In some previous audiovisual real-time computing concepts there have been two prepared guitars (*Waon* at the ISEA 02, Nagoya, Japan), Chinese mouth organ sheng and Chinese two-string violin erhu (*Waon* in Taiwan, 03), traditional Korean instrument haegeum, cheolhyungeum, geomungo and percussion (*Seoul Lightingale*, South-Korea, SICMF 03), traditional Japanese biwa (*The Story of Heike,* Nagoya, Japan, 2001), western instruments like violoncello and clarinet (*Waon* in NYC 2000), bass clarinet, saxophone and electric guitar (*Waon* at VNM 01, Graz, Austria), jazz bass and piano (*Lightingale* at VNM 03, Graz, Austria), experimental violoncello and violin (*living cave* at artport Mediaselect 01 and *running-figure-lantern* at the ISEA 02 in Nagoya, Japan) and also human voices (*living cave* at artport Mediaselect 01 Nagoya, Japan and at Laval Virtual, France 2001) and most recently successfully a modern flute (*Das Kichern der silbernen Flöte*, electronic access @ Goldsmiths, London, 2006), a bass recorder (*The Colours of A Wooden Flute*, electronic access @ Goldsmiths, London and experimental intermedia, New York, 2006 and ICMC 2007, Copenhagen) and a classical bassoon played by a specialist in old music (*quod erat…,* vnm Festival, Graz 2007).

We have previously created special works such as a predetermined accompaniment of visuals with a Japanese biwa master, telling the traditional narrative *The Story of Heike*, which was performed in Nagoya Japan in 2001 during research at the Nagoya City University. The intonation of the voice and the articulation of the instrument were controlling the flow and processing of the picture associated with the content of the story. At the same time we created the audiovisual interactive installation *living cave*, which was performed in exhibitions in Japan and France and led to its selection for the audiovisual instrumental theatre *running-figure-lantern* for the ISEA – International Symposium on Electronic Art, in Nagoya, Japan 2002.

Interactivity

To achieve a synaesthetical effect, where audio events are always related to events in the visuals, we not only use a common trigger like the pitch information and dynamic attack of the notes played by the live instrument. We also link the parameter of the granular synthesis and the visual processes and alter these links during the performance in order to keep it attractive for the audience and us. The mapping of this data is of course an important decision made by the artists.

Figure 2: Graphic: Data Flow.



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It might be accompanied by a script, which is related to the data mapping, in a way of the artistic decision what will happen similar to storytelling. It contains for example the reaction of the visual system according to a trigger from the audio analysis module. OSC – Open Sound Control is used for the network – via LAN and wireless LAN. This gives us the opportunity to send a lot of parameters, even a time clock, which opens sufficient possibilities, but also challenges for data mapping.

The interaction has multiple layers: The first layer of interaction takes place between the acoustic musical instrument and the analysis computer and from there to the visual computer. The audio analysis of the live instrument provides information about the pitch and the dynamics. This data is transmitted to the visual computer, where it triggers the visual event relating to the sound.

The second layer of interaction takes place between the audio computer and the visual computer, where the parameters of the visual processes are influenced by selected parameters of the granular synthesis. So far the transmission of the data occurs between human and machine, machine and machine in a one-way direction. To implement a step of control over and feedback from the progress of the data transmission we employ the following return procedure: The third layer of interaction takes place between visual computer and audio computer, i.e. if the program in the visual computer changes the effect, it sends information to the computer of the granular synthesis indicating the to audio performer which parameters of the granular synthesis are now linked to visual parameters. And last but not least there is a layer of interaction happening between the musician and the granular synthesis performer. As usual in musical improvisation the musician and granular synthesis performer react to each others sounds and both react to the computer aided creation of the visuals.

The Technical Concept

Visual Processing

We developed a patch in Max Jitter called *ModularFilter*. As a source of visuals it takes either live video input, for example of the performer, or some prepared pictures and movies. Sophisticated video effects are exchanged from one part to /another during the performance and their parameters are controlled simultaneously by the sound of the instruments, as well as from the linked parameter of the live granular synthesis.

The choice of the images is subject-oriented which is up to what kind of instrument we are going to play. Some instruments can make longer sustained notes than other instruments; some can easily produce stronger attacks than others. Therefore the varied characteristics of the sounds evoke and associate different forms of structure, colour and statement of the images.

During the creation period of the work *the colours of a wooden flute* (bass recorder) there were three subjects about the initial materials as a source of visuals: *moiré*, *perspective* and *symmetry*. For all the subjects we use live camera input and a selection of different short video clips. After the subjects are determined we take the method of manipulation into consideration for video processing, e.g.: aliasing, the use of the camera and mirroring.

Through the meanwhile well-developed hardware and software technology we can easily apply 3D-Tools within the OpenGL (Open Graphic Library) environment. As the name *ModularFilter* reveals we do apply various modules of effects: e.g. Rutt/Etra scan processor, inspired by the work of Woody Vasulka in the mid-70s, this patch displaces a 3D plane based on the luminance of a video signal.

Multichannel Granular Synthesis

By processing the instrumental sound in real-time, the computer becomes a hyper-instrument played in an improvisation along with the bass recorder, spreading its sound on an eight channel sound system, controlling flocks of grains, rearranging them in terms of pitch, time, order and position within the acoustic environment. We use a granular synthesis based on the rgrain3~ object by Richard Dudas with the usual controls of transposition, position in the audio buffer, grain-length and panning. We record a live signal into a 22 second audio buffer and read all data out from there. The buffer will be overwritten all the time, so we have access to nearly real-time data up to 22 seconds back in time.

One of the specialities of our audio concept is the multilayer structure of granular synthesis. Unlike the usual granular patch we use a four layer granular synthesis, each serving two audio out channels, which makes it an eight channel granular synthesis. In the multichannel granular synthesis the parameters of transposition, panning, duration and location exist four times, i.e. in each layer A, B, C and D. In general the parameters of the four layers can either be linked or individually controlled in the domains of time, pitch and location. Transposition is the pitch shifting in granular synthesis. Duration is the length of the grains, which can be from 1 ms up to 400 ms and also have a controlled randomizer within the chosen range. Location is the position in the audio buffer, which is replayed in the specific layer. It can be a definitive exact point or a window in which the grains are played randomly. Panning is the amount of random panning in each layer. It can be limited to any range between left and right, in this case between the two audio channels, which belong to this layer. Therefore we have eight of these internal audio channels coming from the pairs of audio channels of the four layers. An algorithmic spatialisation constantly and randomly moves the audio channels over all of the loudspeakers. By doing this, the program makes sure that every audio channel starts from one speaker and fades to another speaker in such a way that each of the eight audio signals always has its own and unique position in the electro-acoustic room. The position in the room particularly enhances the perception of a multichannel granular synthesis. The four layers of granular synthesis can either be linked in time to create a certain chord; within this each of the granular synthesis can have their own pitch, grain length and panning using the same audio data. Or we can choose direction and speed for each layer on its own. In this case we can control each granular synthesis independently, each layer can have its own values for all parameters including the time factor, which is the sequential read out of the audio buffer.

Figure 3: Visual of »Das Kichern der silbernen Flöte«.

© Se-Lien Chuang.

The writing position and the re-play locations are independent in their direction, forward or backward and in tempo. Playback time can be original time, half or double time, even any floating point or integer multiplication factor of time, or use a freeze effect to create a standing chord which not only consists of four different pitches, but even of four different position within the available audio data. This leads to situations where the recording position is overtaking the current play position or in the opposite case approaches it.

As granular synthesis offers the treatment of time compression/expansion independently from the pitch manipulation, we are dealing with three types of pitch control: Original randomizers, floating point multiplication of the frequencies aka spectrum and chord playing by multiple transpositions.

Original randomizers like in Richard Dudas granular synthesis, control transposition, panning, duration and location due to limited random functions. All of these parameters have the possibility to select a range for setting a random movement in between or to a fixed value. In the original patch using sliders the transposition is limited in the range of 1 octave higher and 1 octave lower. In our multichannel granular synthesis every layer has its own slider to set the range of the transposition separately. To achieve even very low or very high pitch shifting we programmed an override function into the rgrain3~, which allows any floating point or integer number to be set as a fixed multiplication factor. This is very useful to create certain tunings and chords, which even can be microtonal. In addition to the point above we created a keyboard-like pitch shifting, where transpositions can be played as piano chords, which then will create four kinds of pitch shifting at the same time, of the same or of a different selection within the audio sample. Of course the out coming sound depends on the source material as its spectrum then becomes pitch shifted in a multiple way, simple chords turn into tensions, altered chords or even noise.

For a machine musician the selection of the audio sample i.e. location in the audio buffer is very important. If we hear a sound from the instrumental player, which in our experience is good for further process, we can manually choose this in the visual display of the audio buffer. Alternatively this window, in which the random read out of the granular synthesis is happening, can be moved forward or backward at a constant tempo, meanwhile the window can have any size inside the audio buffer. The location of the four layers can be either linked or act independently. We have one main audio buffer display, which is linked to four smaller displays, one for each layer. A selection in the waveform~ object, which displays the content of the whole audio buffer, represents the window of the actual granular synthesis. When the layers are linked, they play the same position of the audio buffer, standing still or in motion. This is useful for creating chords and echoing a melody when this is driven by a timeline.

A click in the recording buffer sets the starting point of the movement; it enables the audio performer to select a special note out of the visual display of the audio wave. This gives the joyful possibility to click in the real-time display of the recording buffer and select a certain point in the recording and even catch the actual recording to make it a real-time effect, which follows the live audio signal. The »separate 4« function enables every click in the display of the recording buffer to put only one layer in a new position. This is creating a chord or ambient, including freely selected sound bits, which can be chosen visually by the performer in the display of the audio buffer. The »auto separate« function is a certain window follower, which hands over the position from one layer to the other by freezing the last position. Through this operation each layer replays a certain still standing spectrum of the sound but the oldest layer always updates its position to the actual position of the newest recording. So you hear slightly changing frozen sounds of the recording, which in some kind of double windowing, re-play four windows, altogether also moving one by one like a bigger window through the audio buffer. Currently we are working on extending the system for a chamber ensemble or a group of instruments. We plan to separate the granular synthesis as well as the analysis and link the parameters of individual instruments to form a complex visual response to a live audio event. We also hope to develop a system in which the visual events cause reasonable audio responses, to achieve equality of both, the audio and the video domain.

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INTERACTIVITY IN STAGE PERFORMANCES

KLAUS OBERMAIER

The discomfort of many choreographers, directors, dancers and actors with the traditional setup of »performer in front or beside a projection screen« already led in my work *Immateriaux*[1] to own specially designed solutions.

In this case it was the music instrument plexi drums, a box made of acrylic glass, which was played by the drummer from inside. Its four walls, floor and top, all equipped with contact microphones, allowed sound manipulations and the control of samplers and synthesizers. Additionally invisible gauze was stretched between stage and audience to visualize the interactive laser floating in space like a hologram. On the one hand the laser was used as a musical instrument by touching the beams, on the other hand conventional instruments like keyboards and MIDI-guitar controlled it.

The development of a specific setup, which enables the integration of new media, bodies and space, very often forms the basis of my conceptual considerations. Be it the unique body projections in *D.A.V.E.*[2] – digital amplified video engine and *Vivisector*[3] the stage as a monumental computer desktop with overlapping windows with interactive projections in *The Cloned Sound*, a commissioned work for the Kronos Quartet for the opening of the Ars Electronica Festival 1993; or as in my production *Oedipus Reloaded*[4] for the Ruhrtriennale 2004, where I flooded the whole stage with water to create a huge mirror which, together with interactive projections, exposes the actor to an environment with no secure place or firm ground. Oedipus is literally floating in space. Dissolution of

1 Obermaier, Klaus (1991): Immateriaux, http://www.exile.at/ Immateriaux (April 18, 2008).

2 Obermaier, Klaus (1998): Dave, www.exile.at/dave (April 18, 08).

3 Obermaier, Klaus (2001): Dave, http://www.exile.at/vivisector (April 18, 2008).

4 Obermaier, Klaus (2004): Dave, http://www.exile.at/oedipusreloaded (April 18, 2008).

body and space boundaries; instability; removal of the space-time continuum and mixed reality, are recurring themes in my work.

The body as interface between real and virtual

»Transplantation techniques, prosthetic surgery, microphysical stimulation of the body: technologies are not longer sent to other planets anymore, but initiate the invasion of man himself who is no longer protected by anything, neither by ethics nor by bio-political principles.« (Paul Virilio, 1994)[5]

The goal of integrating new media and performance led me to the development of unique body projections in 1998. What was novel was the concentration of precise video projections onto the performers′ body in motion, while avoiding conventional spatial and screen projections. This enabled inconceivable interventions with the human body: breaking up and reordering of movements. Dancers could change their skin color and move at raging speed, culminating in a kind of suspension of physicality. Performers can switch effortlessly between young and old, male and female. They can distort their bodies and their limbs or dissolve into streaming worlds of digital images.

But the fascinating point is: it happens before your eyes with real actors. To make this obvious we chose the subtitle »intervention in the sweating body« for *Vivisector* (which like *D.A.V.E.* was developed together with the dancer and choreographer Chris Haring). In *D.A.V.E.* I combined the body projections with conventional theatre light. In *Vivisector* I went one step further: the video projector as the only source of light. From the exclusive use of the frontal projector light, results an aesthetic of virtually, even in real body sequences and body and video merge still more strongly. The viewer does not think about the video projection anymore, it just belongs to the body. It is a part of the body or the performer is part of the video projection.

D.A.V.E. and *Vivisector* both play in a black box. The sound environment suggests an imaginary space that can be manipulated in size and perceived as tiny or vast.

5 Virilio, Paul (1994): »Die Eroberung des Körpers«, München-Wien: Carl Hanser Verlag.

Figure 1: Klaus Obermaier: Vivisector.

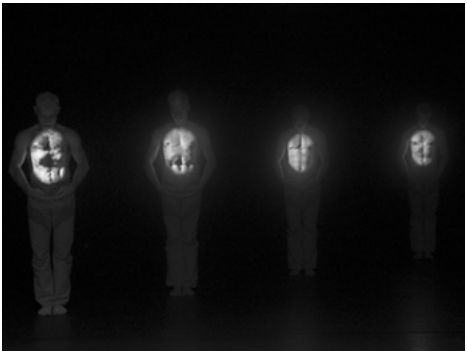

Photo: Klaus Obermaier.

Interactive Performances

In my opinion there is a difference between interactive performances that are conducted by choreographers or directors and such conducted by media artists.

Directors and choreographers think of a new piece, a new staging, and new choreography, mostly from the perspective of their main media. For instance theatre directors tend to start the development of a new piece by working on the text. Only very late do other media get involved and can thus only have an ornamental relevance instead of attaining essential parts in form and content.

For sure one of the reasons for this is the still very conservative education at universities of performing arts. But often it is also the fear of an increasing virtualization of stagecraft or the characters. For example, hardly any choreographer is willing to accept an interactive generative system as an equal performance partner for his dancers.

But new technologies and new media have always been implemented in the performing arts and have changed and renewed them and became integral parts.

»Each time when a technological threshold has been exceeded, observers get the feeling the technology will take over. And it always turns out that the new technology opened new creative resources.« [6] (Vilém Flusser)

6 Flusser, Vilém: Forschungsstelle Musik- und Medientechnologie, http://www.fmt.uos.de, (October 22, 1997).

But for instance even today light is mostly used as decoration, as a simple tool to light the stage, instead of – such as in the works of Robert Wilson – becoming an equal partner from the start to create new ways of staging.

»In my pieces light is as important as the text, the music, the stage, the performers. I take the light into account from the beginning. Most directors stage first, and then light the scene in a few final rehearsals. (…) Sometimes in my pieces the light plays its own special role.«[7] (Robert Wilson)

If by contrast media artists conduct a performance, I often observed other problems: the lack of understanding for dramaturgy and for the stage space; technological questions overlay artistic and aesthetic ones; engaged by the media artist dancers and actors, inexperienced with interactive technologies, act without real integration in an overall artistic concept. A solution is only possible by a new kind of artist, one who is fully aware of and deals with these different problems and who has no particular preferences for one of the art forms involved. Or a very well attuned team, that heterarchically covers those fields.

Apparition

»Today's media art cannot be justified with theory and art jargon if the interactive experience fails to be compelling.« (Brucker-Cohen 2004, p.45)

Interactivity itself is the theme of my work *Apparition*, a co-production of the Ars Electronica Festival 2004, the South Bank Centre London and the Singapore Arts Festival. The development took place in close collaboration with the Ars Electronica Futurelab Linz and Hirokazu Kato from the Osaka University.

Today new technological capabilities allow reliable motion tracking by computer vision, without the performer wearing sensors and transmitters on the body. There is no restriction of freedom of movement besides a predefined interactive zone. In the seventies of the last century Myron Krueger was one the first to explore the possibilities of image recognition for the interaction with computer graphics. Together with Jeffrey Shaw, David Rokeby and others he is counted to the pioneers of interactive art.

7 Wilson, Robert (2006): »Eine vollständige Theatersprache«. In: Adolphe Appia – Künstler und Visionär des modernen Theaters, edited by Richard C. Beacham, Berlin: Alexander Verlag pp. 7-10.

Figure 2: Klaus Obermaier: Appariation.

Photo: Klaus Obermaier.

Considering earlier installations and recent stage works, I observed works focusing on interactivity itself are mostly realized in a rather simple and unsatisfying way. Digital art should at least in its visual and audible manifestation not fall behind already established criteria of traditional art forms.

Interactive performances on stage bear completely different artistic and technological challenges than interactive user installations. While the latter often function by playful approach, similar actions on stage by professional performers easily look embarrassing. In the last years I watched many interactive stage works where dancers, actors or musicians had to execute aesthetically as well as content wise elusive gestures to trigger an image or a sound. For instance the use of a bend-sensor is often hard to associate with the thereby initiated sound.

Most of these works proceed from the one-dimensional idea of triggering or controlling: an actor performs a particular movement or sound to prompt a visual or audible event.

The dilemma is based on several factors: inefficient and unstable software and hardware for the intelligent computer vision and sound recognition; the lack of understanding for dramaturgy and for the stage space as mentioned above; the addressed one-dimensional approach to interactivity. In *Apparition* I extend the interactive thought. The substantial aspect is to understand the performer and the interactive generative system as equivalent partners. Logically *triggering* is not in the focal point of the interactivity but rather *behavior*. All hierarchies are deactivated and the goal is to achieve the same quality of interaction that usually happens between two or more human performers. To reach that level it requires a highly sophisticated technical setup and programming and the flexibility of real-time generated content. By analysis and interpretation of specific dance parameters – such as volume, direction, intensity of motion, velocity, approximation, etc., – the acquired data influences, stimulates and changes the digital, real time-generated content, which again retroacts by its modified behavior to the performer.

The predominantly physical models are equipped with independent behavior. These models react on the inputs by the performer, are however sufficiently autonomously to ensure a genuine feedback system.

Apparition is a logical consequence from my works *D.A.V.E.* and *Vivisector*, where I introduced a unique approach to moving body projections that fused body and image into a consistent narrative.

Interactive body projections extend the scope of action for the performer and offer an enormous freedom of movement and decision – here the computer system calculates behavior, reaction, content, position and masking in real time. Together with interactive screen projections an extensive immersive kinetic environment develops (http://www.exile.at/apparition).

Le Sacre du Printemps

Since the mid nineties of the last century I explore and work with stereoscopic techniques, most notably in the project *jobOpera*, but also in the *Klangwolke* (Linz 1998), where I used stereoscopic laser projections for sixty thousand people.

The discrepancy between subjective perception and seemingly objective perception produced by stereoscopic camera systems, whose images are filtered and manipulated by computer, constitutes the basis of my staging of *Le Sacre du Printemps* (2006).[8]

It is the dissolution of our sensuous perception, of the authenticity of experience in the light of the ongoing virtualization of our habitats, of the fading dividing line between real and virtual, fact and fake, that takes us to the limits of our existence.

Stereo cameras and a complex computer system transfer the dancer Julia Mach into a virtual three-dimensional space. Time layers and unusual perspectives overlay one another and multiply themselves, and enable a completely new perception of the body and its sequences of movements. Real-time generated virtual spaces communicate and interact with the dancer. The human body is once more the interface between reality and virtuality.

8 Obermaier, Klaus (2006): Le Sacre du Printemps, http://www.exile.at/sacre (April 19, 2008).

Figure 3: Klaus Obermaier: Le Sacre du Printemps.

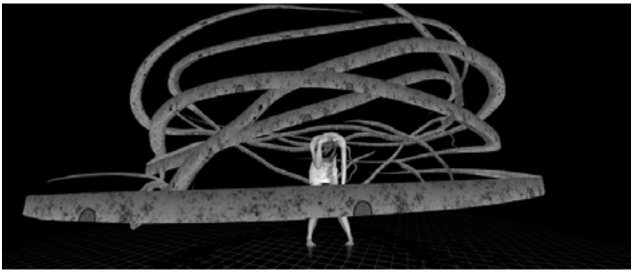

Photo: Klaus Obermaier.

The aesthetic elements reach from the rune-alike characters of the Glagolitsa, the oldest known Slavic alphabet, to the Matrix-like spaces, whose surfaces are visualized by the same binary or hexadecimal code, by which they are generated in real-time. In addition *Le Sacre du Printemps* brings the complex relationship between music, dance and space up for discussion. In conventional productions of *Le Sacre du Printemps* one choreographs and dances to the music. In my case though, the dynamics and structure of the music interactively transform the virtual presence of the dancer and her avatars and thus produce a sort of meta-choreography.

By means of microphones the entire orchestra is integrated in the interactive process. Musical motifs, individual voices and instruments influence the form, movement and complexity of both the 3D projections of the virtual space and those of the dancer.

Stereoscopic projections create an immersive environment, which permits the audience to participate substantially more closely in this communication than in traditional theatre settings.

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Musical Interfaces for Beginners

Wolfgang Kopper, Oliver Wittchow

During the last years, we developed a number of projects aiming at how beginners can access electronic music. These include technical solutions as well as social events such as workshops and concerts in unusual contexts. In the following chapters we introduce some of our work and describe our observations on how children handle various musical interfaces.

Game Boy Music

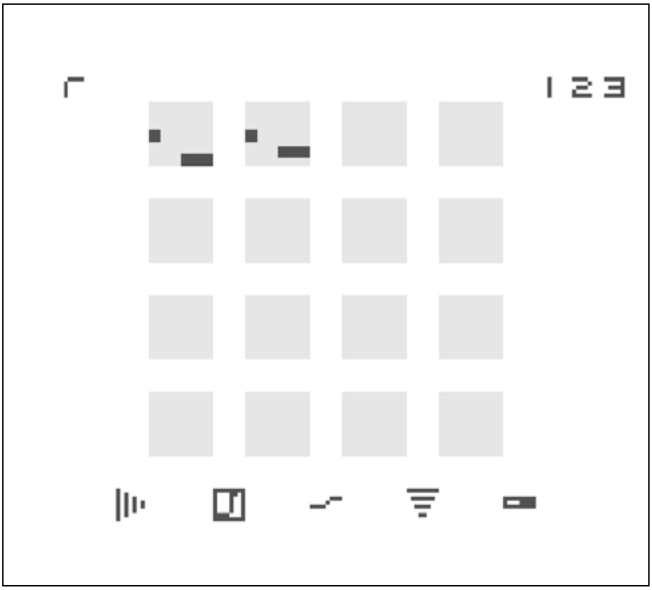
What seems like a banal box of plastic is actually a remarkable piece of interface design, the perfectly shaped work of engineers, who have carefully thought through every aspect of it. Precise but robust build quality and near ideal proportions allow to play for days and nights, while most other devices will give tired thumbs within half an hour. A toy with such properties is quite well suited for music creation, which is usually a matter of long-term usage and heavy interaction.

Besides such technical advantages and the availability of music programs, it's probably also the idea of misusing a toy for noise that made the Game Boy a more and more popular instrument for electronic music over the last ten years.

Nanoloop

Oliver: Nanoloop is a program which turns the Game Boy into a synthesizer / sequencer and allows to use it as an instrument. Creating sequenced music is a somewhat graphical process by itself, as you place notes in space rather than in time so that, to a certain degree, interaction is decoupled from time.

Figure 1: Nanoloop Interface.



Graphic by the Authors.

Nanoloop is designed around this relation of time and space, visualized as 4 x 4 large squares while the music itself is represented by unspectacular little dots. It aestheticises the endlessness of the loop, but respects the actual sound content as something invisible and thus avoids being »audiovisual«. The matrix structure provides easy access to the basic principle of repetitive electronic music and makes it very simple to get started. There are no pre-set sounds or musical assistance though; sounds are available in the raw state in which they come from the Game Boy's sound chip.

Game Boy Music Club

Wolfgang: After I had played around with Nanoloop for a while, I started to bother friends and acquaintances with Game Boy music. My goal was to prove that novices could produce electronic music with it fast and easy, and that they would enjoy it, which they did. The instant success of this simple approach then lead to the idea of a regular event where people could try Game Boy music and play together. The GBMC was born, and in cooperation with Herbert Weixelbaum I established it as a monthly institution in Rhiz club, Vienna.

As Game Boy tunes can become a little annoying when listening to them for more than an hour, we invented a certain ritual of presentation: I moderate the show and when announcing a new player I precisely describe the type and version of software as well as the model, colour and other specific details of the Game Boy unit used. Then, before the player starts, the audience is asked to welcome and encourage her/him with a start-up applause. This credit in advance makes a nice atmosphere, it helps to keep tension and connects the very different styles of music and performance. These range from totally improvised noise to perfectly arranged pop songs, as well as from perfectly arranged noise to totally improvised pop songs – usually all within one night.

Besides the wide musical variety, it is the social variety that makes the GBMC so unique. People of different age and gender and with different background come together and have fun with a toy. The gesture of playing music like a game seems to eliminate not only technical, but also cultural and social barriers.

»Fee«

Part I

Oliver: »Fee«[1] is a PC music program, which allows multiple users to share one workspace through a graphical interface displayed on a large screen or video projection. Simultaneous input is realized via up to four game pad controllers, so that each player can move around an individual cursor and draw sounds represented by simple graphical elements.

Originally developed as experimental instrument for a small group of musicians, we also had the opportunity to test it in a kindergarten for a few weeks in 2006. Our first experiences were not too promising though: Initially, children mainly just played around with the multicoloured cursors and tried to catch up each other. We were surprised to see that they were obviously completely busy with just keeping track of their cursors and at best drawing some patterns. To relate sound with graphics or even intentionally manipulate graphics to change sound demands a level of abstraction which one can hardly expect from young children. Later we introduced separate, gated workspaces so that kids could not mess up each other's work. But they still tended to just fill everything

1 »Fee« was a randomly generated working title. The program was referred to as »the fee« as if it were a person subsequently because the German word »fee« means »fairy«, which kids of course liked.

until they were »done« and generally ignored the audio aspect. Only in single sessions and with some guidance, some were able to produce nice music and even complete tracks.

So the goal to offer intuitively understandable music creation was missed for now and we tried to further adapt the program to what we believed were the specific demands of a very young audience. I first changed the note representation from rectangles to coloured circles that could be placed freely on a grid and which were played from left to right with their vertical position corresponding to the pitch. Available sound types were reduced to sine and noise, indicated by pink and white colour. But that made drawing even more interesting and users cared even less about the sound output. Especially the girls had very precise ideas about the colours and shapes of their symmetric patterns, which they eagerly discussed. Due to the lack of a saving function, they even made backups by carefully drawing the structures on paper.

Our conclusion was that it is a general problem of such audiovisual instruments, that the graphics are the intuitive, immediately understandable part while the music is more mediated, hidden behind the graphics. Music is invisible, and the more graphics try to visualize music or even pretend they *are* the music, they are just in the way. So, given that we wish users to focus on the music itself, graphics should not correspond to sound directly. A typical example for such a direct relation would be the one of colour and pitch: If note values or intervals are tied to colours, an interesting colour combination will usually sound arbitrary or even annoying and vice versa. If you try to compose a melody with coloured notes, you have to work *against* the expression of colour combination. Colours and shapes are such strong elements that they usually develop their own dynamics, regardless of the sound. So, while a drawing interface is certainly nice and entertaining, it does not work too well as a metaphor for audio. We just too often ended up with people – not just kids - drawing a dog to hear what that would sound like.

Besides being misused as a drawing program in the kindergarten, »Fee« also failed in the original context of our small music group. It suffered from what had seemed its greatest advantage: The total transparency of a shared workspace, which allows every user to see and hear what every other user is doing. We soon realized that developing sounds is an intimate process and it turned out that »Fee« was too indiscreet; we missed that vague twilight within which sounds could develop and merge into something new.

Figure 2: Girls playing with »Fee«.

Photo by the Authors.

Part II

Oliver: During an artist-in-residence stay in Vienna in early 2007, I found the time to start again from scratch and develop new concepts based on last year's kindergarten experiences. Thanks to an exposed location in the middle of the *Museumsquartier* cultural complex, I was in the lucky position to always find people willing to give my experiments a try. My first observation was that for kids as well as novice users, game pads were a too demanding, too mediated interface. All the buttons often intimidate users without gaming experience, they hesitate to press any button at all, and ask what they are supposed to do. So, in favour of a more direct control, I returned to a mouse- / touch-screen-interface.

I wrote a series of small programs, each for testing a different approach. Most successful was an extremely simple one which is not even a sequencer any more: You just tap on any point on the dark screen and there a white circle will appear, quickly growing and fading out, similar to drops on a liquid surface. At the same time, a smooth tone plays and fades out, too. If you tap repeatedly, circles and tones overlap, forming simple but appealing structures and chord pads. By tapping excessively, the circles' colours slowly shift from white to pink and the sounds gradually get distorted until they become a nasty noise. So if they try hard and tap fast enough, kids get what they love most of all: Pink colour and noise. The intensity of both is accurately controlled simply by the number of taps.

Figure 3: »Nixe« Interface.

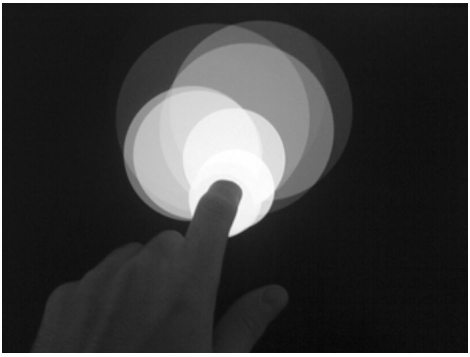


Photo by the Authors.

This little program demonstrates that to be taken seriously, as well as for the sheer fun of it, the ability to make noise is a great advantage for a music tool. If it can do noise, the rest can be really simple, it will still work and provide a feeling of responsibility and true interaction.

The simple, two-dimensional shapes were often referred to as »bubbles«, while for the other programs' minimal, non-figurative graphics children found metaphors like »ants« and »stones«. At no point the lack of flowers or animals seemed to be a problem, even if no figural association would take place at all. They discussed whether to »do« red or green »ones« with the same verve as they would with »leaves« or »beetles«.

Finally, what all kids were really concerned about was to clean up the mess: They usually wouldn't leave unless they had removed every single dot and were happiest when there was a entirely blank screen in the end. A habit which indicates good manners and which should always be taken into account when developing children's software.

Analogue Controls

The Theremin

Wolfgang: We once had a theremin at the kids' museum in Vienna where I could observe how children handle an analogue interface: First they move their hands up and down, assuming that might change the pitch - which it doesn't. Once they dare to touch the antenna and find it makes funny tweety sounds, they keep touching it all the time. That is one problem with the continuous, analogue type of interfaces: In a typical children's fashion, they explore the limits of the interface and then often persist in these extreme positions, get sort of trapped on the edges of the control field. It may be an interesting experiment to construct a device that plays like a theremin, but is muted when the player gets too close – a »don't touch« instrument that demands a certain carefulness.

The MS-20

Wolfgang: Korg's legendary MS-20 is a classic analogue synthesizer with the typical knobs and faders interface for gradual parameter control. I had some interesting experiences with a unit that lies around at home and which my boy has kept playing since he has been one year old. It's mainly the big rotary switches for filter cut-off that interest him and when other kids visit us, this haptic access always makes a nice game because they can intuitively understand the relation of the buttons' movements and the changes in sound. Although the MS-20 is also equipped with a piano keyboard, the interest is clearly focused on the analogue control of continuous sounds. One reason for that might be he monophony of the MS-20, which prevents the use of the keyboard for gradual control (kids like to press many keys at once to accumulate volume and change timbre) and causes frustration. The MS-20 is of course way too complex to serve as a toy; it always requires my assistance to get to a point where kids can start playing. But once they got it going, they carefully designed their own sounds. I could well imagine a minimal version with maybe just two controllers serving as a children's instrument. I once took it to a school where two girls of nine and ten worked with it. One asked the other if they should try to play to that »jelly pudding« sound again – which is a perfect definition for the MS-20 sound and another proof that abstract sounds stimulate fantasy.

Epilogue

Even the simplest toy phone transports an attitude, an idea of possibilities – or the lack of such. There is no indication that a figurative representation of an animal and harmonic melodies are more appealing to children than rotary knobs or an antenna and abstract oscillating waves. The growing popularity of »circuit bending« may illustrate the demand for the two key elements we discussed here: These techniques usually aim at adding analogue control and noise generation to toys that would only play pre-defined stereotype audio snippets. However, today's availability of technology would easily allow to implement new interfaces and sounds as dedicated toys. These could popularize some of the great electronic musical interface concepts developed in the 20th century, as well as entirely new ones.

FOUR MEDIA ARCHAEOLOGICAL ARTWORKS

GEBHARD SENGMÜLLER

I am an artist working in the field of media technology. For the last 15 years, I have been developing projects and installations focussing on the history of electronic media; creating alternative ordering systems for media content; and constructing autogenerative networks. My work reflects critically the historic and social context of current media art. Its focus is on the tools through which art is generated, be it my myself, in collaboration with others, or »autonomously« by the tools themselves. My work often has a didactic component in the sense that a critical engagement of the audience – not only with the work itself, but with the wider context in which it is placed – plays a central role in it. The following chapters comprise four projects that I worked on since 1992. These works are about television, film and telecommunication. In some sense, they also deal with putting things into order and trying to preserve them for posterity. They represent attempts to create systems /environments/tools that produce art instead of me actually having to create that content myself. With this, they examine the interrelation between the specifics of the tools/platforms and the content created with them.

Media Archeology

The four artworks can also be described as media archeological explorations of forgotten aspects of our media technology past. Unlike conventional media history, the field of media archeological art and research tries to reveal a hidden history of media. This »secret« or »forgotten« media history deals with parallel, presumably lost, little regarded, perhaps even merely fictive strands in the development of today's media apparatuses.

Artists interested in media archeology (these include, for instance, Paul DeMarinis[1], Perry Hobermann[2], or Vuk Cosic[3]) purposely use artefacts

1 De Marinis, Paul: http://www.stanford.edu/~demarini/ (August 1, 2007).

2 Hoberman, Perry: http://www.perryhoberman.com/ (August 1, 2007).

from media machines and media technologies »the wrong way« in their practice, developing them into previously unplanned hybrids, opening unknown back doors and thus often turning what were originally defects into strengths.

Erkki Huhtamo, who has undertaken media archeological investigations of archetypes such as the screen, the traveling panorama of the 19th century or the arcade game in his essays, writes in »Resurrecting the Technological Past – An Introduction to the Archeology of Media Art«, »The gaze of the media artist, earlier directed primarily towards the future, has now been supplanted, or rather supported, by another one which faces the past. This gaze is not motivated by the nostalgia of a techno-buff, or the postmodern transfiguration of the banal apparent in Jeff Koons's ›prepared‹ found appliances.«[4] Huhtamo sees this astonished gaze of the artist as an attempt to go beyond postmodernism and tie into a dialogue with the past. The aim of this dialogue is to counter the constant blurring of boundaries and definitions, which he regards as being typical of the »postmodern condition« and as a result of the dissemination of a largely audiovisually oriented media culture. At the same time, he emphasizes that this view of the media archeologist is not rigidly directed towards the past, but is extremely flexible and continuously searching through the historical panorama of technocultural forms, moving backwards and forwards in time, for correspondences and breaks, turning in the end to the present and then possibly to the future, »Archeological artworks are time-machines, yet their way of functioning is closer to Bergson or Proust than H. G. Wells. The user is invited to travel, but not simply up and down the shaft of time, as if encapsulated in a chronographic elevator. Instead, the traveler navigates in a much more complex realm of past-present and present-past, in which layers of time overlap and associate with each other; the conception of time is cyclical rather than simply linear. These time-machines are not automatic or remote-controlled means of (mass) transportation (like the cinema), but individual ›hand-driven‹ vehicles. The realm they traverse only opens up for the active participant, who is ready to leave one's customary chronological ordering of things, and the safety of his/her own socially and cultural defined observation post, heading out to explore potential dimensions in a conversational relationship with the work.«[5]

3 Cosic, Vuk: http://www.ljudmila.org/~vuk/ (August 1, 2007).

4 Huhtamo, Erkki (1995): »Resurrecting the technological past: An introduction to the archeology of media art«. Intercommunication, 14, 2.

5 Ibid.

There is a correspondence here with the themes that Huhtamo addresses, when my artworks conjoin technologies from various eras to form a new whole without taking into consideration the originally intended purposes of the individual elements.

TV Poetry

This early installation is a self-constructed and invented network of satellite dishes, tv-sets and computers that all have one goal: to create poems from television. I remember a statement from the Austrian writer Alfred Polgar from the 1930s about radio. He describes how he listens to radio with headphones. When he takes the headphones off, the radio keeps working, even without him, and the sound trickles into the table top.[6] In this sense, *TV Poetry* deals with the impossibility of absorbing all the available information on television myself, and instead trying to create a system that will put this information to use in an unexpected way.

TV Poetry is an experimental set-up which can be put together at any location. Combined with precisely adjusted receiving equipment, it rapidly scans the various television transmissions it receives (commercials, news, quiz shows, etc.) for text passages visible on the screen.

Figure 1: TV Poetry - field agency V2 Rotterdam.

Photo: Gebhard Sengmüller.

6 Polgar, Alfred (1938): »Handbuch des Kritikers«. (Vienna, 2004), (»When the headphones were removed from the table top, the place where they had been lying and sending sounds into it for fourteen days showed not the slightest tarnish! Not even the slightest trace as though from a breath was left behind.«).

In an ongoing, realtime process, the text is recognised, filtered out, processed, and output as an endless stream of text, generated by TV programs and CPU programming. Through imponderability, inaccuracy, video noise and misinterpretation within the system, the source text is radically transformed, giving rise to new meanings. Very powerful content (headlines, slogans, ...) »shines through« and tends to remain intact.

Signal processing takes place in parallel process on seperate machines and only comes together in the final stage. The quality of the results in terms of density, continuity and recognisable content is in a direct proportional relationship to the available power and capacity of the equipment (number of TV channels, number and operating frequency of the CPUs, bus width of the connections).

TV Poetry 2/94, which I produced for the Medienbiennale Leipzig, worked entirely decentralised. An arbitrary number of field agencies located all over Europe (in this case: artists appartments and studios in Rotterdam (Figure 1), Lüneburg and Vienna) gathered TV signals via cable television or satellite receivers, processed this raw information automatically and sent resulting poetry to the central computer placed in Leipzig. This unique design (externalisation and compression to only one CPU per field agency) relied heavily on the existing telecommunications infrastructure offered the opportunity of cheaply incorporating even distant locations into an open network. Compared to the previous set-up (TV Poetry 1/93 at Ars Electronica) this decentralized version resulted in an increase of channels and available raw information. The gathered information was send to the Leipzig central station at scheduled times via telephone. In the Leipzig exhibition hall a monitor continiously displays the gathered text. Except from three photographs that represented the field agencies, the observer was not aware of the poems distant origin.[7]

VinylVideo™

VinylVideo™ is a new development in the history of audio-visual media. It allows the storage of video on analog long-play records. Playback from the VinylVideo™ Picture Disk is made possible with the VinylVideo™ Unit, which consists of a normal turntable, a special conversion box (the *VinylVideo™* Home Kit) and a television (Figure 2).

7 Sengmüller, Gebhard (2006): TV Poetry brochure: http://www.gebseng.com/05_tv_poetry/01_text/tvpoetry.pdf (April 18, 08).

Figure 2: VinylVideo™ - installation view.

Photo: Gebhard Sengmüller.

At the same time, *VinylVideo™* is a vision of new live video mixing possibilities. By simply placing the tone arm at different points on the record, VinylVideo™ makes a random access manipulation of the time axis possible. With the extremely reduced picture and sound quality, a new mode of audio-visual perception evolves. In this way, *VinylVideo™* reconstructs a home movie medium as a missing link in the history of recorded moving images while simultaneously encompassing contemporary forms of DJ-ing and VJ-ing.

I describe *VinylVideo™* as a fake archeology of media. We designed a device that retrieves videosignals (moving image and sound) stored on a conventional Vinyl (LP) record. The discontinuity in the development of electronic film technology constitutes the historical background for this fictitious video disc technology: Even though television, the electronic transmission of moving images, had been feasible since the late 1920s, storage of these images became possible only after development of the video recorder in 1958. Recording images for private use did not become available until the mass introduction of the VCR in the early 1980s (!). Before, the average consumer was confined to use 8mm film, technology dating back to 1900, usually worked without sound. Recording of television was not possible at all.

VinylVideo™ reconstructs a homemovie technology of the late 40's/early 50's and thus bridges a gap in the history of consumer technology. The images are stored on a conventional analog record, with a running time of approximately 12 min/side. These records are played on a standard turntable with an ordinary diamond needle, the signals are then processed by the VinylVideo Home Kit into a videosignal that is displayed on a black and white TV-set.[8]

Timothy Druckrey writes, »Part subversion, part retrieval, VinylVideo™ stands on the border between the current frenzy for cut-and-paste home production and the nostalgia for pseudo-retro emerging in the reissue of the VW Beetle and its computational cousin the iMac. Posed as a ›fake archeological relic of media technology,‹ VinylVideo™ provokes a range of questions around the expectations of ›a fictitious technological past‹ (as Charles Gute suggested), the faux-status of innovation, the ploys (and plots) of advertising, the quotidian benefits of aesthetics, the esteem of media theory, the vacuous virtual venture of investment, and the participation of artist collaborators producing editions of ›records‹. In refusing virtualization, VinylVideo™ avoids the dead-end of another web project destined for obsolescence by coyly integrating itself into the materialized and mechanical system of objects and the semiotics of the tele-visual. Often omitted from the discourses of state-of-the-art media theory, the flickering black and white images are both deeply coded by their intimations of authenticity and historically destabilized by the collapse of the broadcast ideology that sustained their so-called authority. This oscillation, between credibility and disavowal, surely characterizes an approach to media that straddles the line between the parodic and the farcical while proposing to reflect on the status of the image and the technologies that empower them.«[9]

VSSTV - Very Slow Scan Television

This project is in many ways a successor to both *TV Poetry* and *VinylVideo*. It shows us a parallel TV universe, dating back to an era of television monopolies. It also shows a historic predecessor to current streaming and netcasting technologies. And, once again, it tries to construct a machine that makes use of content which would be lost otherwise.

Very Slow Scan Television (VSSTV) is a new television format that we have developed building upon *Slow Scan Television (SSTV)*, an almost 50-year-old image transmission system used by Ham Radio amateurs. In contrast to regular TV, *SSTV* runs at a dramatically reduced frame rate. *VSSTV* uses broadcasts from this historic public domain television system – available anytime over freely accessible frequencies

8 Druckrey, Timothy (1999): »Missing Links«. Eikon 29, p.4.

9 Sengmüller, Gebhard (2005): VinylVideo brochure: http://www.vinyl-video.com/press/02_text/06_vv_catalog.pdf (April 18, 08).

– to construct an analogy: it recreates a cathode ray tube (CRT) with regular bubble wrap taking the role of the aperture mask (Figure 3). Just as a CRT mixes the three primary colors to create various hues, *VSSTV* will use the surprisingly similar yet magnified structure of bubble wrap, commonly used as a packing material. We developed a device to receive images and output those images onto a new visual medium. A plotter-like machine fills the individual bubbles with one of the three primary CRT colors (red, green, and blue), turning them into pixels on the *VSSTV* screen in a continuous process. Observed from a distance, the clusters of pixels/bubbles merge into the original image. Large and permanent television images are the result, images that take the idea of slow scan to the extreme: due to our process, the frame rate decreases to only one frame per day, down from one frame in 8 seconds possible with the underlying *SSTV* format!

The combination of Ham Radio *SSTV* television and the new output medium's extremely reduced frame rate suggests the name for this system: *VSSTV* – Very Slow Scan Television. *VSSTV* thus devises a process that incorporates analogies on many levels: the transmission of images vs. the transmission of sound; digital vs. analog technology; CRT screen vs. bubble wrap. *VSSTV* makes us recall the elements present in every television image, it also reveals a hidden universe of amateur television broadcasting (going back to 1957). A world of public domain television, accessible even with simple technology, independent of the commercial or monopolized television networks prevalent in Europe and the US. At the same time, *VSSTV* adds an ironic twist to the use of a material familiar to every artist. Bubble wrap, normally used to wrap and protect art, becomes a medium and an artwork in itself. [10]

Figure 3: VSSTV - printout detail.

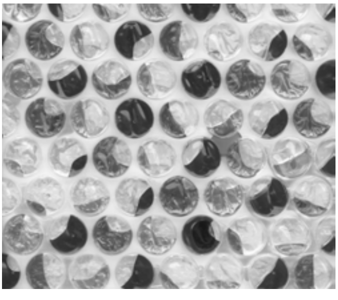


Photo: Gebhard Sengmüller.

10 Sengmüller, Gebhard (2005): VSSTV brochure: http://www.gebseng.com/02_vsstv/vsstv_english.pdf (April 18, 2008).

The imprecision and slowness of the *VSSTV* process stands for a kind of media archeological reinterpretation of features unintended in the conventional context into a new experience for the viewer, who is thus able to experience the transmission and determination of an electronic image in a new way. *VSSTV* emphasizes and exaggerates the slowness, the awkwardness, the technical limitations and the media transitions of the historical *SSTV* medium.

Slide Movie

This recent work is the de- and at the same time reconstruction of a common media apparatus.

Slide Movie appears as a black cube installation (Figure 4): a film sequence (35mm motion picture, 24 frames/sec.) is cut up and the individual frames are mounted as slides. They are then distributed among 24 slide projectors that are all focused on the same screen (the exact same point). Via electronic control of the projectors, these individual images are then reassembled-in an extremely cumbersome way-into a chronological sequence. The formula »one projector per frame« thus gives rise to something that at least rudimentarily (and inevitably very inaccurately, due to the lack of precision of the mechanical devices) suggests a motion picture. The film soundtrack emerges as a byproduct – the mechanical clattering of the projectors changing slides.[11]

Figure 4: Slide Movie - installation view.

Photo: Gebhard Sengmüller.

11 Sengmüller, Gebhard (2006): Slide Movie brochure. http://www.gebseng.com/04_slidemovie/slidemovie.pdf (April 18, 08)

Felix Stalder on Slide Movie:

»Tapping into the wealth of overlooked, forgotten or even repressed experiences in dealing with media is one of the most important aims of media archeology. This is also the approach that Gebhard Sengmüller takes, allowing himself not only the freedom to recall alternative approaches to media development, but also to propose some of his own. As fictive archeology, apparatuses are set back in time, so that the scope of action is radically expanded. If we can allow ourselves the freedom to reinvent the past, would it not then also be possible to imagine a future beyond the high-gloss techno-fetishism that the industry overwhelms us with? Slide Movie, the most recent of Sengmüller's apparatuses, is located not only in the field of media archeology, though, but also in the field of media theory. With the infernal noise produced by twenty-four slide projectors changing pictures, the ›film projector‹ is liberated from the sound-proof projection room and opened up. With the inside out, we find ourselves no longer in the audience space, but in the middle of the projector. The film, whose content is conventionally the focal point, moves into the background. What becomes visible, as though under a magnifying glass, is the medium, the illusion, the way still images are turned into moving pictures. In the terms of cognitive psychology, from which Heideggerian phenomenology also draws, this can be understood as a displacement of ›figure‹ and ›ground‹. The figure is that, to which attention is directed; the ground is everything that first makes the figure possible, but which is omitted by perception, so that we can concentrate on the figure.

The ground of the figure ›film‹ is the cinema, the box office cashier selling tickets, the darkened projection room, the muted projector, the electrical currents that provide the projector with energy, and so forth. All of this must be present, in order for us to see the film. At the same time, however, we must also fade it out, so that we can concentrate on the content of the film, the ›figure‹. Although – or perhaps specifically because – they are faded out, all these things have a much more lasting influence on our culture than any single film, which often disappears again after a few weeks, only to be replaced by the next film.

Slide Movie succeeds in shifting perception in the direction of the medium. The figure of this work is not the film that is projected, but rather the apparatus that carries out the projection with such great effort. This figure has actually always been there, but it is due to the intervention in the structure of our attention that we first really become aware of it. The essence of the projector, the transformation from still images to moving pictures becomes manifest.«[12]

12 Stalder, Felix (2007): »Cinema as Massage: Gebhard Sengmüller's Slide Movie.« 24th Kasseler Dokumentarfilm- und Videofest catalogue, p.56.

Acknowledgements

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It would have been Fantastic - Between Perfection and Failure

Ulf Langheinrich

Looking at the images rendered in works of Franz Kafka I find a striking distortion between the high-definition descriptions of various occurrences in close up, indeed detail obsessed photographic descriptions of objects and figures but behind and after the immediate foreground in focus there is void. This void is the unknown but the inevitable, to the figure in the text as well as to the reader.

I am indeed fascinated by the specific depth in his work: It is literally the depth in the space and time. Any meaningful action – or one could call it interaction- seems to be a useless effort like the rescue efforts of a fly in a spider web or glued to a flesh eating plant. The writing is precise to a degree that it seems as if the images are rendered by a language that is perfectly invisible in itself. The specific quality of those images suggests to comparing writing techniques to a band pass filter that is almost self oscillating: it not only produces a highly colored narrow interpretation of a given world outside as its source material, but almost becomes a self oscillating generator that produces results only vaguely or not at all dependent on the nature of any source material: an uncompromised, hermetic timeless world of inescapable gravity.

This description may however say something about my own way of aesthetic production, my area of artistic research: digital generated sonic and visual landscapes that I like to describe as a resonating matrix or aesthetic matter.

Here contexts, social settings and meanings are of no interest. My focus is the aesthetic potential of media machines, software and hardware. The contradiction between the promise of the perfect illusion and the facts of a specific, that means a specifically limited display apparatus. As I try to find something absolute in the given material I usually find problems and limitations. But of course this is clear and actually appreciated. This very friction reveals the true nature of software and hardware setups, there and not in the promise lays the potential. Investigating algorithms, beamer contrast and color range, and reflective specifications of projection screens etcetera is a constant topic; all parameters need to be exactly tuned. The work is about a beauty and depth that I believe I will find between the intricacy and ordeal of all this render and techno set up sessions. The main question is »does it work, will it not crash?« a bizarre question for a painter: A constant fear for me now.

If it works a viewer is participating simply by his presence, there is not much to recognize and to narrate and nothing to influence, and actually there is not even much happening. That unknown in the void is not so unknown after all, it is not different to the here and now, it is purely the present.

Indeed it is the exclusion of computer-aided interactivity that activates and empowers the viewer's sensitivities releasing them from the promise of navigation and allowing them to accept the internalization of their activity as viewers, or experiences. This active viewer will not embark onto a playful or intellectual or emotional narrative structure, he will embark onto a fragile construction that presents itself a sense-stimulating field.

An overall matter realizes itself as parallel streams of sonic and light projections. The specifications of those interfaces significantly determine the immediate sensory impact, thus, the audiences encounter with the matter, and the creation is envisioned with the intention to create a resonating matrix, sensually intriguing spaces that are dense and empty at the same time.

I avoid abstract gestures or objects moving in a virtual space because this already supports a perceptive situation in which objects, characters, actions are important, and the audience starts observing and contemplating »about« something given, rather than being »in« it.

Figure 1: Drift.

Photo: Ulf Langheinrich.

I focus on – as I call it – a primal overall aesthetic consistency. Such a situation is contrary to how a viewer seeks to track a plot, a sense, a meaning. Movement is only movement in one direction: forward into time and depth.

There may be mirrored movements like a continuous flow from top to bottom and slightly different from bottom to top. The absence of signs, gestures or objects in the apparently dimensionless audiovisual meta – movement evokes the notion of primal and total aesthetic matter resulting in a hypnotic audiovisual space, a delicate and subtle tension.

The visual flow is molded from images based on the notion of noise and interference. Detailed descriptions of a primal and amorphous aesthetic matter, that usually further disintegrates. I produce high-resolution information, but it is mostly layers of pre-random-pixels or lines. In current work the feel like layers of a digital alluvium that peters out, into final stillness and invisibility, dissolved into waves of pure light.

There are multiple parallel spatial and temporal layers that constantly reform through processing that alters the consistency, viscosity and transparency. Each layer is pulsating energy in sync and out of sync to others, in phase or in phase shift, fields of oscillating energy, sometimes clustered into one vibration. The result of the permeation, stacking, and re-visualization of these layers is visual qualities of symphonic noise permutations.

The visual space opens and closes, from surface to deep space and back to just pure screen and light appearing as an inverted illusion. The unavailing fascinated look onto a resonant matrix builds to an immersive deep glow. Direct sensual impact is first of all achieved by precision and high resolution and gives way to an awareness of and excitement about minimal shifts. An important aspect is that certain shifts and oscillating movements occur outside of the actual displayed images. They are sensations resulting as interference between the perceptive and processing potential of the eye – brain – apparatus and specific modulations of resolution of the projected material in time and projection-space.

These interference movements are not simply OP-Art related side artefacts but are the central focus of these works and their characteristics are designed over time. This is why I see the image like sound. I am fascinated by images; otherwise I would only compose sound. But at the same time I don't trust – or better – I am irritated by the recognizable and describable nature of images. A question such as: »what would you like to say with your work« is an unusual question to a composer, but the moments you create visual textures in an art context such questions occur.

Figure 2: Hemisphere.

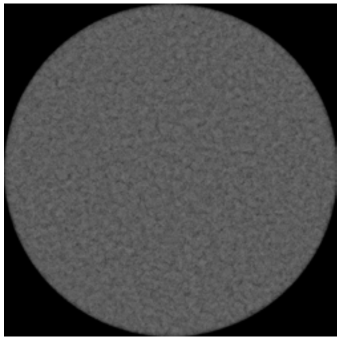


Photo: Ulf Langheinrich.

Since the membrane of the projection area is constantly presented to the viewer in hyper-realistic synthetic waves, they are propelled into a constant contradictory perceptive situation:

He is confronted with a minimal and strict aesthetic statement that demands and rewards for concentration and awareness of subtle drifts. In recent productions I also use stroboscopic light The strobe lights are basically means to distant the projected image from the projection membrane, a way out of my frustration about the projection.

This follows – as everything - the overall notion to create a liquefied matter, a 3 dimensional density rather than a projected image. At the same time the viewer finds himself in unsettling sensory overload.

Created through the remolding of sonic matter a parallel sound field unfolds parallel to the visual movement by changing its extension and consistency in sonic space. Much like in the visual aspects sound changes happen on a general level, as reformations of all sonic layers. Melodies seem as if not yet invented. I envision a force, one slow motion wave and everything and all is drifting and drowning in it. Syn-aesthetic is not sync-aesthetic, or is not sync-aesthetic anymore for me. I have an archive of sounds that I have realized independent of visual work because sound creation is a different kind of work. The main difference is the ability to create complex structures in real time.

I love to work with hardware that allows me to directly and intuitively define sonic density, a feel of temperature and movement. Thus, I prefer to work with machines that may have limited options, but the knob to change a filter cut of is always at a certain position, and will be there in five years, for me this is better than constructing intricate software synthesizer and improve them. If I don't look at the stuff for a while I can hardly make my way into the network of software modules that I once have assembled.

Not one of those former sound creation-synthesizers has survived, but I can create instantly on a few knobs without even one menu between the result and me. This kind of work is about listening rather than doing, the doing is so easy and nothing is interrupted in a render and wait and see the result and correct the result working style. It therefore is of essential importance to the overall feel of all my works even though those raw improvisations are single layers and become remolded, stacked and processed to be textures within an audiovisual application.

Those loaded and fluid sonic textures may be considered analogue to the sonic situation inside a small aircraft during descent. The general appearance of the sonic image is massive, invasive and enveloping:

Subtle differences in speed between turbines result in rich interferences: phase shift, drifting rhythmical phenomena and shifting resonance response to shifting sonic energy.

Due to the impact of the sonic and subsonic sound the virtual space gains immediacy however, its proximity and tension and the impact that the sound and flicker have on the physical body, feeling the sound through your core, takes it away from the virtual and makes it a direct external and internal physical experience.

I prefer a creation to simply be wonderful not meaningful and perhaps I am solely interested in depth, I intend to build structure that can actually be described best in sound. Sound, image, strobe are parallel ways to render this envisioned liquid, splendid, bleak and deep matter. This matter is a dense matter but the contradiction is that all this efforts happen for the ultimate desire for emptiness, nothingness, anonymity and silence, aseptic and pure.

Figure 3: Waveform B.

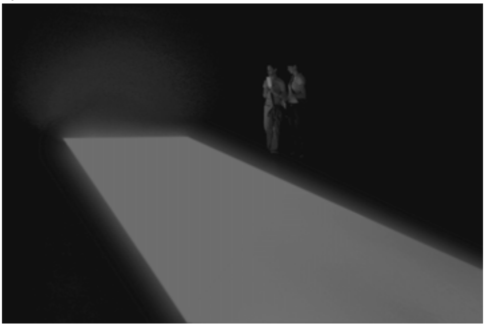


Photo: Ulf Langheinrich.

The work emphasizes on the fact that there is a projection membrane by trying to dissolve this membrane. The interesting aspect is that I insist on projection onto such a membrane instead of simply »skip the whole membrane« idea.

It would be much easier to start from empty and clean, but I constantly collect and re-use and process material, in a way I simply pile it up until everything becomes a indistinguishable rumble and hum but this still seen as an act of processing with the aim of purification.

Perhaps I am not really interested in this final absolute beauty but in a situation of an »almost there«, a promise that makes the absence of it an experience that is actually not enlightenment or joy.

An overload that is almost already silent, an overload and density of information that doesn't lead to anything and anywhere, it doesn't even look like anything but it holds a tension and touches the viewer with ambiguity.

This is why I see all visual creation as another way of composing as if I compose sound. The notion of a self reflective art for art approach is pointless if you see it all as music. Music works beyond meaning and message.

There is a gap between the intention (in my case to create perfection) and failure. Perfection is probably a senseless idea anyway but it is not an absurd idea. More than any other art form digital art promises something new and unseen and so much better than ever before and this time eventually perfect, yet finds itself somewhere half the way in a state of »it would have been fantastic if only….«.

I do find myself always in exactly this situation, confined between deadlines, always too sluggish computing power and the hunger for something new and sensational on the market, while I prefer to look at something again and again and improve a three year old work because I still find it hopelessly far from right. The gap between original intentions and final product can easily become abysmal.

When Kafka's starvation artist finally finds himself in a situation to be allowed to hunger as long as he wants, he discovers the truth of life devoid of any food and eventually faces fatal consequences. He can do this radical research because of the absence of the market: The audience has moved to the next sensation.

(Accra, November 2007)

EVERYTHING IS SO ANALOG OUT THERE

STATION ROSE (ELISA ROSE, GARY DANNER)

how important is

::::::::::::::::performance in our art?

::::::::::::::::the internet for our art? where do we stand with netart today?

::::::::::::::::it for media-artists to re-materialize?

::::::::::::::::it to produce finished products with a barcode & original works of art as a media artist?

::::::::::::::::a mass approach (massmedium TV with 40.000 viewers per week)?

::::::::::::::::hi & low?

::::::::::::::::it to switch between social scenes?

::::::::::::::::the fluidity of STReaming?

::::::::::::::::to compose sound & visuals together at the same time://place?

::::::::::::::::the length of time we give us until a composition must be finished?

::::::::::::::::private://public?

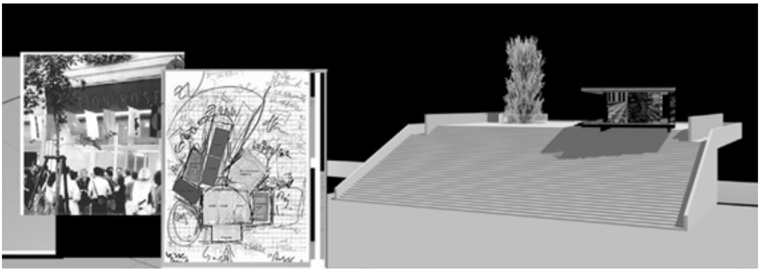
::::::::::::::::the nonfigurative versus the body ?

::::::::::::::::virtual light ?

coming up:

:::::::::::::::::::::::::: 20 Digital Years, 2008.

Figure1: Station Rose, Vienna 1988.



Picture: Station Rose.

Performance

Performance can be seen as the basis of our artistic work. We see digital tools primarily as instruments for performing, be it in the medium of communication, stage work or webcasts. Never before has audiovisual art been so precise to compose, the independence of the composer so huge. When composing in a flow, opposite to the method of verbally laying down a concept first, on paper or in thought, and then realizing it as an artistic work, you are performing during the creative process. We have carried this to the extremes with our Webcasts, were we perform »live@home«, which means composing in the studio, while broadcasting it to viewers in realtime worldwide.

The telepresence of the viewer can be felt, the interaction arising thereby gives feedback to the creative process, enhancing and enforcing it. Operating experience has shown that a live performance at a club, in a museum or at a festival, in front of a physically present audience, always changes the piece you are performing. Soundwise this means not only the acoustic parameters of the space you are performing in, but mainly the »setting« provided by the audience. Therefore every live performance is a piece of interactive art.

Unlike VJs, who most often take up a subordinate role to musicians, Station Rose compose sound and visuals simultaneously in the AV-studio (Elisa Rose: visuals, Gary Danner: sound) since 1991.

This is crucial for exploring the new language of sounds & visuals. Almost every section of our art emanates from performance, be it installation, art production, net art or others. In the focus - from the beginning – has been the obsession with ›playing art & playing with each other‹.

Figure 2: Station Rose performances (Transmediale 98, M12 Berlin 06, Ars Electronica/Stadtwerkstatt 07, Musuemsquartier Vienna 00, Cimatics 07, Soft Targets/Marstall Munich 1991, Club Royal Frankfurt 05, Galerie Martina Detterer Frankfurt 03, Gunafa Clubbing XS Frankfurt 02).

Picture: Station Rose.

The challenge in our case is that a visual artist plays/works with a musician. Coming from two different professions we have really diff-erent approaches. There is a first barrier that has to be overcome – artist and composer have to reach somehow that AV area/space together, that electronic field of sound information & visual information. No words are allowed in the process. Sticking to ones own medium is the only way to proceed, to morph the former two artforms into one new. As soon as we realized that words are the problem zone, we responded not talking for a long time in the studio. The narrative element automatically delivered with words does not allow the desired synthesis in digital AV-art, but instead stops the audio-visual field. An exception is MCing, slamming, because that way words team up with AV in a subtle way. Either we enter the field, play it, stretch it, bend it, deform it in realtime, or stay out. During STR-Webcast 102 (later published in »private :// public«)[1],

1 Station Rose (2000): »private://public«- Conversations in Cyberspace, edition selene, Vienna, p.67.

we talked with Bazon Brock about those angel-like electrons, who visit you in the process, and later move on to another place.

We started to perform digitally in 1991, with Amiga and Atari, experimenting as much as possible with a live art situation. Even if the computers changed over time, the performance setup became clear quite soon. Concerning webcasts – being able to perform behind and in front of the cameras at the same time was a next level. When the Internet becomes less realtime, less performative, but instead more ›on demand‹, it gets less attractive for us, blogs included.

Net Art

The Internet is deeply woven into Station Rose´s performance art. We date our first netart projects, i.e Gunafa Clubbing, as early as 1992.[2] Which is much earlier than 1995/96, when netart as a new artform often is said to have started. In these early three to four years important developments happened, off the map of many inaccurate performance theorists. A black hole in art history, as well as a wrong dating are the consequences. Basically Gunafa Clubbing, the audio-visual-online club project Station Rose started in Vienna in 1989, but made realtime & online in Frankfurt in 1992, was centered around playing a realtime performance and being online with our virtual community simultaneously, and it was not about vj-dj-ing. It did allow people to come in and interactively be part through the net, through the WELL. And it was projection art, with 4-8 projectors set up in a room.

The Internet is most interesting for us when we do something live. It became more boring when vector-style and website creation started to become the essential thing. It did become a challenge with Electric Minds, an early virtual community project in 1995 that we among others were hosted, and our own STReams/webcasts started 1999 at stationrose.com. After almost 200 realtime webcasts, and youtube-ization as a mass version of it, but not live, instead integretating only aesthetic elements, Kwa29[3]? We look for a next possible level.

2 Station Rose (1998): »1st decade«, edition selene, Vienna, p.75.

3 Dejond, Aurélia (2006): »cyber-langage«, Bruxelles, Éditions Racine, p.22.

Finished Products

On the other hand, the more animations we create, the more a desire to halt is generated. There can be a soft change from performance to installation just by freezing motion. This stop makes space inside the virtual room, and works perfectly in an exhibition, too. A next or parallel step is to choose some stills out of the flow, and let them re-appear re-materialized as prints on fabric, c-print, etcetera. We extract a composition, a Leitmotiv that way, like recently in form of ›electronic habitat‹ installations, and from 2008 onwards, when Station Rose »20 Digital Years« takes place, even in form of architecture as a next form of media-rooming. Re-materialization offers the opportunity to stay in a theme, which is necessary. For sure we are not going back to painting, but freeze/pause for a moment. And, there is no need to leave all ›real space‹ to analogue collegues, as harddrives go well with rooms.

As media artists it goes without saying for Station Rose to produce completed products.

From the point of view of the composer of the sound-part there are three kinds of compositions. The first one is the rarest one, it is composed, produced and recorded within short time (approximately one day), and stays that way until it is released in one or another way. The second one is the most common, and takes approximately one month to finish. It can turn out to be a »hit« when performing the piece live, though sometimes never sees the light of day as a product like CD or DVD (It can surface in the underground as live-bootleg at myspace, or as bonustrack on audio products). If a composition does not fit into any of these categories, it belongs to category three, and is put into the trash. »The goal is not longer to produce something, but to clear space for the act of producing itself.«[4]

Elisa Rose is in charge of recording the AV-sessions on DV, sometimes tries to forget about them, rarely takes a look at them the next day. When excavating them later, she has a distant enough look at it, and uses the material in various ways.

Hi & Lo

»Hi & Lo« is important. Hi & Lo are a couple. And won´t divorce. If you want something hi-res & clean, then make something for a museum only.

4 cp. Vilem Flusser, Vilem (1997): »Medienkultur«, Frankfurt/M.: Fischer Taschenbuch, p. 65.

Or work for an ad-agency, where they let you work on hi-res stuff for others brands. If you have your own brand, stick to hi & lo-res. Whenever a next better resolution is achieved, the next low is coming anyway. HDTV meets youtube and mobile phone resolution.

When we had the chance to produce audiovisual art for German television from 2002 - 2006 once a month (»Station Rose Best of Webcasting«, hr fernsehen/ARD Digital, broadcasted once a week), and when we had signed an artist-contract with Sony Music in 1996, we realized that we do not »concern ourself with pop« in our artistic statements (a term which is often used in describing the work of contemporary artists), but a part of our work had become pop(ular culture). Media art has the (political and technological) potential to become pop, to be seen and heard on the streets, to compete with capitalism and mainstream art.

Fluidity

The fluidity of STReaming, of Digital Art, is the goal. Can IT always move? Stuck in the flow is, like lo-res, sort of included. There are enough reasons for that – harddrives, RAM. But this is not all, interaction is the other important factor - with the media-room & with the people. How is the encounter with the public? How fluid is the dataflow moving through the Internet in a STReam?

The importance of switching between social scenes

Station Rose works in three scenes, which barely, if not at all, intermix: the music scene (lower to higher middle class), the new media-art & TV-scene (middle class), and the art scene (higher middle class to aristocracy).

Compared to 20 years ago, there has been an ongoing convergence between the media art scene and the electronic music scene. This is mainly due to the collapse of the music industry (mainstream and independent) at the beginning of this century. Since then more and more mature musicians get drawn to the audiovisual, as it is easier to sell music and visuals as a package to media festivals. They have to do so, as advanced electronics-CDs are hard to sell these days, and performing has become an important means of money-making again among musicians and composers 30 years and up. (I could not find this tendency with musicians in their twenties, as my research in the Dubstep scene showed.)[5] While (electronic) music and media art seem to approach each other, the art scene (galleries, museums, art fairs) still seems to be quite an island of its own. The hi-bourgeouis social scene of the art market, due to its momentary economic boom, seems to set rules of ist own. So artists can be watched entertaining audiences with their skills as DJs, singers or guitarists, but you will almost never see a musician do a solo show at a gallery. If this is so because the etiquette of the art scene forbids it, or because musicians have better things to do than paint a picture on canvas, remains unanswered. Nevertheless since the beginning of their career, Station Rose switches between the scenes mentioned.

private://public

We made a lot of self-experiments with living intensely in the studio and the Internet. When we decided to become digital from 1993 onwards, we created the term »Digital Bohème« in 1994, more than 10 years before it re-appeared as late as 2006/07. Today an autistic studio situation is mainstream & experiencable for the masses through web2.0, being no longer a question of the avantgarde. The question of private :// public remains - one has to evaluate when to open and what to show, what to hide & what to close away, what to tag.

The Nonfigurative Versus the Body

When Gary Danner started as a professional musician in 1979, it was in the cultural environment of the Viennese Punk movement. Like so many micro-underground movements they were quite dogmatic, and all 20 of them had to find a shared enemy. They envied the British, Dutch and American punks, as their easy to find target were the »hippies« (whatever that meant), and envied the German movement, because they had the »68-generation«. Nothing compareable had happened in Vienna during the sixties, so they had to settle for Viennese Actionism. Station Rose feel some sort of a disrespect against »body-art«, being the remnants of a decade long gone, and still prefer more neutral, abstract samples.

5 Danner, Gary (2007): »Dubstep. Die Dominanz des Subbass und des Raumes.« SKUG Journal für Musik # 71, pp. 21-25.

Virtual Light

Until recently there was always the next ›stronger‹ projector in focus. But it looks like we are reaching an upper level of virtual light intensity. When we performed at Cimatics Festival in Brussels in November 2007, we used three projectors (in a row) with 3.500 Ansi each = all in all 10.500. Is it getting too bright – or do we need a dimmer for virtual light, or darker art or only position the projectors more 3D?

- from Everything Is So Analog Out There – to 20 Digital Years in 2008

:// or why it is important to build again.
Mediasculpture. The LED skin breathes. The architecture is the frame. Digital archive fever.

- Vienna Phase I (1988-91)
- Virtual Phase (1991-today)
- Architectural _update …2008

Building an Audiovisual Sculpture: Exhibitions, Media-Installation, Performance, Net Project.

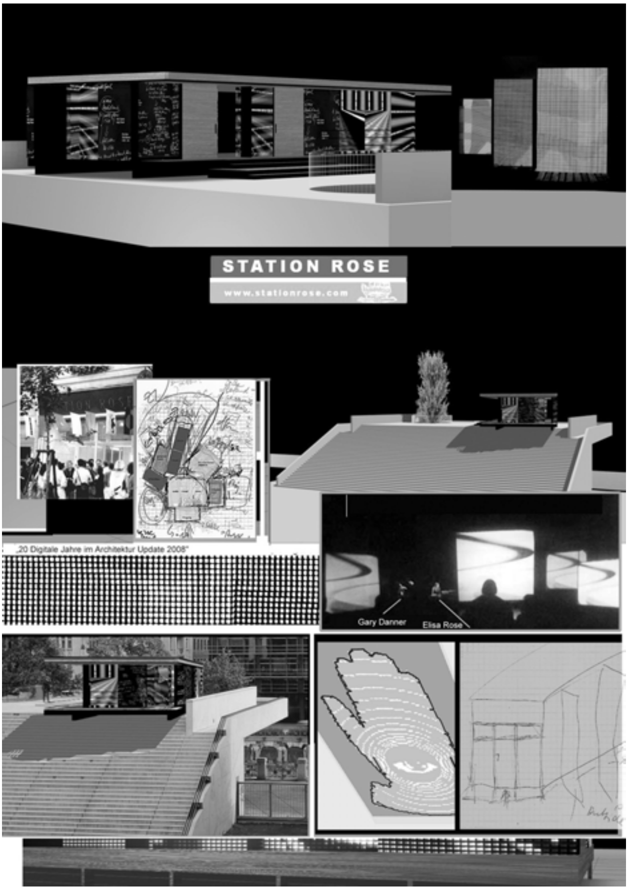
:// Background:

On March 11, 1988, Station Rose/STR was opened as a public media laboratory, exhibition and performance space in Vienna, Margaretenstrasse 26, by Elisa Rose & Gary Danner, following the reception of their diplomas from the University of Applied Arts.

The Station was situated in the center of the emerging art and gallery scene in the fourth district. It was open and active from 1988 to 1991 and can, in addition to the University of Applied Arts, be seen as the essential (and only independent) space for media art in Vienna at that time. Since the Vienna Station used to be a shop, and was situated on a downtown main street, it rapidly evolved into a public place of art, exchange of ideas and cooperations. Through Station Rose digital art became reality in 1988, with business hours. The virtualization was realized after the move to Frankfurt in 1991. The activities primarily took place in the Internet from then on. The contact to real space was kept through performances, exhibitions, club projects, and symposia.

For the 20th anniversary in 2008[6], we build a real place again – an audiovisual sculpture. It will be realized as a temporary walkable sculpture, with a timeline of »20 Digital Years« as AV and Web 2.0 database and, just like the Vienna Station from 1988 to 1991, as performable work-in-progress artwork. It will also be an active station operation, as a living media sculpture.

Figure 3: Station Rose, 20 Digital Years 2008.



Picture: Station Rose.

6 Station Rose: http:/www.stationrose.com/2008.html (April 18, 2008).

The virtual and the real morph together on location

STR creates a foundation through the building process exactly because of the years of dematerialization, and thereby making the complex 0-1 art and its digital history accessible. Through the database and the accessibility, the possibilities of real as well as virtual entry are given. The street-shop-architecture from 1988 now becomes exhibition architecture, with samples of the original Station. The fluid LED skin and the AV/Performance space, the office, the smoking room, the audio room, the relic room, the secret room provide installative, performative, interactive access to the 20 years of activity. The active station is in focus. It is about NOW. STR will perform during the project. This audiovisual projection art in realtime will be taking place live at given moments. However, the audiovisual works of Station Rose (1988-2008) will be accesssible in a steady flow on the LED skin as well as inside the station through projections, therefore changing the sculpture by procedural morphing. In an exchange with artists, musicians and theoreticians findings can originate on-site – performances, talks, concerts as part of the dataflow, the networking. The material architecture is the skeleton/the frame for the dematerialized projection/AV-art. In this time now, where terms like »Digital Archive Fever« are circulating, Station Rose deems this project precisely »situated«. Inside & Outside, it is supposed to beam. The database of 20 Digital Years, the data flow, the audio-visual frequencies can be perceived from every angle of the station.

: // The Public

Urban space, GoogleEarth-Mapping & Zooming-in in RL/real space. MAK Austrian Museum for Applied Art / Contemporary Art, Vienna.

Also significant for the form and the aesthetics of the media-sulpture are the architectural conditions and the characteristic of the MAK´s terrace plateau, where the architectural update will be buildt. It functions as landing plateau, as launch pad, and multiplier for the radiating power of the LED-skin. The Vienna Ringstrasse-style with its back side-/side-version has already been updated through the existence of the terrace plateau leaning over the boardwalk of the MAK. Now, this ›free-standing, visible, and accessible‹ space in the sense of »available for STR« is being played, used, irradiated, fraught with sound. The visibility of the station set up this way seems to have a very big radius. According to our estimate, three sides of the station will be visible & audible from a far range. Each »visitor« watches his/her own movie by starting to walk, to stroll this urban way. This walking-tour is urban, public, but constitutes only a part of the »tour«. On turning into the boardwalk, entering the garden, one walks into the direction of the terrace plateau stairs, gazing, watching LEDs, increasingly noticing the acoustics, to finally climb up, take a second tour upstairs, to zoom in on it in the sense of a GoogleEarth voyage, to finally enter. Not only that the Station Rose will be visible from a distance, and therefore respectively offers new views on the object, its accessibility and existence as a sculpture are provided to be able to delve into visual and acoustic details inside the station. After the first stop in the MAK, Vienna, the station will hit the road.

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Multiple Media – Internet (Driven) Works

Ursula Endlicher

»On the Internet, nobody knows you're a dog«
Peter Steiner[1]

When I began working with digital technology in 1990 and with the Internet a few years later, I was eager to let completely new concepts, new media, and different worlds into my art production, which was back then fed by diverse studies such as those of Fine Art, Theater and Philosophy. I moved from Vienna to New York in 1993 to engage in further studies – in Computer Art[2]. There I was introduced to »telecommunicating« with other people, places, and objects. Always being intrigued by the phenomenological idea of an inner life of objects, seeing them as entities and worlds, I wondered, how it would be to have them talking to each other, from one side of the world to the other. Or, how it would be to produce a piece that would be the same no matter where you are at the moment, or where you are looking at it from on the globe. I did my first piece for the Internet in 1994 – for The Thing's BBS – for which I produced several graphic files that could be downloaded, printed, and assembled by anyone.

Another new thread that entered my thinking was spun by the notion of non-linearity, which was stimulated by experiments with hyper-textual applications such as HyperCard.[3] Within this thread of inspiration were also the early browser versions for the World Wide Web. Interestingly enough, there were attempts around to apply non-linearity into »linear« media in movies and literature, such in Italo Calvino's *If on a winter's*

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1 Steiner, Peter (1993): »On the Internet, nobody knows you're a dog«. Cartoon, first published in: The New Yorker (Vol.69 (LXIX) no. 20), July 5, 1993, p.61.

2 I did my MFA at the Computer Art Department of the School of Visual Arts in New York (1993-1995)

3 HyperCard was an application program from Apple Inc., among the first successful hypermedia systems before the World Wide Web.

night a travler, as the storyline was often broken off and interspersed with other narrations and comments, and continued at another moment in the book. Another application that was offering non-linear and interactive composition functionalities while »breaking out of the box« was Director,[4] as it allowed one to extend whatever was happening on the screen into a physical realm – interfacing the world within the application with something in »space«, something like an everyday object, such as a table, or knife and fork, via the use of programmable hardware and sensors. My Master's thesis, an interactive dinner table, consisted of a movie projected into a plate which could be *cut through* in different areas to go to the next story; for me it resembled the idea of stabbing and cutting your meal in the dinner plate, but instead of receiving food to enjoy it, one would dive deeper into the visual narration...

The third thread of rethinking my art production was spawned by the visits to the worlds of MOOs.[5] These MOO's were the first chat rooms and the ancestors in spirit for what later would be first *The Palace*[6] and now *Second Life*. They delivered new possibilities of inventing, talking, and acting out verbally as avatars, not knowing who was actually talking on the other end. For instance, characters could be assigned a hybrid gender, or some plural identity. I sometimes think that these early environ-ments had more freedom in creating a character as it was more or less up to the user what to create. Also the available options for building a character, such as gender, or personality, were more diverse and imaginative than I find them now in *Second Life*.

All these new conceptual and technical approaches – plus acquiring a new tool set within the art production, i.e. programming and scripting languages – allowed me to invent a new space where art could exist.

Methodology: Multiple Realities – Mixed Platforms – Where and How Do They Meet?

How can I interface different realities such as the Web and physical space, how can I relate them to each other? Where does one world start and where does the other end? How do different media intersect, and

4 In 1994 it was called Macromind Director, and was changed into Macromedia Director (v 3.1.3) the same year. Macromedia Director 4.0 was released as well in 1993.

5 These were the PostModernMOO and LambdaMOO.

6 Palace is a software program used to access graphical chat rooms and was first released in 1995.

how do they learn from each other? How can performance simultaneously be online and on a stage?

In my practice, the exchange of online and offline worlds results in objects, in performances, in Net art, in ephemeral and in haptic manifestations, in multiple-media installations, and a blend of all the above. They usually are interactive, user-driven, or tell a non-linear story of their user-created origin. Performative settings are inviting the audience and the online user to participate. I like to investigate the parallels between an everyday life that takes place in RL (Real Life) and in VR (Virtual Reality). I am using this term here for everything that's »virtual«.

Before my shift online, mixed-media installations were part of my oeuvre; performative elements marbled through several video-based works. With the addition of the Internet and the Web, another level in my artistic practice was reached. It actually fused all media and all approaches in a denser, more political, more hands-on, more social, more user/audience-based kind of way.

The scope of my work has been growing since then, in letting these different realities adopt from each other. So consequently, my works nowadays have several layers of reality: the Web, the gallery space, and performance. All of these three seem to have a different physical condition or, applying a term from physics, »states of aggregation« in art.

Hence I have been developing works for the Web – they can only be seen and experienced there – while other projects expand from the Web into »space«. These can be performance works, and installations – but most of the time these three elements merge. I am interested in multi-layered structures. As we perceive and live in a multiple-media world, it seems clear to me that art takes on the same form and reflects the many media layers we live in.

Many of my works live online, but I am often interested in bringing the piece, with the reality of the Web, into physical space. So, often my Web works extend into installations that immerse visitors in spatial settings where they can communicate with, and experience, transformed Web data through different communications devices or scenarios. These range from different combinations of media, such as the interactive mouse chair, a navigation device, which invites one to surf the Web with the whole body; and extends to objects such as *Website Wigs*, which are hypertext links translated into braided hair.

On the other hand, there are performance works in which I am »becoming an antenna« for web-based information. I perform as the incarnation of a website, while the structure of the website's data representations, such as *html*, becomes its life essence. Hypertext markup language is transformed into instructions, which tell my »character« how to move and behave. (An interesting question to me is, what is driving this creature who represents and impersonates a website – what is the motor for its performance? Is it the site's own traffic, its users, or its programming and scripting language?)

All of my works within the last decade visualize or embody the architectures and languages of the Web – scrutinizing cultural phenomena that manifest online, while bringing them into an online/offline experience. I am fascinated by how information that exists online can be displayed, or acted out, or become an environment in RL, which can then be fed back onto the Web.

Worlds that Coexist – Works from 1997-2007

In recent years my focus has been on »animating« the Web's grammar by making it visible – on the Web or in a web-driven spatial setting. One of my latest web-projects, *html-movement-library (2007),* is an online database of video performances articulating html code through gesture, movement and dance. Visitors to the site can upload their versions of »html performance« into the library as video clips which are then instantly included in *html_butoh (2007)* – a composite enactment and web-based performance of the »Top 500« websites. The piece then displays these video submissions to the library as choreographed by each site's real-time html structure.

Figure 1: Html_butoh (2007), Screenshot.

Net art commission for Turbulence.org.

The URLs, or the stage, are renewed every 3:28 minutes, running through the day's most popular five hundred websites within a twenty-four hour cycle. (I also showed the html-movement-library as an interactive installation in the form of a »walk-in« environment, where visitors to the gallery could immediately film and upload their ideas).

Website Impersonations: The Ten Most Visited (2006/07)
is a live performance series where I enact different websites following the html structure of each site »on the fly« and responding to it with movements. Every submission to the library will generate another digital »hieroglyph« in the movement alphabet, which I will have to follow during the performance.

Singing Website Wallpaper (2007)
gives voice to html by re-interpreting »live« html code of websites as a musical score, and the frozen source code as scales in the form of printed patterns on wallpaper.

Website Impersonations: The Amazons (.at versus .com), (2006)
juxtaposes two »humanoid« websites in an interactive dialog. An anthropomorphized Web can be accessed via an interactive input device, the mouse chair, which functions like a large trackball inviting visitors to sit down and surf the Web with their whole body.

In my lecture at the Interface Culture Lab in Linz in 2005, I talked about my recent pieces, *Website Portrait Performances* (2005), which portrays websites based on their hypertext-linked structure. In this piece I was interested in visualizing the link structure of different websites through maps built on color-coded lines, symbols, and video portraits of each link. In the interactive installation version of the piece, the first version of the mouse chair was developed. Other works I mentioned back then were *Famous For One Spam* (2004), which repurposes the overload of spam email and questions the "fake identity" of the sender while confronting it with the »real« person found online. A new piece I started that year were *Website Wigs* (2004-2007), a series of wigs that were braided following the hyperlink structure of websites. I also mentioned previous pieces such as the *Web Performer* series (1999-2000), a series of search-engine based theatrical interactions, based on finding the Web's interpretation of historic or public icons. Another piece reflecting on web-specific qualities was *Ready to order – WWWaitress* (1997), dealing with the »wait« to get served online...

Figure 2: Website Impersonations: The Ten Most Visited (2006-07), Performance Series (Life and Life-Web-Content), www.howstuff-works.com.

Picture: Ursula Endlicher

Figure 3: Website Impersonations: The Amazons (.at versus .com), 2006, Interactive installation with mouse-chair navigation to trigger web-driven content. Exhibition at Austrian Cultural Forum, New York.

Picture: Ursula Endlicher

Questions, Answers – Future will tell

In my practice I am often confronting online identity and structure, and virtuality versus physicality. What happens when transplanting the Web out of the box? What is its native environment? Is the Web's nature screen-based? I think it is »multi-medial« and therefore can have many different outlets in the way that art that derived from it can crystallize: as sound pieces in headphones, as hybrid works combining web technologies with spatial interfaces, as performances, and even as objects that obey the rules of the Web without being online. Many of my web-based works extend into RL, interfacing with physicality, and therefore bridging the Web and spaces, such as the museum, the gallery or the performance stage. Simultaneously, Net art and art that is driven by the Internet introduces a different approach to display – be it the Web, or an amalgam of physical objects interfacing with the Web. But I think one of the main questions is, and this will interest me going forward, how will the traditional gallery or museum space change in order to embrace New Media? I think every piece being developed, has it's own display inherent, and will demand its own way to be shown, be it online, or in a gallery, in a merged way of both, or something new.

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Childhood Memories and Interactive Fairytales

Keiko Takahashi

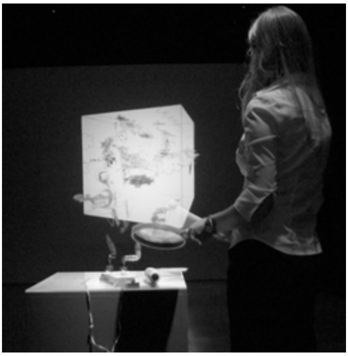
When you were a child, you must have dreamt about things that do not exist in real life. I also fantasized and wished that those things would actually exist. That is why I started to create interactive installations. I wanted to bring the fantasy world I dreamt of into reality. Through my interactive works, grown-ups should also have the possibility to participate in childhood dreams. To me media art seemed to be cold, digital and lacked human warmth. I wanted to add warmth and inspire sweet childhood memories.

Rakugaki

Idea

Rakugaki was produced from 2001 to 2005 and was my first interactive work. My aim was to add warmth and evoke childhood memories of the users. The relationship between sound and images was a field of interest to start with. We often think music evokes images, but I realized that sound doesn't evoke paintings or images.

Figure 1: »Rakugaki« at Beall Center Art+Technology U.S.A. (2005).



Picture: Keiko Takahashi.

My image of a sound is like a long line. The sound of a flute becomes a long line and then becomes a drawing, moving freely. I decided to use objects, toy instruments such as Trumpet, Drum, Metallophone (Glockenspiel), Maracas that would be easy for a child or an elderly person to use. The instruments are the interface. I gave each instrument a function to control the drawing. I wanted the drawing to have a story-telling element. I wanted to include an element like an illustrated book - when you flip a page, a new image appears and a new story begins. I decided to use a cube and each side of the cube to act as a page.

Operating Instructions

Trumpet, Drum, Metallophone (Glockenspiel), and Maracas are used as interface. *Trumpet:* When a person plays the trumpet, a line appears on the projected screen. The line starts to bend and move freely. When a person stops playing the trumpet, the line disappears. The line starts to bend like a spring and transforms into animals, fishes and birds. They float on the screen and after a while, they disappear. *Drum:* When a person plays the drum, a crumbled ship appears on the screen and starts to transform into animals, fish and birds. They float on the screen and after a while, they disappear. *Metallophone / Glockenspiel:* Can control the images created by the trumpet and drum. When a person plays a high scale, the images will start to spin and drift upward. When a low scale is played, the images will start to spin and drift downward. *Maracas:* When a person plays the maracas, the cube starts to spin around.

The six surfaces on the cube represent three different worlds, »Ocean«, »Sky« and »Land«. The creatures that fit the environment will appear. For example, for »Ocean«, fish, ships and submarines will appear. In the »Sky«, birds, dragonflies and butterflies appear. On »Land«, dogs, horses, cows and humans appear and walk toward the horizon. In this matter, maracas will shuffle and spin three different worlds, so you can enjoy the different atmospheres. When the screen displays a new world, the story changes and a new chapter begins.

Technical System

The interface is the four toy musical instruments. A microphone captures each sound of the instruments. A PC analyzes each sound from the microphone and generates the images and animations based on each characterizing sound. The image is projected onto the cube by a projector. (Programming: Shinji Sasada)

Floated through my Mind

Idea

I wanted people to experience my work in public areas. By installing the work on the walkway, images move and change depending on peoples' movement. I used the same structure as a hanging mobile. If you can imagine the structure of a hanging mobile, the images hang down from one to the next.

A camera detects people's movements and the computer simulates the movement of air. When a person passes by slowly, only the fringe on the bottom moves in response to the air.

When groups of people pass by or a person passes by quickly, the image moves from the bottom upwards, in response to the air. It starts to spin, increases in speed and the whole thing starts to spin. As it spins, the images and the back ground change.

Each fringe has different sounds. The more it spins; the more sounds are played in harmony. The sound grows louder, responding to the speed in which it spins. When it slows down the sound grows smaller.

Slowly the different world changes and images appear on the magic lantern. When there is nobody around, the images slowly stop moving and the sound fades. The image comes from the little match girl lighting a match and the dream like images appear through the light. I am hoping that by installing this piece in a deserted space, like a subway platform or a parking lot, it will make the space brighter.

Figure 2: »Floated through my mind« at the Beall Center Art+Technology, 2005.

Picture: Keiko Takahashi.

Technical System

It resembles the structure of a mobile hanging from a ceiling. People walk in front of the screen, which the image is projected on. A CCD camera captures the shapes of human shadows. A computer recognizes the amount of people and the velocity of the people walking and simulates the air movements. The images flicker like a breeze and rotate like a mobile when people pass in front of the wall. (Programing: Shinji Sasada)

Diorama Table

Idea

When I tried to explain to my friends what kind of installation *Rakugaki* and *Floated Through My Mind* are, they couldn't understand them. It is very difficult to explain in words what my work is all about. I wanted to create a piece that would be easy to explain to people. In addition, people could be able to share and experience it together.

Then, I came up with the *Diorama Table*. I wanted to create a table that becomes a city just like when we used to play with wood blocks and miniature cars.

Figure 3: »Diorama Table« at Ars Electronica Center, Austria (2007).

Picture: Keiko Takahashi.

When you place a cup or a plate on the table, a city appears. When you place a rope, railways and lakes appear. People can arrange their own city and interact with it.

This work's interface uses daily objects like tableware such as a cup, plate, fork, spoon, chopsticks, little candys or chocolates and ropes. The general public is familiar with these objects and able to handle them.

Operating Instructions

Ropes: When you put a rope on the table, the rope becomes a railroad and trains starts running along the rope. When you connect ropes together, you can make several routes. The trains will choose their route at the crossroads and wait for the other train to pass. When you make a circle with the rope, it will turn into a lake. Ducks will appear out of nowhere and rest at the lake. When the circle rope is removed the ducks disappear as well. *Cups and plates:* When you put cups or plates on the table, houses, buildings, trees and flowers appear and create a city. There are cats hiding and sleeping under the cups and plates. When you remove a cup or plate, the cat wakes up and tries to find another cup or plate to hide under. *Spoons:* When you place spoons and forks and chopsticks on the table, a car appears and starts to run everyway. It will maneuver around the railroads (ropes) and city. *Small candies and chocolates:* When you place small candies and chocolates, a dog appears out of nowhere and tries to eat them.

Technical system

In the image recognition section, images from a CCD camera are processed in the CPU memory and recognized. In the process of recognition, all noise except the objects on the table are filtered by the repetition of smoothing and binarization. After acquiring the binarized image the table becomes the background /image and the objects make up the black parts. Through this process, »ropes«, »cups & plates«, »chopsticks« and »breadcrumbs« begin to be recognized. Ropes, which become railroads, are recognized as thin, long objects. Thin, 5cm to 20cm long objects are recognized as »chopsticks« which are used in the CGI process as a starting point for automobiles moving around the table. At present, objects under 5cm are recognized as »breadcrumbs« that have been dropped on the table. Large objects within a provided square are recognized as cups & plates. A labeling process is performed on the chopsticks, breadcrumbs, cups and plates to detect their positions and shapes when the CGI is generated.

If objects exceeding the formatted size appear, they are recognized as »irregular objects« (e.g. human shadows) and this information is ignored.

Instead, the previously recognized information is adopted again. At present if »irregular objects« are observed five times in succession, they are programmed to be recognized as »cups & plates«. This is because it is considered that the user has tried to create an image of some object intentionally.

In the CGI section, pictures are generated using OpenGL that are based on the image sent from the image recognition section. The received image information is labeled so that its shape and position can easily be detected. Here, the procedure of generating animations from the image information of each recognized object is explained.

For »ropes«, their ends are recognized and become the starting points of railroad trains. Running the train by using the labeling information produces an animation. In the case of »chopsticks«, in the same way as "ropes", their ends are recognized. The direction of chopsticks is also detected, and produces an animation where automobiles begin to move from the edge of chopsticks.

With »cups & plates«, their positions and shapes are detected from the labeling information. Around the cups and plates, animations are produced. Houses and trees are built and gradually a town is created. In the case of »breadcrumbs«, sizes and positions are detected from the labeling information, and then an animation is produced. From the end of the screen a dog approaches the areas where the breadcrumbs are and devours them.

For each animation, original watercolor pictures are captured by a scanner and mapped onto a polygon as a texture and animated. Each projected figure emits sound as a sound effect by using DirectX API.
(Programming: Shinji Sasada, Taku Omize, Takahide Mikami)

Work and my Profile

I studied oil painting and print making in collage. That is why I incorporate illustration in my work. When I start painting, the process is enjoyable, but once it is finished and installed, it leaves me. The painting develops a relationship with the viewer. It is somewhat sad and I won't be able to sense what the audience is experiencing. With Media Art, especially interactive art, I will instantly be able to sense what the viewer is experiencing. The viewers and their reactions are different from country to country. I am able to update the installation every time I install it and it is interesting to see how the work is completed. I am very excited to be in a situation where there is always a relationship between the work, the viewer and the creator.

Reaction by the Audience

People's interests and reactions are different from different countries and cultures. This is very interesting. For example, for *Rakugaki*, the interface is the instruments. Sound and drawing respond to one another, but the reactions differed from country to country. In Australia and Europe, people played the instruments together and enjoyed looking at the drawings transform. In Japan, people hesitated to play the instruments. They feel uncomfortable making noises in public. In Hungary and Poland, some people made sounds until the work stopped.

For *Floated Through My Mind*, the interface was people's movement and not sounds. Children enjoyed moving in front of the work in all countries, but adults stood in front and watched. Adults seemed to hesitate to move their bodies in public.

In Japan, people were relieved because they did not need to actively participate. Japanese may be too tired and overworked. They liked the fact that they did not have to do anything, but just watch the work. This reaction was very unique. That was the reason why I wanted to create work that could be enjoyed by adults and children equally around the world.

Every country has a railroad buff and the joy of building a city, railroad toys exists in all countries. I decided to create a game where people could build cities. I wanted to create a table where people could imagine a city, run mini cars and trains. Because we all played the game as a child, but it was an imagination and not something that could be shown. That is why I decided to use the diorama which everyone has imagined playing and created a game where people could play together. That was the beginning of *Diorama Table.*

The reaction to this work was universal. People reacted almost exactly the same in every country I exhibited this work. The difference was between adults and children. Adults look at the work for a while, then, read the instructions before starting to touch. Children just started playing. They seemed to know how to play with the table.

Artist and Engineer

I have always been in charge of the idea, the planning and imagery. I rely on computer science technology to realize my ideas. I've always collaborated with an engineer. The artist and the engineer have different points of view. People who come from completely different worlds create the work together. There is an artist's direction and an engineer's direction. They try to look for a vector and find a common ground through discussions. It is difficult to create work with people who have different points of view, but it is also very enjoyable and rewarding. It takes a while to figure it out, but once we make a decision, it cranks into high gear.

Conclusion

Since I stepped into the world of Media Art, I've been showing my work in the dark which is similar to the process of making the work, always in the dark, feeling my way, »is it this way?« or »that way?« Trying out different ways and figuring things out, it feels like that is what I have been doing for a while. When I see children glued to my work and interacting with it, it brings me great joy and makes me forget about how difficult it was to create it. I know I will continue searching in the dark and there are people who I would like to thank for their support, Engineer, Mr. Shinji Sasada, the students and Mr. Nobuo Suyama at NEC Display Solutions Inc., Head of Department, Mr. Suzuki and Japan Electronics Collage.

Evolving the Emergent Content Workshop

Kim Cascone

Research and Development

In 2003 I was invited to take part in the RAM4 conference held in Helsinki. Architects, video artists, web artists, programmers/hackers, installation artists, sound artists and other creative workers were invited to meet and discuss new methods of creation using digital tools. The general plan, in between workshops and lectures, was for everyone to break up into smaller work groups, and develop a presentation to be given at the end of the conference. I happened to wind up in a work group with two other sound artists. Later we decided to visit a local cafe with our laptops and discuss possible approaches for our presentation.

Fueled by dark roast coffee we wrote a bullet-list of topics for our presentation but we were still perplexed as to how exactly to present them.

Later that evening in my hotel room I was flipping through channels on the television and stumbled upon a strange program. A young woman sat facing the camera while silently staring at something just off-camera as if she were reading something.

On one side of the television frame a phone number was displayed where you could send SMS text messages. Up from the bottom of the frame scrolled text messages, which I assumed were sent in by the viewers. Suddenly she began speaking as if having a one-sided Bluetooth phone conversation, talking into the air, to no one. Addressing a remote and distant viewing audience she responded in short clipped phrases interspersed with nervous giggles, verbally mimicking the frenetically thumbed in messages written in mangled text speak.

As the woman read aloud the text messages and responded to them it dawned on me that this process could be used as a model for the conference presentation. I made copious notes that, I presented to my work group the following day.

Using my notes as a starting point we worked out a plan: the three of us would log into a group chat on our laptops and would be projected on the wall behind us during our presentation. One person would select a topic from our list to talk about while the other two would respond, via chat, with anecdotes, web links, quotes, book titles, and remarks. After that person was finished speaking another would select another topic and speak about it while the other two would tap away on their laptops contributing more text to the group chat. The chat text served as live footnotes as it filled the wall behind us. After 20 minutes or so, a lengthy document emerged via a simple system that was eventually printed in the conference proceedings.

Because the process was transparent, there was no need to explain it to the rest of the conference attendees, but there were many questions directed towards us afterwards.

Cybernetics

Shortly after the RAM4 conference I received an email asking me to put together a workshop involving post-digital sound art creation. Around that time, I was researching generative algorithms I wanted to incorporate into my Max/MSP[1] performance patch. Wanting to replace the core algorithm based on random file selection with something less unpredictable I began to explore breeding sound file combinations. As a result, I decided to use the simple genetic algorithm as a framework.

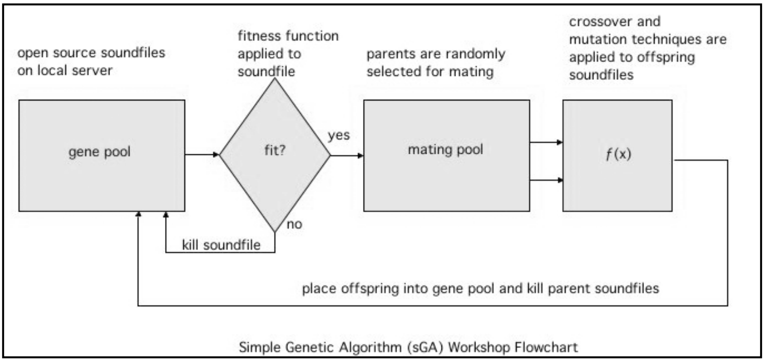
After testing the new patch I felt the genetic algorithm did not quite meet my needs as a performance instrument but my exploration led me to use the genetic algorithm as a framework for the workshop I was preparing. Working on the genetic Max/MSP patch inspired me to revisit the work of some key authors on cybernetics and systems art from the 60's and 70's. Norbert Wiener, Abraham Moles, Jack Burnham[2] among others helped pave the way for much of media art today so I felt their work was important to helping me establish a framework for the workshop. Further in my research I came across a web site describing a project by John Maeda called the Human Powered Computer Experiment[3]. This experiment consisted of people physically performing simple computational tasks such as adding two numbers or storing a variable. Each person would perform the role of one part of the computer: one would be the CPU, another person the accumulator; another would be the RAM, etc. People, following a set of instructions, would pass data around on small slips of paper until a simple task was performed.

1 Tools for Media: http://www.cycling74.com (April 18, 2008).

2 Burnham, Jack (1974): »Great Western Salt Works – Essays on the Meaning of Post-Formalist Art«, New York.

3 The website for this project is no longer online.

Figure 1: Simple Genetic Algorithm (sGA) Workshop Flowchart.



I liked the model of a group of individual agents performing simple tasks that contributed to solving a problem or performed a larger complex process. It mirrors grid or distributed computing in that it uses human cycles in a network to accomplish a particular task.

I also preferred to organize the workshop using an open organization model[4] rather than a top-down hierarchy and in my research I uncovered a rich collection of texts in the archive section of the *Firstmonday* website.[5] By placing the engine of a simple genetic algorithm into the framework of an open organization I was able to build a conceptual vehicle for my workshop.[6]

While considering the various techniques used in evolving content I knew I wanted a system that would allow participants to explore 'solution space', create diversity in sound files, and allow for the unexpected to happen as part of the creative process. As it turned out, I found exactly what I needed in the simple genetic algorithm.

The Simple Genetic Algorithm

I decided early on that the primary goal of the workshop should be to breed or evolve a library of sound files and afterwards have the group perform as a laptop orchestra using the library. Improvisation can also be

4 Open Organisztions: http://www.open-organizations.org/view/Main/IntroToOpenOrg (April 18, 2008).

5 Firstmonday: http://firstmonday.org/ (April 18, 2008).

6 Stalder, Felix and Hirsh, Jesse (2002): Open Source Intelligence. firstmonday.org/issues/issue7_6/stalder/index.html, (Feb 25, 02).

viewed as an emergent algorithm of sorts that draws upon the dynamic social and musical meta-levels formed during the workshop. This would allow the workshop to exist in a creative framework without it turning into a seminar on genetic algorithms – which it was not.

Because of the nature of working with sound each participant was required to work in headphones but this made establishing channels of communication among the group problematic.

The solution was to borrow the group chat concept from the conference presentation. This solved the problem without any extra work since most of the participants already had chat clients installed on their laptops.

In addition to the group chat I started a WIKI page where participants could add favorite links, information about themselves or anything they felt like sharing with the group. The WIKI added another level of emergence to the process as the document that evolved over the course of the workshop could be used later on by the members for reference and further research.

Also, the content generated at each level (chat, WIKI, sound library) was fed back into the other levels and formed feedback loops.

Generation Zero

The first task facing me when designing the workshop was to build a framework that would allow a genetic algorithm to be used for content creation.

Each sound file, representing an individual in the population, contained two distinct layers: the filename, or genome, and the data contained in the sound file itself.

There was no simple or direct way of linking these two layers other than having the filename reflect the aesthetic fitness of the data contained in a given sound file. In other words, the genome reflected how aesthetically pleasing the group found the sound file.

Keeping the two layers distinct allowed problems in programming and aesthetics to surface separately and be solved by people who felt best equipped to help solve them. When working with laptop musicians you usually find that they have both computer and musical skills in varying amounts, i.e. programming versus sound design, and because of this each person will have very different abilities to solve both sorts of problems.

Since I didn't want a single overarching fitness function to rule the process I made each participant responsible for rating each sound file as well as shaping the sound data itself.

The filename of each sound file consists of a string of numbers with each place holding one participants rating: a single digit from zero to nine, a rating of zero indicated the person didn't like the file at all while a nine indicted the person liked the file a lot. The sum of these ratings in the filename represents the overall aesthetic fitness of a sound file.

While the fitness rating only partially determined if the sound file would be selected for breeding, thus passing their genetic material on to future generations, it was the sound data inside the file that was subjected to crossover and mutation procedures.

In order to create »offspring« each sound file is divided into regions (loosely representing chromosomes) using an audio editor then manipulated by applying the operators of crossover and mutation to it. This creates sound files containing new genetic material through sound processing (mutation) and shuffling regions (crossover) into a different order. While the offspring bears some resemblance to the parent they contain enough new information to be considered new.

Random Populations

Genetic algorithms are often used in engineering applications such as finding the ideal aerodynamic shape for an automobile body. Each point on the car body moves in three-dimensional space and with every iteration of the genetic algorithm, the car is tested and rated according to some criteria, e.g. the least amount of wind drag for a given volume etc. Once an ideal shape is found it is considered to be an optimal solution to an aerodynamic design problem.

The initial population of an evolutionary process consists of random individuals or random possible solutions. These individuals would, at some point in time, ideally converge onto a single ideal location in solution-space after many generations of testing against a fitness function.

Being that I wasn't interested in breeding ideal design solutions, but rather exploring solution-space, I decided that selecting the appropriate type of sound files for the initial generation was an important problem to work out. The next step was to figure out what a random population would sound like.

In determining the appropriate type of sound files for an initial population I chose content that was culturally transparent, i.e. non-musical, as I didn't want the content to influence the rating process, which would result in a convergence towards a set of favored sound files on the first iteration. In other words, I wanted to ensure diversity from the very beginning.

Field recordings seemed to be a logical choice as this allowed the initial population to be considered neutral or random – almost ›found‹ recordings.

In order to encourage diversity in the offspring I wanted to allow the less fit members a chance to breed as well as the more fit members. Since fitness-proportionate selection algorithms were anathema to exploration and diversity they were discarded early on. I chose the Roulette-Wheel Algorithm which probabilistically allows less fit members a chance at breeding in the Mating Pool.

Once a member is selected for breeding they are moved into the Mating Pool. Then each participant in the workshop randomly selects two members (parents) from the Mating Pool with which to create offspring. Each set of parents creates four offspring: two crossovers and two mutants. Selecting an internal region from each parent sound file and swapping them create the crossovers. This allows a sound file to develop an internal structure, a recognizable signature that could be used musically in the resulting performance. The mutation process is achieved by applying arbitrary sound manipulation to one and only one region in a crossover sound file. As a result four new offspring are created and then moved into the Gene Pool. The parents are killed off so that only new genetic information will circulate in the gene pool.

Once the offspring are born and placed into the Gene Pool the process starts all over again. The participants rate the new generation in the Gene Pool and the roulette wheel algorithm is used to select new parents for breeding et cetera.

After four of five generations of breeding offspring the sound files start to acquire a strange quality. Since all the participants in the workshop potentially have a hand in shaping parts of each sound file the files take on a life of their own. Each file contains bits and pieces of everyone's aesthetic input and selection.

After some number of generations the participants decide if the sound files accumulated are adequate for performance. They then begin to discuss possible strategies for performing with the sound library.

Observation of Group Dynamics

A fascinating aspect to the process is how evolution occurs on many levels simultaneously. It is important to enable and encourage these meta-layers and to interconnect them as they help to facilitate the process of an evolutionary system.

To illustrate this, let's suppose a problem arises. Some of the participants find the task of adding the fitness ratings and implementing the roulette algorithm by hand to be tedious. This in turn prompts a discussion about developing a tool that will automate this process for the group. Some solutions are discussed on chat and quickly they decide the best way to design this tool. A network of skills then coalesces in response to this task. So a PERL programmer will develop a script that will sum the individual ratings and then calculate the weighted value for each member in the Gene Pool. As the tool takes over the work of performing the mundane tasks the participants are free to concentrate more fully on the creative process of shaping the sound files.

The other type of solutions to emerge in workshops have been systemic tweaks: killing off parents to limit old genetic material, limiting the number of offspring to prevent population explosion, killing off the previous generation in the Gene Pool allowing only new individuals a chance at breeding, again preventing old genetic material from reentering the evolutionary process.

Many solutions emerge via chat and often prompts research on the Internet; specific applications are downloaded and placed on the server for the group, or information is googled and a link shared via chat or posted on the WIKI page. This viral spread of information forms a common knowledge base that hastens the process of emergence by equalizing differences in skill sets. For example, a non-programmer could possibly contribute an important view on the problem that was missed by the PERL coders while sketching out a solution in pseudo-code.

Performance as Emergence

People with different backgrounds and experience sign up for these workshops and there happens to be a broad range of musical performance skills. Some participants come in with little or no improvisational experience and prefer to adhere to a structure or score for performance. If a more structural approach is decided upon then an algorithm is developed. Ideas are evaluated until something is decided upon and is formalized as an algorithm or set of rules.

If the group decides to improvise then typically an unspoken set of rules governing how players interact musically are followed. These can be loosely stated as follows: listen, select a sound, play that sound, rate how that sound fits into the overall sound, if not good then stop playing or select another sound, else go to beginning.

Sometimes structural and improvisational approaches are combined, allowing the players a certain amount of freedom within the constraints of a rule system.

Conclusion

I have discovered many intriguing layers to this workshop I didn't realize existed when I started. I've often been surprised by how different each workshop performance sounds and how problems inherent in the evolutionary process get prioritized. Each group of workshop participants is also a random population that is subjected to the evolutionary process who end up breeding ideas, solutions and content.

Another phenomenon I've observed is how communicating via chat keeps personal politics at a minimum. Chat names are used instead of real names and gender is mostly forgotten or loses focus while people engaged in problem solving and creation deal with one another as nodes of intelligence in a network. This thin veil of anonymity also keeps people on a more level playing field by not allowing one person to dominate by talking louder or having aggressive body language.

What is most important is that evolution is a democratic process in action, allowing a system of ideas and actions to be judged by their merit instead of who suggested them.

If this can serve as a model for future creative work groups then I feel as if I have contributed something of value to the world.

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BLINDSPOT

PAULO PEREIRA, HERWIG TURK

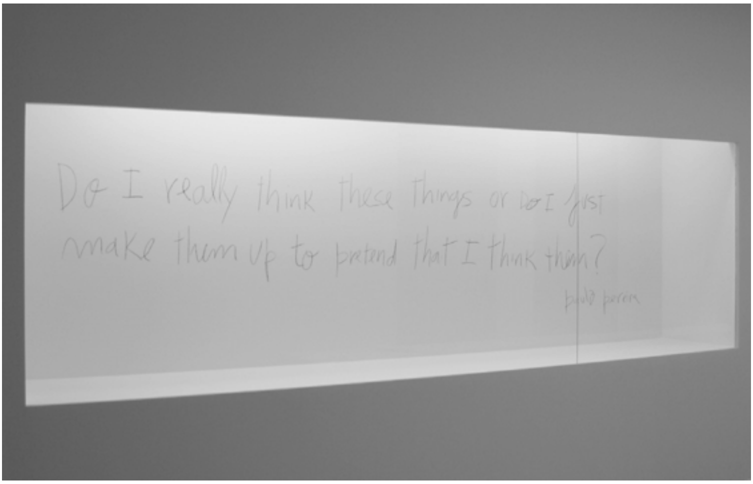
blindspot is an interdisciplinary research project about perception, developed by Herwig Turk and Dr. Paulo Pereira, in cooperation with Günter Stöger, Beatriz Cantinho and Patrícia Almeida. The project aims at investigating perception in a broad and global sense, as well as its circumstances, its determinants, and its contingencies. The proceedings in the laboratories for research in vision sciences are translated into different settings, thereby creating a meta-language that crosses the traditional boundaries between science and art. At the same time, a new heterotopic space for experimentation is created where objects, gestures, and language acquire new dimensions, having been separated from the supporting contexts. The approach used by the authors of *blindspot* adopts the formal structure of a research project. The starting point is the hypothesis that science represents an imperfect means whereby perception is used as a privileged means to assess reality (»an improved means to an unimproved end», Thoreau, 1854).[1]

The project´s approach is based on the long-term exchange of scientific and artistic knowledge, and methodology. »Perception is the process whereby sensory stimulation is translated into organized experience« (Encyclopaedia Britannica).[2] Vision sciences tend to focus on the process of sensory stimulation: from the eye to the brain or from the photon to the image. Anatomical, physiological, neurological, and biochemical approaches can convey the means to gather great amounts of information that agglomerate in large volumes and treaties. However precise, a vast amount of information is neglected or is actively translocated to a place outside of the laboratory by the application of scientific procedures. What remains is contamination from the outside world, largely the subject matter of this interdisciplinary project. What remains outside of the controlled laboratory environment questions the cultural context of visual perception as it includes social and cultural components.

1 Thoreau, Henry D. Walden (1854): »An annotated Version«. Walter Harding (Ed.) Boston: Houghton Miffin.

2 Encyclopaedia Britannica, online edition. available at www.britannica.com (March 18, 2008).

Figure 1: Installation view »peripherla vision«, Museu das Comunicações, Lisbon.



Picture: Herwig Turk.

Individual perceptions cannot be considered, or observed as isolated, but rather as something that is distributed within group structures (persons, objects, environments). One perceives oneself and our everyday environment through the reflections and reactions of others. Each and every single person is connected to a floating system of information and a clear line cannot be drawn separating individuals from others, nor from their own surroundings.

Science aims for a universal language supported by inertia referentials. Scientific language is highly coded and the distinction between words, concepts, and the corresponding entities in the »real world« is often blurred by the complex system of references that are used. Scientific systems of reference include necessarily established conventions comparable to GMT (Greenwich mean time) or the null meridian, in an attempt to identify standards that make measurements possible and comparisons universal.

One of the main goals in this project is to identify calibration standards and points of reference that are critical in influencing individual perception. Once such points of reference are identified they can be easily manipulated by deconstructing their own foundation and by displacing them into a different context/setting. This approach questions the fallibility of scientific conventions and highlights the importance and contribution of social and individual constellations to what is perceived as a scientific truth or a scientific fact. More importantly, the founding principles and corner stone of the scientific method are man-made and become less abstract as the project emphasizes and brings to stage – highlights such structural elements that are both invisible and – thought of as – infallible in daily scientific routines.

This goal can be accomplished through a variety of procedures, including the dislocation of both the observer and the object of observation to different scenarios where common references are no longer obvious and the elements that support perception are often absent. Experimentally, this creates a field where different categories of knowledge meet, revealing the interdisciplinary nature of the project.

Three channel video installation *blinddate*

To pursue the goals of the project a number of different and complementary approaches have been used. These range from video installations, photography, performance and laboratory experimentation. The first approach within the project is the large-scale, high-resolution video installation *blinddate.*

blinddate explores the meta-language of laboratory life, through an approach where objects are dissociated from their usual context and where elements of space and scale are manipulated. This approach further explores the paradox that objects that are generally viewed as practical tools in the hands of the scientist may become anthropomorphic representations by posing as autonomous entities in a series of portraits.

Figure 2: blinddate, MAK Museum of applied arts / contemporary arts, 2005.

Picture: Herwig Turk.

There are only brief glimpses of an organ, as viewed and imaged through a machine, thus adding to its alien character. This is a performance where objects are the only »true« characters. The organ remains an organic object that is being calibrated and assessed for its physical properties. The machine »looks« at the organ, which becomes the object of calibration.

blinddate also comprises a subtle questioning of the fallibility of scientific procedures that rely on the calibration of machine-made measurements (movement, position, temperature, light absorption, etc). Useless scientific information, taken from experiments that went wrong, is shown and confronted with the apparent precision of the instruments' calibration.

The sound is based on recordings done in the lab, which are partly filtered and recycled. The sound occasionally synchronizes itself with the images eventually losing them again. By using this approach, the soundtrack is deliberately used to alter and modulate perception of the image.

As a whole, *blinddate* is an ongoing research project about portraits of laboratory life and representations of scientific language, exposing its limits and crossing the traditional boundaries of life-outside-of-the-laboratory.

Two channel video installation *uncertainty*

The fallibility of scientific procedures is also explored in the video installation *uncertainty*, based in a quote from the Austrian physicist Manfred Drosg: »A model can never be a perfect portrayal of reality, and there can never be a part of reality perfectly mirrored by a model«.[3] This statement emphasizes the impossibility of generating the perfect model, as well as the inability of a model to ever fully represent reality. Indeed, the Heisenberg Uncertainty Principle broadly establishes, that the act of »looking« at an object changes the properties of that object.

In the installation *uncertainty* the camera »looks« and registers the movement of a fluorescein solution set on top of a shaker. A similar shaker, set to move at the same speed, in an attempt to reproduce the solution's exact motion, also supports the camera. In a precisely controlled experiment the solution would not move. This, however, is impossible since the movement of both shakers can never be perfectly synchronized.

3 Drosg, Manfred (2006): »Dealing with Uncertainties. A Guide to Error Analysis«, Springer: Heidelberg/New York.

The structure of the interfolded systems in the installation and the manipulation of the »inertia referentials« challenge the perception of space and velocity, causing a sensation of indisposition or malaise.

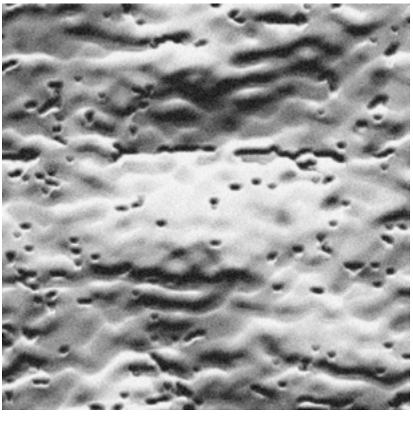
Sequence of photographs *referenceless*

The manipulation of external references and social contributions to individual perception of science is further illustrated in the sequence of photographs *referenceless*.

referenceless is about the impossibility of withdrawing meaning from an image. The photographs created by Herwig Turk on an empty computer screen appear to fulfil this primordial function with scientific precision. The pictures were created artificially to look like something meaningful yet unknown. They translate a subtle attempt to question the symbolic value of legitimacy as a means of ascribing authority and the power of discourse in ascribing meaning to an image.

The photographs presented in *referenceless* seem to be expropriated by the arts and appropriated by science. These are »scientific« pictures that, in their own context, would represent trivial elements registering an informational processing. There is, however, rigorous discipline in the production of these images. The pictures represent abstract paradigms of knowledge, supermatic forms of portraying scientific knowledge, opening new avenues that allow for the questioning of its proceedings.

Figure 3: referencless 001-98, referencless 004-98, duratrans in lightbox 100 x 100 cm.



Picture: Hewig Turk.

There is a clear deliberation to exclude the author from the creative process. Nonetheless, Turk's photographs require the observer to confirm their meaning. The intrinsic intervention of the observer, which in science is an instrumental part of the scientific process, is required to certify that paradigm.

Wittgenstein once suggested that when one cannot see anything it is always helpful to take a closer look.[4] Many of the highly reputed scientists that viewed these pictures, looked really close and saw a few things. There are a number of common elements that are described by most of the scientists that analysed these images and that ensure the unity and cohesion to the communication codes that are characteristic of the scientific process. For example, all of the biologists agree that the images represent microphotographs of biological tissues or cells magnified through microscopy techniques.

Scientists use a common language with reference to shared codes, symbols, standardised semantic formulas, and well identified hierarchies of knowledge. The scientific language is, in this respect, a meta-code. A functional, but minimal telegraphy with no excesses or redundancies, as is revealed by the legends to these images.

It is only through the scale of magnification that details susceptible of interpretation are revealed. It is not particularly important if these photographs are a calibration standard for a laser confocal microscope, an electric signal modulated by the neuronal cells of a zebrafish, if they represent the cornea of a monkey, or a cataractous lens of a whale. What seems to be important is the rigour and precision in the identification of details in subcellular structures. However precarious, the idea that the closer you get the more you see, and that the more you see, the more you know is well illustrated in the descriptions and legends accompanying these pictures.

referenceless photographs, which portray objects or landscapes that do not exist are associated with a hyper-real legend written by a scientist. The unsettling and disturbing unity created by the set formed by the photography and its legend creates a heterotopia »a site of impossibilities, a place without a place, a non-place, on the level of language« (Foucault, 1990)[5], where all contradictions co-exist in a real space.

By exploring and crossing traditional boundaries between science and art, it is possible to denunciate the structure of scientific proceedings. Moreover, it is possible to isolate and highlight the symbolic nature of

4 Wittgenstein, Ludwig (1975): »On Certainty«. Blackwell Publishing, Oxford.

5 Foucault, Michel (1990): »Les mots et les choses«. Gallimard ed. Paris.

science and its means of social representation, emphasizing its strong dependence on perception.

According to Bruno Latour, the permeability between the site of experiments and its surroundings creates the possibility of producing symmetric analysis.[6]

One Channel Video Installation *Setting04_0006*

The *setting04_0006*, as well as the blindspot project as a whole, explores the non-linear interface between humans and non-humans in the ecotone created by the transitional boundary between laboratory space and the space outside-of-the-laboratory. Gestures are part of laboratory life, as are objects and scientists. A number of approaches under the umbrella of blindspot examined the perception of spaces when humans were removed and objects assumed centre-stage. The object created an unambiguous and sharp language conveying new meaning and an alien identity to the laboratory space. In *setting04_0006* both the human entities and the objects were eliminated. Only gestures remained, creating a continuous and complex sequence of movement. The repetition of a complex sequence of movement creates a primordial pantomime. However, at closer look, there is an intrinsic complexity in the movement. Due to the absence of external references and structural principles one observes in gestures accompanying language, the whole sequence is rapidly lost acquiring a rather crude and unsettling character of expression. They are little more than stochastic short sequences of movement. Ultimately meaningless, yet, minimal contextual elements are still present: gloves, a white coat. Traces and clues that remind the viewer that this is part of a bigger picture, that was deliberately left out of each frame.

Figure 4: Stills from the video setting04_0006, (2006).

Picture: Herwig Turk.

6 Latour, Bruno (1999): »Pandora´s Hope: Essays on the Reality of Science Studies», Harvard University Press. Cambridge.

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VIRTUAL KNOWLEDGE SPACES IN THE ART CONTEXT

SYLVIA ECKERMANN

» The world, as we perceive it,
is our own invention.«
Heinz von Foerster

In this abstract, I introduce three recent art projects that engage in a variety of topics of game design and art. What they have in common is the attempt to visualize complex ideas in a playful manner, so that the participants can experience these ideas. The tools and means used to implement this approach are immersive environments, interactivity, sound, visuals and ego shooter game engines.

I consider my work as a continual work, a work in progress – immediate, abstract and particular. I do not follow any rules of game design or forms of storytelling. There is no narrative string – no retrievable data storages with objective knowledge bases. There is no didactic guideline that helps to understand.

The world is full of information and impressions. Today everything is omnipresent. Reality is mirrored; virtuality becomes a »second life«. As an artist, I believe that merely mirroring reality is not the main topic to think about and work on. My working methods rather deal with dissecting a phenomenon, breaking it down to its smallest units and then carefully examine and investigate these elements; I try to understand their meanings, characteristics, forms and styles. The results, emerging out of a cluster of possibilities, are subjective and sometimes very personal. My preferences, my understanding, my fears and my desires clearly format the final product.

We are surrounded by all kinds of data in the real world, and we conceive and imagine them in manifold and varied ways in our daily life. Likewise, the visitors of my work are immersed in a media-architecture of images, sound and the designed physical space where they map their own mind flows. Each detail has a specific purpose. Combined they work like an abstract painting: Maybe you like the aesthetics, the form and the surface. But the longer you engage yourself the more you experience. You need to be an active and committed user to understand and realize.

Space-delight / Raumlust

»Penetration can be a physical technique as well as a technique of observing or of acting in spaces. The main part of an ancient temple, for instance, the core of its sanctuary, only accessible to a small number of priests and arcane to the general public, was called Penetrale. The Penetrale is the ›unaccessible‹, the ›holy of holies‹«.

writes Linda Hentschel in her book »Pornotopische Techniken des Betrachtens« (Pornotopic Techniques of Observing). Later on she makes the case that people who love going to the cinema do this not only because of the narrative: The delight is primarily evoked by the cinematographic construction of space and the position of the observer. This form of opening the »pictorial space« finds its continuation in interactive media art. The voyeur – the subject who sees everything – becomes an actor. In Game Art his/her digital alter ego finally is »inside«.

nowhere - ein welt raum spiel[1]

Heinz von Foerster once said: »I treat Wittgenstein's propositions more like axioms. When I negate the axiom, 'We make ourselves a picture of the world' and say, 'We make ourselves a world from a picture' then I create the whole of Constructivism.«[2]

A second influence for my interactive game *nowhere,* this time from the art field itself, were the members of the Constructivists' art move-

1 *nowhere* was a commissioned work by thecrystalweb for the exhibition »Colour Houses and Luminous Plants« in Vienna 2006. *nowhere* was also shown in Innsbruck at the Centre for Architecture (Aut), in China at the Beijing Cubic Art Centre and at CICDAF/06, an Digital Arts Festival in Changzou/CN and in Athens at the game-conference »medi@terra«. *nowhere* was realized in collaboration with Christof Cargnelli who was responsible for the sound, Gerald Nestler who did the research and co-developed the concept and Oliver Irschitz who supplied the interface design for the exhibitions in Austria.

ment the early pioneers in the Photomontage technique. Gustav Klutsis' »Dynamic City« as well as »Lenin and Electrification«

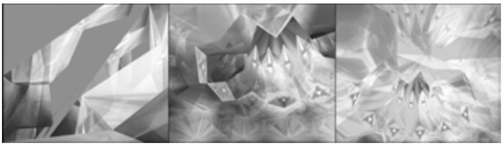
(1919-20) are some of the first examples of this method. Dadaism created the collage by bringing together news photographs and painted sections. For »n o w h e r e – ein welt raum spiel« we resolved to construct a virtual space as a 3D-collage.

»The Glass Chain« or »Crystal Chain,« sometimes also referred to as the »Utopian Correspondence« (German: Die Gläserne Kette) was a chain letter that was conducted between November 1919 and December 1920. It was a correspondence between architects and artists that formed a basis of expressionist as well as utopian art and architecture in, initiated by Bruno Latout. In *n o w h e r e*, we used as a starting point, excerpts from the letters and research materials of paintings and sketches by the proponents of the Crystal Chain and compiled them into an accessible »dream like« virtual space.

»Today I dreamt a dream that stretched over 12 years. I had a flying settlement built. […] On the 23rd of December 1920, after we had circled the globe five times without an accident and with a feeling of absolute safety, in all directions at various altitudes, made marvellous discoveries and carefully noted them down, the flight upwards towards Mars should begin«,

wrote Hablik in his diary as in 1908. The participants of the Crystal Chain did not see or anticipate people as future interstellar tourists, though. Mankind should – at the end of its striving – crystallize into a star, or – to use one of the central metaphors of the correspondence – turn into crystal. The Crystal Chain's idea of »space travel« led inwards to a realisation of mental space. In the meantime, on the journey so to speak, the cosmos as exterior space would be »conquered along the way«, because inside and outside would gravitate into each other. Hablik brought this to the point in relation to architecture: »Utopian architecture – made feasible by the material of glass and exalted by the symbol of crystal – is the symbolic expression of the future aspired to.«

Figure 1: screenshots of the ludic interactive environment »n o w h e r e«



© Sylvia Eckermann 2005.

In the ludic environment *nowhere* the visitors approach and appropriate this idea of cosmos and architecture as developed by the proponents of the Crystal Chain. The virtual space through which the visitors travel is »nowhere« and yet simultaneously »here and now.« It is a collage of various utopian elements that populate the space of the environment, enabling the visitors to experience the project and the world of the Crystal Chain.

nowhere is a GameMod, a modification of the Egoshooter Unreal. The user moves freely in any direction in virtual, three-dimensional space. Architecture, sound, voice-over and images support the immersive effect of this medium. Flying freely through space and time as a metaphor reflects the intellectual world of the group of artists and architects that came together in the Crystal Chain share their ideas.

Mere depiction was not the aim of our work, or transferring the two-dimensional sketches, designs and drawings into the third dimension. We rather intended to entice the viewer into a simulation of a historic world of utopian ideas. Thus, in *nowhere* Wenzel Hablik's outer-space painting »Sternenhimmel« (Starry Sky, 1909) appears as a dense, sometimes concave, sometimes convex cosmos, situated in an unknown system of suns, of agglomerations of stars, satellites, flying machines and airborne colonies. Some of these celestial bodies are inspired by text fragments from Paul Scheerbart's »Glasarchitektur« (Glass Architecture), a work by the man of letters who died in 1915 and who influenced the proponents of the Crystal Chain immensely:

»Paradise beetles, light fish, orchids, shells, pearls, diamonds and so on – all of this together is the most magnificent on the surface of the earth – and this is all to be found in glass architecture. It is the highest – a pinnacle of culture.« (Glasarchitektur, 1914)

In the *nowhere* game a cluster of planets – an interstellar stairway – beams the visitors (the navigating cosmonauts, so to speak) into the space of contemporary architecture – a room full of citations and Collages in shining colours.

»Glück ohne Glass – wie dumm ist das! « (Happiness without glass – how dumb is that!), »Was wäre die Konstruktion ohne den Stahlbeton? « (What would construction be without reinforced concrete?), »Ohne einen Glaspalast ist das Leben eine Last!« (Without a crystal palace life is a burden). These hardly translatable examples are citations of the »Glashaus Dictum« formulated by Paul Scheerbart for the glasshouse constructed by Bruno Taut for the Werkbundausstellung in Cologne in 1914. In *nowhere* these text fragments shine through fragmented extracts of contemporary architecture that appear in front of the visitor like dazzling coronas before they fade away again.

A crystal appears; in its faceting the cosmos is reflected entirely. The visitor encounters this crystal in all the segments of *nowhere*. It is the »teleporter«, the gate, the wormhole so to say – it links to the cosmos itself from where the journey continues. The crystal as universal metaphor and basic element of nature at the same time was a crucial metaphor for our protagonists: for them, it was pervaded by light, unifying outside and inside, simultaneously form and spirit, an inorganic material growing similarly to a biological organism, a reflection of man to come. In nowhere, the visitor penetrates the crystal, forming a relationship of reciprocal transferences and penetrations of form as well as of meaning. And – as if one was inside a multi-faceted microcosm – the polygons delineating the crystals inside become an immersive kaleidoscope.

A particular crystalline form is assigned to Wenzel Hablik, Bruno Taut, Wassili Luckhardt, Hermann Finsterlin, Hans Scharoun and other proponents. Like a chain, link after link it lines up on invisible threads. They seem to be enclosed in this form that appeared so important to them – like the insect caught up in resin that has become stone. Where they twinkle like inclusions in the light of the stars there are other links and invisible portals.

One enters a prismatic lucent cylinder in which mountain panoramas revolve through fog. Bruno Taut, the spokesman of the Crystal Cahin, dedicates this to the Alpine Architecture (1917-1918). His drawings seem to become real inside the mountain chains – crystal nests adorn the ice crevasses, chrysocolla, amethyst and bismuth tower upwards like futuristic buildings competing with the mountain tops.

The area dedicated to Wassili Luckhardt does not tell of the vastness of the starry sky but of the stronghold of fortress construction. His designs for buildings of worship (around 1920) are external views of crystalline-formed glass architecture that are interpreted as a possible interior view in the virtual architecture *nowhere*.

The sparkle around Wenzel Hablik's crystal is the transition to his »Schöpferische Kräfte« (Creative Powers), a series of etchings (1912) that tell of the becoming and being of crystal, of birth and death. The cosmonaut in my *nowhere* game – the visitor – is able to discover this and much more as he flies on his freely chosen path through the cosmos of the Crystal Chain.

Figure 2: plastic trade-off, a kinetic light sculpture.

© Sylvia Eckermann, Gerald Nestler2006.

Plastic Trade-off

For the exhibition »WORKING_WORLD.net Working and Living in Globalization«[3] Gerald Nestler and I realized an artwork on the topic of global financial markets. The complex interactive and dynamic installation shows our views as artists and communicates a debate on relevant market events that was conducted in cooperation with Beat Weber, an economist. At the centre is a transparent and shining »sculpture« that depicts the network of global financial markets – this is, the place of action with links dispersed around the globe – in a three-dimensional shape.

The kinetic changes of the LED-lights inside the transparent »arteries and veins« of the sculpture correspond to real-time codes of market events and their data streams. Constantly generating aesthetic forms, which feed from real data, the installation shows markets as a virtual and infinite medium of values as well as a social system: real objects and transactions are deconstructed to ever new tradable, utilisable virtualities that react upon reality and so exert their influence on the lives of people

3 The exhibition »WORKING_WORLD.net Working and Living in Globalization« at the Museum Arbeitswelt Steyr opened on June 6, 2006 and continues until 2011. The curators worked on many different topics such as: Industrial Mass Production, Social Models, Unbounded Mobility, New Forms of Working and others. The museum's space was divided corresponding to these topics and an artist and a theoretician where invited to develop ideas for an installation. Among the invited artist were Konrad Becker, Oliver Ressler, Valie Export, and Ingo Guenther. Gerald Nestler, an artist who worked as a broker and trader in the 1990s and I were commissioned to develop an installation on »The Stock market: Rumours, Profits and Dangers«.

and societies. Included in the sculpture is a ticker that continuously displays the mantra: »…youbuywhatyousellwhat…«.

»How does an emblematic installation emerge as an 'appearance' of the worldwide system of global financial markets that exceeds the purely representative and enables a critical and discursive approach?« Gerald Nestler on plastic trade-off.

plastic trade-off is a light sculpture as well as a virtual knowledge space. It visualizes global financial markets and thus a core element of global economy. *plastic trade-off* could be described as a visual approach to the oscillating growth of markets and their diverse connections and dependences.

The project traces the social life of the (im)material values of trading. The real-time data of specific markets are translated into abstract light flows which reflect this global system in a dynamic work of art. The sculpture itself radiates light that visualizes of one of the most influential and controversial systems of our times: the global financial markets.

The coordinates of selected places of the market system were marked in a 3D programme on a simulated globe and connected as regards fundamental markets. A 3-dimensional and spatial framework emerged – the structure of the sculpture.

A virtual knowledge space invites the visitors to access diverse and varied information about global financial markets and exchanges.

When designing a concept for an artwork that focuses on global financial markets, one faces complex questions on a variety of topics including economic, social, political, cultural, and artistic questions. Among other things they relate to the economic system as a paradigmatic implementation of media and technology to financial markets; to global distributions, social changes and developments that are enacted through the liquefaction as well as the power claims of capital; to the dissolution of proximity and distance in the virtual space of trading (which rarely finds an equivalent 'on site'); to current colonialisms; and to facets that offer new possibilities and opportunities to the complex questions the development of what we call »reality« today. Last but not least is the question of an artistic approach to realize such a project.

plastic trade-off can be described as a »Tableau vivant-artificiel«, alive like a cyborg, artificial like a city. It resembles a living organism or rather a colony of living organisms, which move, exchange, reproduce and manifest themselves. It oscillates in-between information, transformations, institutions and the cyberspace.

As a semi-transparent cluster-fetish it creates in flashing simulation a social system of communication, a virtual medium of specific values and thus a critical »moneyfesto« of the markets. At the centre there are not single markets but a global entity with a history that pervades through all of modernity and a net that is constantly expanding, being refined and virtualised.

The artwork does not stop at pure representation; it is not metaphoric nor does it show a »Gegenwelt« (counter-world): it exposes global financial markets themselves, displays them as a medium.

Spiegelzellen / Mirror Cells

The phenomenon of the so-called mirror neurons has been the starting point and the source of inspiration for the interactive installation »Mirror Cells«.[4] These neurons that were for the first time experimentally demonstrated in 1991 not only fire in an action but also when an action is observed, thus mirroring the behaviour in a looped potential that does not cause an action. This is considered a possible key to the understanding of complex social behaviours like language, culture or empathy.

That raises the question how this relates to computer games in which gamers identify with their virtual selves to the degree that they speak of their own deaths when the game ends involuntarily. What is it like to be immersed into a virtual world, to perceive yourself inside it, to describe your representation with the term »I«? How do gamers react to game situations that do not allow annihilation but mutual appreciation, that do not allow combat but common experience, that do not allow manoeuvres but strolling around? Do the invented fantasies of a game enable potentials for the users to realize real forms of acting together or forms of realizing the acting of others?

Situated in this context, *Mirror Cells* was developed as an independent »projection« taking on the form of a mental and narrative journey:

Mirror Cells is an interactive installation that turns around our perception of space and time inside an entirely mirrored architecture. The visitors are immersed inside an acusmatic-visual 3D-world. The aim was to create an environment that is set in motion, manipulated and controlled by the visitors.

The architecture consists of a mirror-space of five by five by two meters that tapers upwards. The visitors are mirrored all around in the re-

4 The audio-visual interactive installation »Mirror Cells« was a feature project of Ars Electronica 2007 and was exhibited at the Linzer Landesgalerie in the exhibition »Acting in Utopia« (curated by Anna Karina Hofbauer/ Dieter Buchhart). The composer and sound artist Peter Szely was responsible for the acousmatic space; Doron Goldfarb for the programming.

flections of three circular projections – they seem to hover and at the same time become part of the virtual world.

Three people interact with each other at the same time. They move through a continuous stream of audio-visual spaces, which deal with realms of experience on memory, adaptation, the body, and what we associate with these topics.

A specific sound is ascribed to each of the participants. Each sound represents an »acusmatic I« that acts and develops according to the moves of the player. The first-person-perspectives are separately audible in an 8-channel-sound-environment, but are actively »cultivated« by the gamers to manifold »chords-variations« and complex sound tracks.

The virtual environment–reflecting the brain itself – is opened up, a sensual connection to the outside is implemented by a specially programmed interface: The visitors are invited to send text messages, which are mapped into the 3D-world, thus allowing communication between the real world and the mirror world.

Figure 3: Spiegelzellen / Mirror Cells, installation view.

© Sylvia Eckermann 2007.

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AUTHORS

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Ulf Langheinrich is an internationally renowned media artist, he currently lives and works in Accra, Ghana. Since 2003 he realized various solo projects. He performed, taught and lectured worldwide.

Laurent Mignonneau is an internationally renowned media artist working in the field of interactive computer installation. He is professor and head of the Interface Culture department at the University of Art and Design in Linz Austria.

Klaus Obermaier, media–artist, director and composer. His performances are shown worldwide. Since 2006 he is visiting professor at the University IUAV of Venice teaching new media in dance, music and theatre performances.

Dietmar Offenhuber is an architect interested in spatial concepts of cognition, representation and behavior. Currently he is key researcher at the Ludwig Boltzmann Institute for Media.Art.Research and Professor at the University of Art and Industrial Design Linz.

Christiane Paul is Adjunct Curator of New Media Arts at the Whitney Museum of American Art and director of Intelligent Agent, a service organization and information resource dedicated to digital art. She has written extensively on new media arts.

Paulo Pereira, since 1999 Director Labaratory Biology of Ageing, Center of Ophthalmology, IBILI, Faculty of Medicine, University of Coimbra. Co–project leader of blindspot.

Georg Russegger, a.k.a. Grischinka Teufl, is a media–artist and theoretician in the field of sociotechnological communication and interactive media. He holds a PhD in Media–Theory and is a researcher at the Toyko National University of Fine Arts and Music.

Mika Satomi is currently a PhD candidate at Interface Cultures, Institute for Media Studies, Kunstuniversität Linz Austria. Her recent projects explore the concept of body extension in the realm of wearable technology as an experiment on our plastic nature.

Mischa Schaub, designer and head of Institute HyperWerk for Postindustrial Design, Basel, University of Applied Sciences, North-western Switzerland. He is further president of the association salm2 in Senones, France.

Jürgen Scheible, researcher, music and media artist, doctoral student at Media Lab, University of Arts and Design Helsinki, author of the book 'Mobile Python – Rapid prototyping on the mobileplatform' (Wiley).

Giaco Schiesser, professor for the theory and history of the media and culture with a focus on »Media Culture Studies», director of the department »Media & Art« at the Zurich University of the Arts (Zürcher Hochschule der Künste).

Sabine Seymour focuses on next generation ›wearables› and the intersection between aesthetics and function. Her company Moondial (Vienna, New York) resulted from her research and role as an educator. She develops and consults on fashionable wearables.

Gebhard Sengmüller is an artist working in the field of media technology. Since 1992, he has been developing projects and installations focusing on the history of electronic media. His work has been shown extensively in Europe, the US and Japan.

Christa Sommerer is an internationally renowned media artist working in the field of interactive computer installation. She is professor and head of the Interface Culture department at the University of Art and Design in Linz Austria.

Chris Stary is currently full professor in Business Information Systems at the University of Linz, Department of Business Information Systems – Communications Engineering and leader of the Competence Centre on Knowledge Management.

STATION ROSE was founded by Elisa Rose (visuals, concept) and Gary Danner (sound, concept) in Vienna/Austria in 1988. They were among the first artists´ groups worldwide to explore the performative possibilities of audiovisual media and the Internet.

Keiko Takahashi´s media art projects were selected for Honorary Mention at Prix Ars Electronica 2001, ISEA 2002, the 5th and 10th Japan Media Art Festival, Siggraph2003 and Siggprah2007 and exhibited at multiple venues in Europe, U.S.A. and Asia

Paul Thomas, Senior lecturer, Coordinator of the Studio Electronic Arts (SEA) at Curtin University of Technology, founding Director of the Biennale of Electronic Arts Perth.

Herwig Turk, works in new media, interdisciplinary projects, projects in public space, site specific projects, photography, video, installations.

Stefano M. Vannotti is a designer, research associate and assistant lecturer in the Interaction Design major at the Zurich University of the Arts and PhD candidate at Interface Cultures in Linz.

Georg Weichhart, is currently researcher at Johannes Kepler University Linz at the Department of Business Information Systems – Communications Engineering.

Andreas Weixler and Se–Lien Chuang run Atelier Avant Austria, a studio for contemporary composition, computer music & media arts, performing and lecturing worldwide.

Oliver Wittchow is the developer of »nanoloop™«, the first independent music program for the Nintendo™ Game Boy™ platform. Since the first public presentation in 1998, nanoloop has become equally popular in Europe, North America and Japan.

Mahir M. Yavuz is currently a PhD candidate and instructor at the Department of Interface Cultures in Kunstuniversität Linz. He received his BA and MFA degree in visual communication design and is engaged in research on cities and information visualisation.

Hiroshi Yoshioka teaches aesthetics and art theory at Kyoto University and IAMAS in Japan. He was the editor in chief of the journal Diatxt and the general director of Kyoto Biennale 2003 and Ogaki Biennale 2006.