Nonverbal Communication in virtual space and physicality – the Experiment "seidesein"

Author: Nadja Kutz, nad@daytar.de

Abstract

„seidesein" is an artistic Installation, which studies physicality and communication in virtual spaces. Next to the description of the installation „seidesein" we will shortly refer to the subject of mathematical/physical simulation and its impact on perception and communication.

1 Introduction

The potentials of nonverbal communication by means of (information-) technology are not just enhanced by the technical feasible, but rather open up completely new forms for human culture and experience.

Nonverbal communication includes often the body of the corresponding individuals, such as in the case of gestures, facial expressions etc. But nonverbal communication could equally consist of a sequence of symbols, pictograms etc. It comprehends often (but not always) very subtle integrations of the cultural and living spaces of the corresponding individual such as via utilization of symbols, accoutrement and images.

In our project „daytar" (www.daytar.de) seidesein co-author Tim Hoffmann and me are experimenting with issues between mathematics/physics and perception. Nonverbal communication and its manifestations are here for us of particular interest. In our experiments we proceed rather intuitive and playful than systematically and target-oriented. With our „experiments" we try to carry out a kind of „brainstorming". We see our experiments rather located in the domain of media art.

Our initial motivation is rooted in mathematics and physics.
Mathematics and physics are integral part of computer generated worlds. But math and physics are also human cultural forms which describe the world around us in a mostly nonverbal manner.

Abstract mathematical concepts are in the process - next to verbal forms of expression – accessed by analogies, images, intuitions, which are coined by human experience, human perception and human communication forms.

Mathematical education is dedicated to a great part to the learning of how to exclude perception- and representation acquired „mistakes", however it is clear: also mathematics is not completely seperated from the actual world view and knowledge. Logical consistency also does not imply necessarily the absence of subjectivity.

The relation between perception and description/communication of content with respect to the content itself is to us of particular importance in our experiments.

Math and physics describe a certain part of our world. On the other hand an enhanced (as the case may be „virtual") world is created with math and physics by means of computers and technology. This is the point where our experiments are put forth or in short: How can one create a world, which one intends to describe and perceive?

Concrete examples, which indicate in which directions these kind of questions can go:

– To what extend is e.g. the reproduction of microscopic and macroscopic worlds (i.e. worlds which elude from our direct perception) affecting the understanding of this new enhanced world?
– How much physicality is in our traces which we convert into preservable information? It is our life time and thoughts which are converted and saved as e.g. digital information.
– To what extend are physically „uncorrect" physics simulations in virtual environments or films affecting our realistic capability of reaction and perception and even our movements? -- In the case of films this influence may be not so strong, but what in the

case of completely immersed worlds?
- Can we perceive more than 3 space dimensions?..like with a lot of brain training?
- To what extend is our perception accessible to direct manipulation? We perceive our world by our senses. Can we eventually manipulate our senses in such a way that the simulated world appears real and that we can perceive ourselves as complety new entities? What is then happening with our „old" real world? How would that affect our understandings, questions? Are we then still an entity? What is physicality then? Who is the other? Who is deciding what reality is? Which physics is then valid?

How much controllable math and physics is in our perception? How much does our perception feed back on math and physics?

I would like to try to explain these questions also on the basis of a little example, which was coincidentally mentioned in two recent articles by E. Mineur and L. Manovich below.
Let us look at the notion of an „infinitely" big sheet of paper inside a computer. The paper is drawn from our experience of real paper, it is something which one can e.g. draw or write on. I.e. we can try to simulate these features on the computer. Since there exists the notion of scrolling of paper rolls (think of Thora rolls for example), one can even imagine that the feature of scrolling a „paper" on screen is a consequence of a direct simulation – however the infinite size of an „infinite paper" on screen (see google maps e.g.) is a feedback from simulations of „inhabited" space and interactions with spaces. This is also historically evident I.e. these interactions with space were especially evolving with the development of certain videogames (e.g. defender 1980) and not with the idea of reproducing a virtual paper (see e.g. E. Mineur: TYP Observatoire typo_graphique Numero 2 -hiver 2005 http://revuetyp.com or http://www.my-os.net/blog/index.php?2005/07/18/64-la-gestion-de-lespace-sur-ecran).

A similar thing – just in the oppposite direction – happened with asteroids (1979).
Glue a rectangular sheet of paper along two opposite sides together in order to obtain a cylinder. A cylinder can be mathematically absolutely the same („topologically") as having a flat sheet of paper with a (in one direction) periodic domain. A (in one direction) periodic domain is a screen/domain where e.g a space ship leaves on one side and appears on the opposite side, like in asteroids. This is as if one tears the glued paper parts of a paper cylinder again apart in order to get the sheet of paper flat again, but still remembers that the space ship should move on a cylinder. This concept of space is an ancient mathematical construct, not unlikely coming from paper folding and in fact it is taken into serious consideration as a possible model for our universe (however in higher dimensions). (See e.g. „The shape of space at "http://www.geom.uiuc.edu/video/sos/). So this „periodic" concept of space is not directly accessible to our perception in real life. It came together by mixing two different physical perceptions.

The „simulation of media" question was also raised by Lev Manovich in:
After   Effects,   or   Velvet   Revolution   in   Modern   Culture.   Part   1 (www.manovich.net/DOCS/motion_graphics_part1.doc) where he attributes the new qualities of „simulated media" mostly to the technical feasibility of mixing various media. I.e. if I have e.g. a video game space like in the game defender then technical feasibility makes it easy to link e.g. the method of how the game is used to the idea of a scrollable simulated sheet of paper (which leads to a new hybrid language of moving images in Manovich terms).

I think the debate should not start with the media, but with the question from where the media comes from. Or again: the experience of space in defender is a physical (and/or mathematical) experience, just as is the experience of a full materialized sheet of paper and the way we use it. The

computer allows to bring these two simulated math/physics experiences easier together.

And there is more. Since a computer can only simulate, i.e that means the computer loses and or alternates the informational content of the real thing - we are adding new things which come from a new alternated perception of reality. So its not only the remixability of given content which comes into play and which is an integral part for recreation but its also the creation of new physical/mathematical content due to our different perception. This extends of course immediately also to the design of new technical devices, which are based on this perception and accordingly induced wants.

The experiments on our „daytar" website (www.daytar.de) are mostly only indirectly connected with these questions and also our project „seidesein" is only a very simple experiment, which keeps the above existential questions playfully at „the back of ones mind". With seidesein and with our other experiments we do not want to explain but to discover.

Some media experiments on our site as examples: in seidesein (physical) representations of the human body and the mutual perception of the other are central themes. Our project d-room has a similar background. The piece ToPong thematizes games and mathematical constructs behind them, surrealey links typography from a mathematical typography software with image, content and animation, the InSeries produces metacontent via mathematical formulii, radonge thematizes (mathematical) code and the role of composition, CloneGiz is thematizing generativity as a mathematical procedure applied on visual content in connection to symbolized mathematics etc. etc.

In section 2. we describe our project seidesein. In section 3 we will shortly illustrate to what extend seidesein plays with the above questions.

2 Description of „seidesein"

2.1 Functionality

Two users are embedded into virtual space via an avatar, which has the form of a veil-like mirror. The veil-like mirror is controlled via an input medium called gametrak.

The gametrak is a device of the company In2Games (http://www.in2games.uk.com/) and is e.g. used for virtual Golf and Boxing games. The gametrak device consists of a box from which two strings can be extricated. The coordinates of the strings endpoints are read in via direction and length of the rope. The strings are retracted into the box via a spring mechanism.

The physicality of the virtual „veil" and correspondingly the ones of the video mirror image feels „liquid". In particular the physics simulation of the veil produces the feeling of a liquid environment. Also colors, specular lights and „reactive dirt" invoke associations of silk and water. The „mirror image" is read in via a respective webcam and mapped as a texture onto the respective veil. With the gametrak the respective veil is moved. The mechanical retraction of the strings in the input device gametrak induces the feeling of weight.

The virtual space can be experienced via various platforms, such as a LCD displays, video

projectors or in a virtual 3D cave-like environment.

The two users can in principle (not yet implemented) meet in virtual space via a network like e.g. the internet. The quality of the transmission depends on the quality of the transmission of the video data only; the physics simulation happens on the respective computers, i.e. next to the videosignal only the gametrak input data needs to be transmitted.
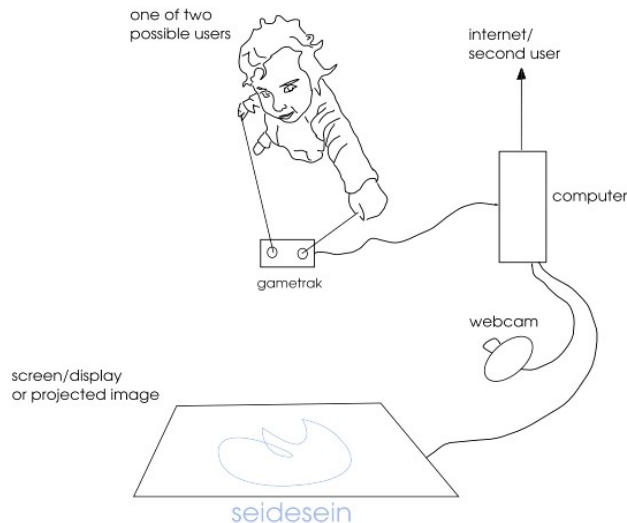

2.2. Technical Details for „seidesein"

2.2.1 jReality

The rendering software in use is jReality (www.jreality.de). jReality comprises a thread-save scene graph, which communicates with the corresponding input and output devices via abstract interfaces. jReality is developped by a group whose members are currently located at the Technical University (TU) of Berlin. the LMU and TU Munich and at City College New York. Main developers are Charles Gunn, seidesein coauthor Tim Hoffmann, Markus Schmies and Steffen Weissmann. jReality is - similar to VTC – a visualization environment, which has been mainly designed for scientific applications. Hence jReality comes – next to the scene graph – with various tools, which facilitate scientific data processing (e.g. tools for the creation of graphs, for the processing of different space geometries etc.). Furthermore a set of additional libraries is directly hooked to jReality, such as jtem (a numerical library) or Oorange (a rapid prototyping program, which allows for mathematical extreme programming), under developpment is furthermore jSym a string-rewriter for symbolic manipulations.

jReality is currently used as visualization software at the „Portal" a CAVE-like virtual environment at the math department at the TU Berlin. For example the „Mars-Earth Planetary Flyby" which is

usually publicly available at the „long night of sciences" shows images of the Mars Express Mission via jReality.
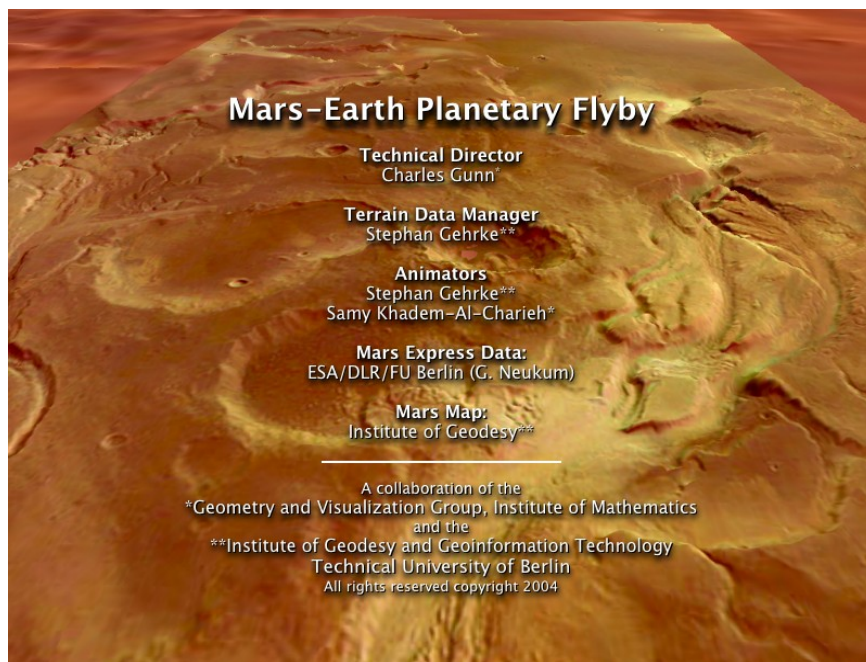
jReality was beta-released August 2006 as an open-source project with a BSD license.

2.2.2 Hardware

Details for the input device gametrak can be found on the website of In2Games www.**in2games**.uk.com. The webcams are ordinary consumer webcams. We currently use webcams from Labtec.

The computer in use is a Fujitsu Siemens PC with Intel Pentium 4 with 3 Gigahertz and hyperthreading. It was important for us not to use high end computers as seidesein should be used by the ordinary consumer. The graphics card in use is a Gforce 6600.

The underlying operating system is Linux (Ubuntu). Furthermore one needs a Java Runtime Engine with JOGL (Java OpenGL) bindings, JMF (Java Media Framework) and jinput.

There are some more details with regard to configuration and maintenance in our description on our website: www.daytar.de/art/seidesein/ .

3 seidesein, physicality, perception and communication

In the introduction we already indicated a bit what our motivation for seidesein and other media experiments was.

In seidesein a computer generated world is created. For the modelling of this world one has to make use of physical and mathematical experiences. However for us not the concrete mathematicals/physics simulation was interesting, but other aspects, which could eventually be called artistic.

Our modelling of seidesein uses math and physics as material. On the other hand the form of appearance is a representation of the involved math and physics. If we model the veil in seidesein are we then creating its space-time appearance or its mathematical construction? Similar questions arise e.g. in codeArt (see e.g. Florian Cramer: http://www.rebelart.net/i0007.html or
Georg Trogemann: http://www.khm.de/~georg/texte/2005-CodeArt.pdf)

The artistic components which can emerge in the treatment of virtual physical space can here be indicated only in a keyword-like and incomplete manner. A more in-depth disquisition is not at place and can be found in essays on media art. However I would like to loosely draw a connection between artistic concepts and math and physics by making the following choice of four by physics motivated categories: **time, space, physicality** and **interaction**. By this I do not want to analyse but just indicate the complexity and depth of the problem.

time: relation of time between observer, observed, producer, i.e. the „exterior“, but also to the „transformer“ (e.g. computer); psychological and biological properties of time, time aspects of interaction.

space: projection; space form; motion in space; psychological impact of space; time-space connections; body in space; spatial aspects of interaction; spatial connections to the „exterior“.

physicality: physical and other properties of bodies/entities in relation to space, time and interaction, like textures, forms, reflection properties; storage properties; motion, sound; „mass“; tactile information; body perception; psychological impact of bodies; bodies as symbols (which includes inanimate things and also animate avatars); communication; intelligence and interaction as attributes of bodies.

interaction: sound and light as transmitters of audiovisual information; causality; communication; intelligence and interaction of bodies within the virtual world; connections to the „exterior“, like e.g. creative flow, gameplay, tactile in- and output etc;

Art allows to deal with selected points of above thoughts, it allows to connect them and to „investigate“ them „playfully“. Almost all artworks deal with one of the above issues. This „playful“ part of the artistic work-flow resembles the brainstorming and intuition seeking process of science and technology (i.e. the process before a scientific analysis) and it can contain an „analysis at large“, i.e. a partial and tentative analysis and taxonomy.

In this sense our installation „seidesein“ only broaches the issue of the above aspects, namely

deliberately „playfully" and without regard to a seperate investigation or analysis of each aspect alone.

I.e. in particular with seidesein we didn't want to study the modelling of silk in fluids, neither did we intend to model a fluid space, we did not intend to invoke a „water effect", we did'nt want to substitute a human by a veil or a mirror, we didn't want to translate the movements of a human into the motion of a virtual veil etc. These are single aspects, which can be investigated seperately, but which were taken by us only as means of expressions and metaphors. We wanted to „investigate" (in a rather artistic sense) the possibilities of a nonverbal communication which corresponds to a nonhaptic touch.

If two people meet - and if they only look at each other - then they exchange a vast quantity of information, i.e. a communication takes place.
We call this exchange a „nonhaptic" visual touch or contact. This kind of communication is strongly associated with the physical properties of the person, the clothing, the spacetime environment, the cultural knowledge. We wanted to play with these conditions. We experiment with the virtual existence of the user, his/her physical properties and space and time in virtual space also in order to see how this affects communication. And also if in seidesein associations of liquidity are invoked – the physical modelling of the „fabric" corresponds to no „realistic" cloth simulation (in particular the cloth can e.g. intersect itself), moreover the seidesein virtual space is intended to appear „plain", the videoimage is processed and even the optical caustics are fake.

In a manner of speak we wanted to place the human into a primordial soup and make him/her look at him/herself in the mirror.

This was absolutely also intended as an ironic annotation to existing – and in particular commercial – virtual realities as e.g. secondlife (http://secondlife.com/) or fantasy environments such as World of Warcraft (http://wow-europe.com/de/)
However it was important to us that the original „human effigy" (here the videoimage on cloth) can be changed in a very controlled way. I.e. the user should decide him/herself how much „deformation" and „fragmentation" he/she allows for his/her own body. We also wanted to keep the effect of an avatar of acting as a symbol (especially visible for a comic-like avatars) negligable. Important was furthermore the controllability of the proximity to the other user - for that reason the interface needed to be very intuitive.

However the concrete technical implementation of seidesein was also important. The use of the gametrak, which can be purchased in any media store and the use of the graphics card for computing tasks, allows for a portability to „cheaper" computers and hence caters for a realistic possibility to be used by „everyone".

4 Conclusion

Math and Physics are describing reality in a certain way. Physical and mathematical descriptions are the prerequisite for computer generated realities. This interaction was – for us – a starting point for reflection and experimentation.

In the media experiment „seidesein" we are broaching the issue of physicality of the human body with regard to nonverbal communication.

5 Outlook

Up to now we tested seidesein only in installations, i.e. two users are standing next to each other. This use as an installation is an intended use, however we also want to implement the feature to use seidesein via a network. This is also important for the realization of our original concern – namely the investigation of the impact of physicality on communication or - the physical manifestation of communication, respectively.

We want to continue our experiments with communication within the framework of other spacetimes and physicalities. Eventually this will include also narrative elements, music or „gameplay".

We would like to continue our work with mathematical language and its audiovisual and haptic implementation.

Links

- www.daytar.de (media experiments Tim Hoffmann, Nadja Kutz)
- www.daytar.de/art/seidesein (seidesein website)
- www.jreality.de (seidesein rendering software)