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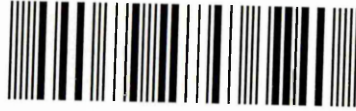
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This is not here: Connectedness, remote experiences and immersive telematic art.

A thesis submitted in partial fulfilment of the requirements of
Sheffield Hallam University
for the degree of Doctor of Philosophy

Michael Hohl

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An approximately eight minute video documenting the Radiomap application is included in this thesis in form of a DVD. It is also available via the project website at <http://www.hohlwelt.com/en/interact/practice/radiomap.html>.

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This is not here: Connectedness, remote experiences and immersive telematic art.	1
Abstract	6
General Introduction, aims and objectives	8
Methodological Approach	15
Theoretical Frameworks	17
Practice relating to research	18
Research methods used	18
Making	19
Contextual Review	20
Questions and context	20
Mapping the terrain	25
Global awareness and the physical world	27
Transformation of data into a sensual experience	28
The dimensions of Transportation, Spatiality and Artificiality	32
How real does it feel? The concepts of presence and immersion.	36
Bringing there here	39
Classification of Media Art Installations	47
Case Studies	49
Buckminster Fuller's "World Game", 1964	52
Stewart Brand's "Whole Earth" Buttons, 1968; NASA's APOLLO mission	54
Ingo Günther: "Worldprocessor", 1988 -	57
Taos Group's "Beware Satellite," 1996	59
Smart Studio's "remote home", 2003	64
Paul Sermon's "Telematic Vision," 1993	68
Kohji Setoh's "Global wind chimes project", 1999 -	70
Golan Levin, Zach Lieberman, Jaap Blonk, Joan La Barbara, "Messa di Voce," 2003	73
Luke Jerram's "Tide", 2001	76
The system of methods	81
Studies in practice: immersive telematic environment	91
Conceptual issues the artwork explores	94
Telematic Culture, Telematic Art	96
Experiences of global awareness and holistic overview of the world in Radiomap	101
Telepresence and Telepistemology: How can we trust remote data?	112
Hearing and Radio	114
The map image	118
Exploration, immersion and collaboration	120
Telematic Art: the dialogical vs. the contemplative	121
Art, Design, HCI critique	126

My position	132
Software development	139
Process model workflow: Concept, role, evolution, communication	139
Documentation of affordances and constraints, detail	141
Making	143
Statement of ownership of work	147
Pilot Study: Screen-based application	148
<i>Review of pilot study conditions</i>	148
<i>Study focus</i>	150
Methods	151
<i>Developing a grounded theory from interview data</i>	153
<i>Visitors book</i>	154
<i>Analysis of data</i>	155
<i>Conclusions of the pilot study</i>	170
Main Study: Interactive Environment	174
Review of main study conditions	174
Study focus	177
Methods	179
<i>Observation</i>	179
<i>Reply postcards</i>	181
<i>Developing a grounded theory from interview data</i>	182
<i>Analysis of data</i>	183
<i>Conclusions of the main study</i>	208
Conclusions	215
Introduction	215
Main research questions:	215
Critical review of the system of methods	221
Reflections	230
Outcomes and contributions	232
Concluding remarks and future research	235
Appendix I: Concept paper and structure of software	239
Appendix II: Structure of software modules	251
Appendix III: Questions, interviews, coded pages and notes, visitors book	259
Appendix IV: Technical construction of interactive environment	300
Appendix V: Secondary sources	302
Bibliography	303
Footnotes	313
DVD: Video documentation of Radiomap software application (approx. 8 Minutes, PAL)	

This is not here: Connectedness, remote experience and immersive telematic art

1: Abstract

In this interdisciplinary research I set out to develop an understanding of the stages in which human participants experience the application *Radiomap*, an interactive telematic application mapping live radio stations upon a photorealistic live map of the world, developed as part of this practice-based research program. It was applied in two iterative studies, first in a study using a screen-based version of the application, followed by a study using an immersive, telematic environment. Both studies capture and analyse participants experience via interviews in an adapted Grounded Theory approach, resulting in different models of the stages of experience. This includes diagrams of experiential stages as well as telematic set-ups.

A contextual review looks at media theory, media design practice, and relevant dimensions of Human-Computer Interaction research and how this discipline understands and describes telematic experiences. Parts of these dimensions are adapted to inform the methods and methodologies necessary for this research and also to discuss a selection of case studies of interactive art. These case studies, as part of the contextual review, are used to elucidate, establish and analyse the areas of interest Telematic Art, Transformation Art and Global Awareness Art and point to their intrinsic capabilities of not only extending our limited human senses to sense the natural world via remote sensors, but also to create a global awareness, in the sense of an awareness of the planet Earth, in this process. Relevant literature from art theory, philosophy and history of arts complements these examples to form a comprehensive and interdisciplinary system of research methods aided by diagrams and other visual aids depicting crucial experiential characteristics, such as spatiality and medium, which again inform the analysis of data.

The conclusions present a critical theory of the different stages of experience that individuals using the application go through. It suggests that a combination of immersive telematics together with the transformation of data into another sensorial modality can create a platform for technological art that questions our relationship with technology and that this critical distance, as opposed to an overwhelming immersion, may aid this process in leaving space to reflect and contemplate this relationship.

ACM (1998), Categories and Subject Descriptors

D.3.3 [Information Systems, Arts and Humanities]: H.5.5.1 Multimedia information systems – Artificial, augmented, and virtual realities, Audio input/output, Evaluation / methodology, H.5.5.2 User Interfaces – Evaluation/methodology, input devices and strategies, interactions styles. H.5.3 Group and Organization Interfaces – Synchronous Interaction, Asynchronous Interaction, Theory and models J.5 Arts and humanities – Fine Arts.

Keywords:

immersive telematic environment, unencumbered, immersion, live experience, global awareness, collaboration, interconnectedness, presence

2: General Introduction, aims and objectives

*“We need a new medium that will nurture our senses so that we may all be compatible with the natural and cultural diversity of the world. A new world demands a new medium: a medium to develop a new “common sense” regarding our planet, our land, and ourselves.”**

Shin'ichi Takemura, Taos Group, creators of Sensorium.org

To introduce myself, and contextualise the origins of the work you encounter here, I would like to state that my own background lies in graphic design and digital media design. In 1989 I began a traditional three year apprenticeship as a graphic-designer in the town of Ulm in Southern Germany. This apprenticeship was very much influenced by the formalist ideals of the Bauhaus and the School of Ulm, and based on craftsmanship and hands-on-experience, especially in courses that involved manual techniques such as photography, aquatint, etching and lithography. But also in typography and layout practice we focused on manual techniques such as drawing and sketching. Access to computers was limited until students had shown a basic understanding and confidence in working with ratios, materials, sizes, shapes and colour. At the heart of this apprenticeship lay the insight that a graphic-designer structures data in such a way that it becomes information, and in the best case, knowledge; and that he or she plays a decisive role in whether a way-finding system or bus schedule is intuitively accessible or requires disproportional effort to be understood. The program provided a sense, that if the recipient had to work too hard to understand the purpose of the visualised information the designer had failed his or her responsibility. Information had to be structured and displayed simple, clear and concise.

After this apprenticeship I continued with a BA and an MA in Visual Communication and Digital Media Design at the Berlin University of the Arts. This course regarded design as taking a sign out of its context and placing it into another relationship context, looking into the heart of a problem and finding a form from within - instead of imposing

*. Shin'ichi Takemura. : “The Internet as a Sensory Medium for Rediscovering Ourselves and Our World” <http://www.sensorium.org/faqs/person/takecomment.html> accessed June 29th, 2006.

the form over the problem from the outside. This often involved intractable problems and the insight that there was not one perfect solution but many different ones, all with their own advantages and disadvantages. Media-adequacy was an important guideline, which emphasised that the best media format depends on the audience, context and the purpose. Some times this would be a book, at other occasions a film, a web-site, a CD-ROM or an interactive installation piece. During these studies I learned to use the computer as a tool, and later as a medium in itself to convey information into an experience. In 1996, at the beginning of my MA, we began to leave the screen behind and explore interactive installations in spatial settings. Usually these installations allowed an audience to navigate information by an interactive process, but also included structuring information or processes in an accessible and comprehensible format to create knowledge.

The quote above was taken from a talk given by Shin'ichi Takemura, one of the initiators of the Japanese Taos group, an interdisciplinary group of designers, artists and researchers who created a number of interactive pieces for Ars Electronica in 1997 under the name Sensorium.org. Their seminal approach towards technology, making the complexity disappear and turning the engagement with their pieces into an inspiring, eye-opening and sensual experience has always been an inspiration for me since the days of my MA. Through their work I realised that interactive art can be a deep, sophisticated and physical as well as a sensual experience; and that computer mediated experiences can be pleasurable and knowledgeable at the same time.

In 1997, during my studies at the digital media class I created an interactive map of the world as an alternative to the common navigation of internet radio stations otherwise organised as a verbose hierarchical list. I presented this browser-based version created with Macromedia's Shockwave software several times in public and the responses of visitors were very unexpected. Although individuals could not interact with this version themselves they were very excited about this representation, very immersed and emotional. I was surprised by these reactions as I saw the geographical mapping of data primarily as a smart alternative to the common three-click depth of navigation usually offered by websites: Country/State/City. My deeper intentions were also to show a map of the world without political boundaries in an synchronoptic* overview and to provide

*. Synchronoptic implies a point of view that allows to view different entities of information at the same period they occurred in time. In Radiomap the synchronoptic overview allows to see the radio stations at their geographical location at the same moment in time.

this as a live audio experience. Something that is not possible with a hierarchical list. Though very curious, at this time it was not possible to follow-up and research the background of the observations made. Once the opportunity arose in late 2002 to conduct this research project it became clear that this would be the ideal situation to explore the relationship between the mapping of remote data, global awareness experience and telematics.

Aim of this research is to gain an understanding of a particular area of media art. It focusses on those projects that use telematic technology to create experiences of interconnectedness and global awareness for participants. The objective is to gain a better understanding of this type of artistic practice, its history and its relation to technology; to create a visual language in this process to describe these types of set-ups and also look at computer sciences to develop methods and methodologies that may aid in determining participants experience of the application created for this purpose. By doing so bringing a new perspective into telematic art practice. The results gained through this research describing conditions and characteristics of immersive telematic* art will hopefully open a vista of potential applications that involve remote data in interactive telematic environments for the benefit of all disciplines involved, HCI, media art and media design.

The study begins with a review of literature and art works that incorporated enhanced experiential qualities in the engagement with technologies and the main findings include examples of biofeedback, telematics and transforming data into another sensorial modality. At this stage I recognised that my observations from 1997 related in some respect to telepresence, but to a different type of telepresence that was not about “going there” but that could rather be described as telematic experience, a special awareness of the moment induced by live data. The research proceeded in different directions, gaining an understanding of the manner in which Human-Computer Interaction (HCI) describes these telematic experiences and to get an overview of the history of the idea of a global awareness, in the sense of an overview of the planet Earth.

*. I define immersive telematic art as art that creates its main experiential characteristics by employing data from a distant (tele) location by technical (matic) means, thus *tele-matic*. Its immersiveness may be the result of a physical immersion by surrounding the participant or by psychological immersion by captivating the participants attention.

Then it engaged in the development of an immersive telematic artwork, to gain an understanding of how participants experienced its telematic characteristics.

Since the 1980s HCI has gained a deep understanding of the technological and psychological aspects of telematic technologies and provides a rich resource of concepts, methods and principles of the human effects involved, especially in the disciplines of Virtual Reality and Telepresence. Of particular value were texts by Gaver, Benford, Ditton, Lombard and others, that included concepts and diagrams of Presence, Immersion, Transportation, Spatiality and Artificiality to describe the psychological dimensions that individuals in telematic setups experienced.

Other findings included the works and the writings of Buckminster Fuller and Stewart Brand. Fuller emphasising a holistic view of the world, *spaceship earth* (Fuller, 1969) a finite world with limited resources and the yet infinite possibilities to achieve a sustainable relationship with the world through the intelligent use of technology. Doing more with less. Brand was among the first individuals who recognised the inspirational value that a photograph of the whole earth from space would have upon individuals. Both thinkers having a global perspective of the planet earth at the core of their philosophies.

Gaining an understanding of telematics and telecommunication technologies and their application in the arts proved an intractable and confounding challenge. While works are very similar on a technical level they appear very different on an experiential level and in the expression of their content.

While some of the works allow remote parties to *communicate with each other from person to person*, others allow access to, or control of information. The communication part often includes video and audio connections beside written texts or other, more experimental and playful characteristics such as collaborative drawing. The information part is often used in telematics as a two-way connection to control remote machinery. This may result in creating a telepresence experience for the operator of the device, the experience of leaving the local space behind and feeling more present at the remote place than in the immediate physical surrounding. One-way, or non-interactive connections, are used to embed data from remote places such as weather data and others. This sometimes includes the transformation of this data from one sensorial modality to another.

Although this set-up does not offer a factual interconnectedness with the remote place, it often creates vivid telematic experiences for the recipients of the remote data. What facilitates these experiences? How do people experience them? How can we distinguish between the different layers of connectivity and experience?

The vehicle for the practice-based part of the research is an immersive telematic environment called *Radiomap*. Participants walk on a 8 x 4 Meter projection of a photorealistic map image of the earth, which is updated every five minutes. This map shows day and night regions and it is updated regularly. Depending on their location participants access live radio broadcasts from the corresponding place on earth.

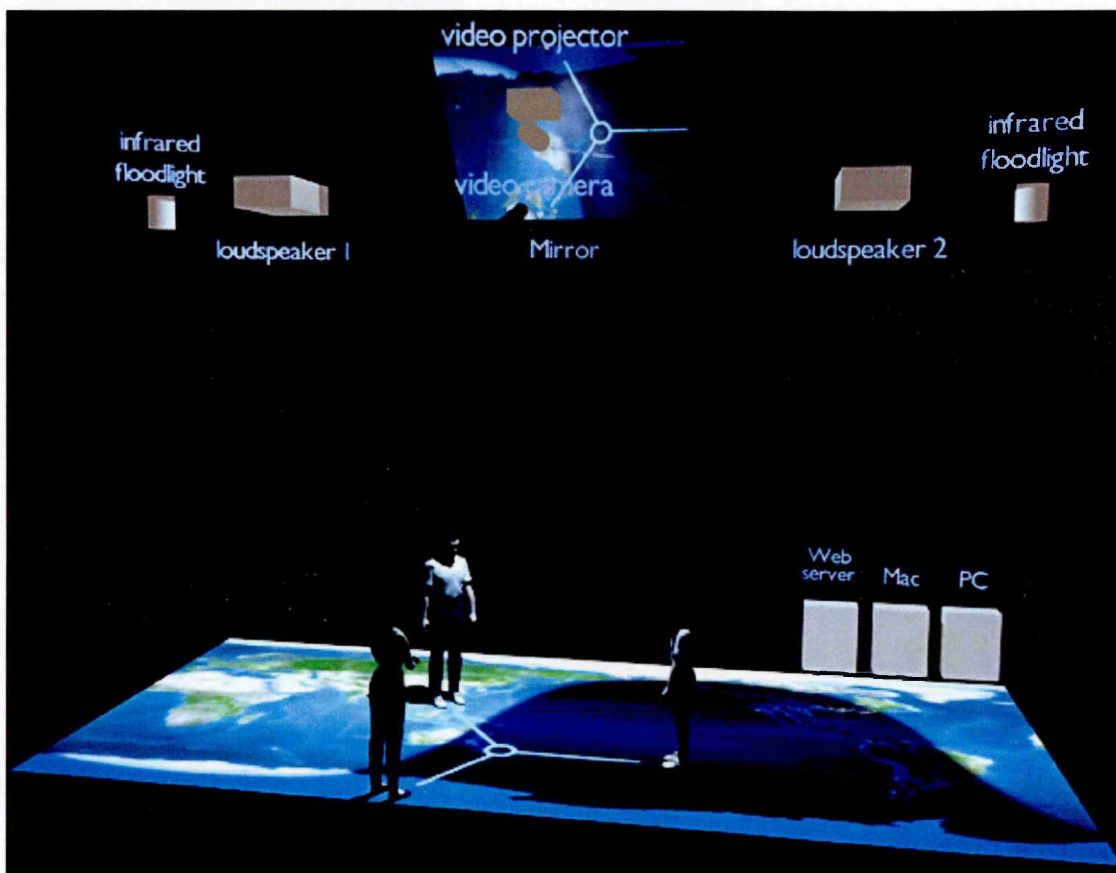


Figure 1: The immersive, telematic environment Radiomap with three participants collaborating. The ring-element in the centre is used to select radio stations. A short description of the software application follows on page 90.

The selected stations usually have a strong local character and program format as opposed to stations which only play music. These broadcasts together with the unusual, disorientating viewpoint create Gestalt effects that enable participants to perceive the earth and other cultures from a different perspective. It is a collective and holistic experience of cultural exploration, surprise, longing and belonging, mediating between indi-

viduals in the installation and the culture of the broadcasting origin, creating an intense presence that is expected to last beyond the active participation itself.

The desired outcomes include:

- an understanding of participant's experiences of immersive telematics
- the conditions for a telematic global awareness experience
- a visual methods to depict telematic installations that enable researchers from the concerned disciplines to converse about these experiences.
- a new perspective and understanding of telematic experience, which is not about "going there" but bringing properties of "there" here.
- a new perspective on Telematics emphasising its combination with the transformation of data into another sensorial modality.
- a new perspective upon the artistic application of telematics, besides from connecting people with people and communication, to connecting people with places, emphasising a global awareness experience.
- new perspectives for the broader media arts and computer science community
- novel methods to capture and describe the "experiential quality" of immersive, telematic environments.

Qualitative methods include an adapted Grounded Theory approach consisting of observation and semi-structured video interviews, a visitors book and reply postcards.

This practice-based research seeks to critically engage the disciplines of media art, HCI and digital media design. It negotiates its own path through the contrasting theoretical and practice-based methods and methodologies of these disciplines, creating an expanded, multidisciplinary methodology for its own purposes. Visits to conferences and seminars show an area gradually developing where the disciplines of media art, HCI and media design share mutual interests, their different approaches and skills complementing each other. Collaborations between teams of researchers, artists and other practitioners of different backgrounds become more significant. Although their methods and approaches may differ, these projects have brought media arts, HCI and media design closer together in order to cope with the increasing complexity and magnitude of contemporary projects.

Behind this research into immersive telematic environments lies a persistent interest in the effects of telematic technologies upon our lives. Among the reoccurring terms of this thesis are experiences of global awareness, feelings of interconnectedness and an holistic overview of the world. These terms attempt to describe an enhanced awareness of the planet earth and our position on it, of its geography without national borders, and its ecosystem in the sense of an expanded home and expanded self. Feelings of interconnectedness refers to a sense of being subliminally connected with distant places. Holistic overview refers to the overview effect, (White, 1987) realising the difference between dry knowledge and the true reality that our home is a huge sphere that is slowly rotating through black, inhospitable space.

Altogether these terms allude to a process of insight or *Erkenntnis*,* of a fundamental change of *Weltanschauung*; of taking a cognitive step from abstract dry knowledge of a bigger world out there - to a vibrant mental state of concrete realisation and the internalisation of this insight *as a truth*. These experiences can be facilitated by telematic technologies. Their qualities are the underlying objective behind this research project.

This practice-based research explores how users experience the software application Radiomap. The application allows participants to physically navigate a projected photorealistic map of the world and listen to live radio programs from worldwide locations. While a pilot study focuses upon visitors experiences of a *screen-based* application and refining research methods, the main study focusses on the experiential qualities of an unencumbered, *immersive telematic environment*.

Both studies attempt to capture the experiential quality of the application, especially of being connected with a remote place and to understand which properties constitute experiences of *global awareness*, *holistic overview of the world* and *feelings of interconnectedness* which some visitors report they experience. During the process of making the artwork this research creates its own methodology drawing from the different disciplines and establishes an adaptable system of methods to describe conditions and results of these experiences in words and diagrams. This also includes a collection of terms and diagrams that enable us to communicate about telematic characteristics.

*. A *conscious insight* transcending mere knowledge and including the acceptance of this knowledge. It always refers to the relationship between a recognising subject and a recognised object.

This thesis is structured into three main chapters, beginning with a contextual review which gives an overview of Human-Computer Interaction (HCI) perspectives upon telematic technologies. These perspectives conclusively inform a number of selected case studies which are used to establish the areas of interest telematic art, transformation art and global awareness art. Together HCI perspectives, art theory and the selected case studies form a system of methods which inform the data analysis.

It then proceeds to the second main part. This section begins with a discussion of the conceptual and theoretical issues the artwork explores and its philosophical background. After establishing these terms the software application is introduced, the software development and the two practical studies conducted with the application. These are followed by the conclusions which critically reflecting upon methods, methodologies, the outcomes and relevance of this research.

Initial Research Questions & Hypotheses

1. Are the reactions observed related to Telepresence?
2. How is Telepresence defined and described by the computer sciences?
3. Is there a vocabulary or a visual language from HCI or the arts that helps us to understand the relationship between the spatiality and display technologies of telepresence systems? Or rephrased: Is there a method of displaying the relationship of the spatial dimension together with the sensorial modality at both places?
4. How are telepresence technologies applied in art practice?
5. Are there examples of art practice focusing on experiences of global awareness and holistic overview?

2.1: Methodological Approach

This research project developed its own methodology consisting of *applied* and *contextual* research on a qualitative basis. This process was formed by an analysis of existing artworks, relevant art history theory relating to interactive art, as well as specific frameworks of HCI. The most notable frameworks deriving from *presence research*, *telepresence research* and *virtual reality research*. A focus is placed on terms that refer directly to telematics. These terms can be further employed to describe the enhanced experiential qualities of *global awareness*, an *holistic overview of the world* and *feelings of interconnectedness* among participants and the properties which constitute these effects.

The applied research consists of the implementation of an application as a research instrument; a tool to explore the original hypotheses. The planning is carried out in two iterative studies, its framework of production grounded in professional practice. The first study examines participants experience of a *screen-based* version of the application,* the second study examines their experience of an unencumbered, interactive and immersive *environment*. Participants are observed, interviewed and their responses are recorded and later analysed.

Another important strand of the research process consists of carrying out a contextual research by collecting and analysing mainly artistic works and thoughts of other makers, focusing on how they represent *enhanced experiential qualities*. This included investigating how artists have used telecommunication technologies or other live connections in their works. This also served the purpose of understanding the relationship between the technical set-up of a piece and the imaginative quality of experience it created, as it is difficult to tell from the magnitude of technology deployed the *imaginativeness* of a piece. That said, this is no attempt to create a framework of evaluating the quality of interactive art. Through the different perspectives of the conceptual framework, these case studies are later described and analysed forming an adaptive and flexible strategy for creating an own framework and definitions.

Main research question are:

1. Which qualities are necessary to create experiences of global awareness, holistic overview and interconnectedness? In which ways can the evidence be recorded and analysed?
2. How does the experience change when participants of the interactive environment version have to collaborate?
3. What is the history of the idea of global awareness? Is there artistic practice interested in this experience?

The study's focus is on how participants experience the Radiomap application. One group experiencing the screen-based version, another group the interactive environment version. Following a grounded theory approach, interviews are conducted immediately

*. The pilot study was originally intended to be an immersive telematic environment with the following study as an iteration. Site-specific reasons such as a prohibitively low ceiling and building regulations prevented this. Therefore the screen-based mode was used instead.

after the experience and then analysed relating overall *themes* to which participants refer, to concepts and categories of experience. The phenomena we are looking for in these themes are informed by HCI concepts of Telepresence, Virtual Reality and Presence research.

2.2: Theoretical Frameworks

Before locating my own practical work within this methodological framework we will look at different approaches towards *telepresence* and among others, associated concepts such as *telematics*, *immersion* and *presence*. Several of these concepts form the foundation for my views and are later adapted to describe some characteristics of the case studies which were used to inform and aid in the re-evaluation of these views.

Both early Telematic Art and applied Telepresence research are interested in facilitating connections over unnatural distances*. While in the past the artistic perspective focused more on the medium,** telematics is interested in functionalities such as agency.*** Another area closely related to Telepresence is Virtual Reality (VR). VR is also applied to connect remote participants. These participants do not remain isolated in their individual Virtual Realities but meet each other in a shared virtual place. This involves similar technologies such as head-mounted displays and paradigms such as “going there,” and explains the close link between VR and Telepresence.

In a joint paper, “*Understanding and Constructing Shared Spaces with Mixed-Reality Boundaries*” Steve Benford (Benford, et.al., 1998) describe different properties of *shared spaces* and their commercial application. This includes systems for tele-conferencing and shared workspaces where remote parties can jointly act.

*. An unnatural distance implies a distance beyond what we can sense with our innate capabilities. As human history is also a technical history of the tools we invented to extend our limited human senses, these extensions have almost become part of our nature. We may speculate here, that what is perceived as *natural* may underlie cultural influences, exposure and habituation and is probably not a static value but changes over time.

**. Creating a process such as collaborative storytelling via international tele-facsimile exchange or slow-scan tv, a black-and-white radio image that takes between ten seconds and several minutes to transmit.

***. Controlling remote robots that could handle hazardous materials.

This text provided initial frameworks to inform this research, especially the concepts of Transportation, Spatiality and Artificiality.

Other helpful frameworks include “*Immersion, Engagement and Flow*” by Douglas and Hargadon (Douglas and Hargadon, 2000) and Ideas on *Presence* and *Immersion* by Lombard and Ditton (Lombard and Ditton, 1997).

Another key dimension is the concept of *transformation*. Transformation refers to the degree data is transformed from one medium into another medium, for example the actual live measurements of a seismograph into changes of the sound of a media installation piece. It determines the overall experience for participants in fundamental ways. It may be compared to synaesthesia a neurological phenomenon where sensorial perceptions overlap so that a sound can not only be heard but also tasted on the tongue. In the same manner transformation *transforms* data from one sense to another, thereby making information more sensual and graspable .

2.3: Practice relating to research

The initial research is based on observations made with a similar, browser-based application created in 1997. Visitors then showed strong reactions to this experience and the purpose of this research is to repeat and systematically examine and analyse the conditions for these experiences to understand their requirements. This also includes researching related works and writing.

2.4: Research methods used

The aim is to apply qualitative methods that will give insights into participants experience; qualitative as this would give a deeper understanding in visitors own words of their experience with the application.

The methodological framework to analyse the data will be models and perspectives from HCI, a comprehensive contextual analysis of comparing and analysing a number of relevant case studies and also literature from the arts.

After evaluating a number of Qualitative methods I decided for an adapted Grounded Theory approach. Grounded Theory is a qualitative methods and often involves interviews, observations and note taking. Following a set of procedures it results in a theory to emerge from the original data in participants own voice.

2.5: Making

The Radiomap application is designed in a top-down approach following professional practice. It included sketching and reflecting on the design, then describing it in detail in different techniques such as 3D models and written concepts. This information was passed on to an external programmer. Past hands-on experience with digital media resulted in a design that was technically feasible as well as realistic and economic to implement. Sketches were done in one main “idea book” in A4 size. Two of these books are filled over the course of this research, each containing 200 pages. John Maeda writes: “[...] *paper is more a state of mind than an object, it is a place outside our minds, to think and reflect*” (Maeda, 2000, 145) They are filled with sketches, ideas, notes from books, references to papers and notes from conferences as well as with comments from tutorials creating a long narrative that mirrors the development of ideas around the research in all its diversity. In these two books the whole research process is documented.

Once the affordances (Gibson, 1977) of the application were outlined the external programmer set up “Subversion,” a version-control system that keeps track of changes of the software and is seamlessly integrated into the computer desktop which allows to update the software when necessary.

Contextual Review

1: Questions and context

The following contextual review consists of two main sections. The first part provides an overview of relevant HCI dimensions, frameworks and methods used to describe conditions and characteristics of Telepresence and Virtual Reality technologies. The second part introduces a number of relevant case studies to elucidate and establish the areas of interest, which are also used to see the HCI dimensions applied as a visual language to describe the technical layer of the works. This will be followed by an elaboration on methods and methodologies, and a discussion regarding their appropriateness and scope.

The initial research questions were:

1. How is Telepresence defined and described by the computer sciences?
2. Are the reactions observed related to Telepresence?
3. Is there a vocabulary or a visual language from HCI or the arts that helps us to understand the relationship between the spatiality and display technologies of telepresence systems? Or rephrased: Is there a method of displaying the relationship of the spatial dimension together with the sensorial modality at both places?
4. How are telepresence technologies applied in art practice?
5. Are there examples of art practice focusing on experiences of global awareness and holistic overview?

Why is this research needed and what evidence is there to support it?

When we use tele-communication technologies we exchange or receive data over an *unnatural* distance from a remote location. The effects of these technologies and how they change society have been observed and described in the 1950s by Marshall McLuhan who describes these networks literally as extensions of our nervous system. Marshall McLuhan also coined the term “global village” referring to the change tele-technologies inflicted upon modern societies. McLuhan’s “global village” does not refer to a global

perspective in a general sense, but more to the shrinking of distances as a result of radio broadcasts, television and the telephone. It was Buckminster Fuller in 1927-28 who first drew and spoke about the “one town world” which later turned into the “one island in one ocean” Dymaxion world map (Sieden, 2000, 213-240, 241-269). The drawing (Figure 2) depicts different kind of vehicles, planes mostly, travelling from continent to continent. The display emphasises a global perspective whereas McLuhan’s view focuses on tele-communication networks which connect people to each other and allow for information to be distributed on an unprecedented speed and quantity. It is this change of perspective, from the “global village” to “spaceship earth” this research is concerned about.

Lloyd S. Sieden writes about this drawing: *“Because [Buckminster Fuller] understood that improving global transportation and communication were advancing humanity toward a single World society, Fuller began referring to his illustrated map as the “One Town World” perspective. He continued refining and expanding that global perception, and in 1951 he coined a new descriptive phrase for it, “Spaceship Earth.”* (Sieden, 1989, 127)

Since 1927 telecommunications technologies and transportation have dramatically increased, yet it took longer for the public to gain a global perspective. While we make use of the television, the internet, the radio and the telephone we utilise it to get information, to be entertained or educated - but we hardly view it from a perspective that emphasises the miraculous distances involved or the global network that encompasses the whole planet behind it. Its *utilitarian qualities* mostly supersede these reflective insights. Understanding this difference between utilitarian use and a holistic overview experience of the planet is part of this research and an argument why it is needed.

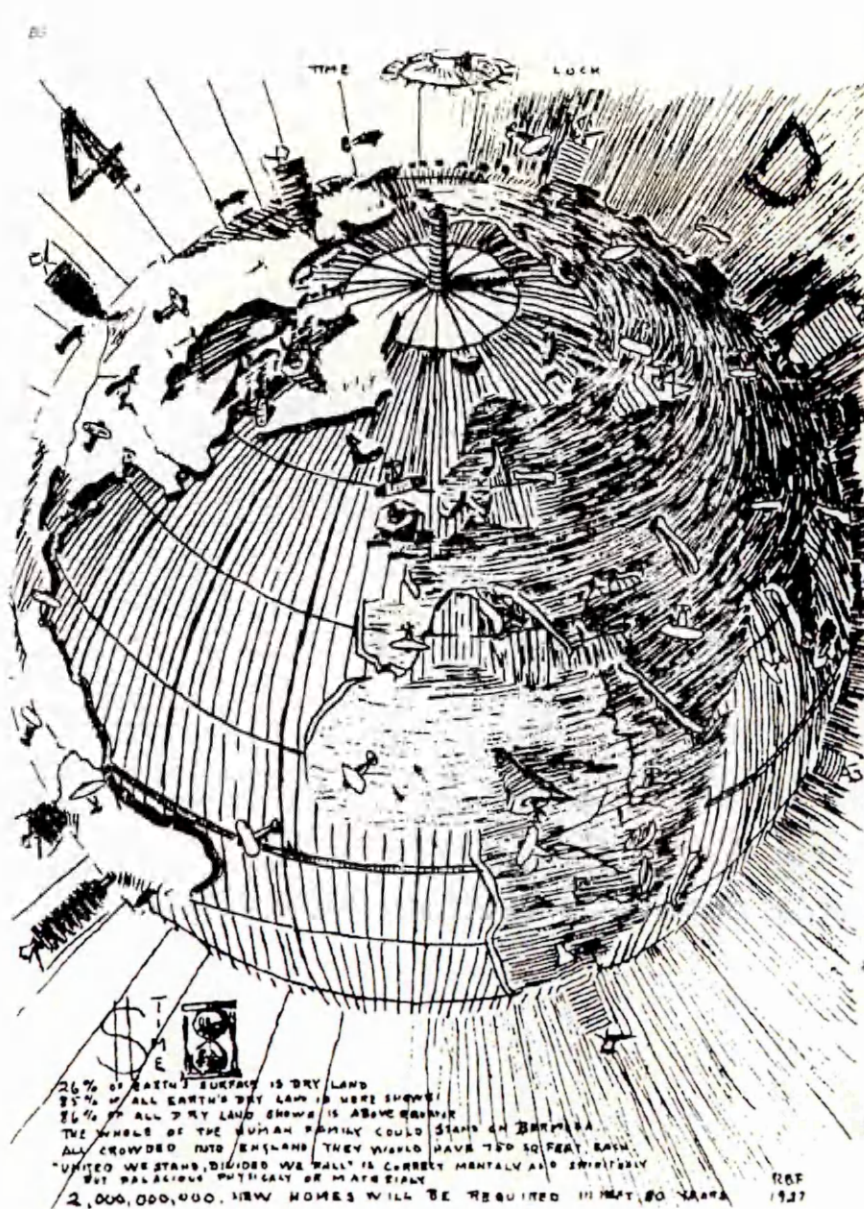


Figure 2: Buckminster Fuller's 1927 "4D time lock" drawing also referred to as the "one-town world." Image by The Buckminster Fuller Institute; (Krausse, 1999, 99)

The application of certain aspects of telecommunications and Telepresence* has been extensively researched over the last two decades, both in artistic practice and the computer sciences. On the one hand there is the proliferating area of mobile technologies

*. Telepresence encompasses a wide variety of applications. For some researchers it is restricted to operating remote machinery while others define it as the psychological phenomena of 'feeling more present at a remote location than in the immediate physical environment.' For some researchers the telephone is already an application of Telepresence. These and other definitions are presented in more detail on page 24.

and ubiquitous computing where a wide variety of new devices blur the boundaries between media. This area is increasingly explored by multidisciplinary teams of artists and researchers. On the other hand in the mainly immobile area of telepresence research, Collaborative Virtual Environments (CVE's) we find new applications such as virtual meeting places while virtual workbenches are interconnected with CAVES and CUBES* allowing multiple individuals to collaborate in virtual environments while being physically present at different locations. Most of these explorations are concerned about facilitating communication as this is a promising commercial area high in demand as we see in the increased demand in mobile technologies over recent years.

While these areas have received great attention for their tele-communicative properties there appears to be little thought about the *mapping* of remote *data* and how it is visualised or transformed into a sensual experience. Lev Manovich referred to this in his 2001 essay "The Anti-Sublime Ideal in New Media" (Manovich, 2001) where he describes the possibilities of "mapping data" as "*one of the most fruitful research directions in new media art*" without explicitly referring to telematic technologies in this context. In other words, while the model of exchanging information, facilitating communication, and connecting people with each other has received great attention from the research community the *theoretical* model of connecting a person with a place or two places with each other has been overseen to a certain extent. Mobile devices are potentially telematic technologies yet transport little of the magic that telematics initially incorporated, in the early days of radio and telephony when the public was still fascinated by these technologies. Why is that so?

*. CAVE, CUBE: Acronym for "Cave Automatic Virtual Environment" An immersive Virtual Reality room which is open on one side, while a CUBE is closed on all sides. Computer generated imagery is projected onto the walls of the CAVE or CUBE from the outside. Participants inside this space have the impression of being immersed in an interactive virtual world. Senders embedded within stereoscopic glasses simulate movement and a handheld controller allows interaction with virtual objects. People experience representations of themselves and other interactors of these virtual worlds as simplistic graphical representations called Avatars. (DeFanti et.al. in Guedj et.al., 2001, 137)

Fundamentally it also is about realising the inherent kinship between telematics and so called *non-visual multi-modal visualisation* or what we here refer to as the *transformation** of data from one sensorial modality to *another* or short *transformation*.

One application of Telematics is Telepresence. The term *Telepresence* was coined in 1980 by Marvin Minsky and Pat Gunkel. It referred to the “*phenomenon that a human operator develops a sense of being physically present at a remote location through interaction with the system’s human interface, i.e. through the user’s actions and subsequent perceptual feedback he/she receives via the teleoperational technology*” (IJsselstein, 2000) more recently its meaning has changed somewhat and it is less about the perception of leaving the local space behind but is more generally understood as “*the union of telematics and elements of remote physical action.*” (Kac, 2005,193) Stephen Wilson also has a wider definition and suggests that “every kind of telecommunications is telepresence - a technology for a person to be present in some form in a distant place” (Wilson, 2002, 526) adding that email was telepresent to an extent. Brenda Laurel and Scott Fisher define it as a technology “*that enables people to feel as if they were actually present at a different place or time,*” (Wilson, 2002, 527) a definition that includes the change of the spatial properties of a *local* environment as telematic data is augmented and would thus pertain to Radiomap. For Rosenberg or Sheridan (Wilson, 2002, 527) telepresence is not complete without the ability to *act* at the remote location, something other researchers would define as teleoperation.

Trying to understand telepresence effects and telematics with the aim of developing a methodology for this research project that could also inform my methods of enquiry I began looking at relevant texts from HCI. These texts referred to Virtual Reality, Collaborative Workspaces and Interactive Workbenches and introduced me to a variety of different views upon telematic technologies from an HCI perspective.

A selection of texts, mostly from Computer Sciences but also from Cultural Studies, Art history and Media Studies informs the search for the methodological background and methods. Here frameworks of telepresence were most valuable, psychological effects and perception. The findings included dimensions and concepts such as Presence, Im-

*. As most transformations are visualisations, this term has established itself. Nevertheless, it is linked to the visual sense and does not emphasise the other forms that data may materialise in, such as sound, vibration, temperature or all of the above.

mersion, Spatiality, Artificiality among others. Cultural Studies and Media Studies gave an overview of the development of computers in art, communication arts and telepresence art.

Overall three texts from HCI proved essential, providing the methodological foundation for this research. They were necessary to understand implications and related ideas to immersive experience and especially the idea that connected my own observations with Telematics. Here the rich history of computer science exploring telepresence was very useful. The concept of “*Immersion, Engagement and Flow*” by Douglas and Hargadon (Douglas and Hargadon, 2000); Ideas on *Presence* and *Immersion* by Lombard and Ditton (Lombard & Ditton, 1997), ideas on *transportation* and *spatiality* “Here, there meeting in a virtual space.” by Benford et. al. (Benford, 1998). Although this paper is on “shared spaces” and the commercial application of Collaborative Virtual Environments it provides three helpful dimensions called *Transportation*, *Artificiality* and *Spatiality* to classify shared space technology. These dimensions inspire classifying interactive art in general and allow for comparing artworks to each other from their technical set-up and enable conclusions to be drawn. They also inform the conceptual background in informing the interview questions and successive coding of the interviews with participants. Benford also introduces three different spatial properties: Containment, Topology, Movement plus a shared coordinate systems which were of no deeper relevance for this undertaking as they were more speculative allusions.

This research is needed to promote and gain a better understanding of a promising area of interactive art that creates experiences of holistic overview of the world. This area can apply telematic technologies in combination with the process of transforming data from one sensorial modality to another to create these experiences. An important role in this process is most likely played by the degree of interactivity and the live-character of data provided. This may be data resulting from natural processes such as the wind, other weather phenomena or earthquakes. The following section attempts to ground and elaborate on the initial questions this research began with.

1.1: Mapping the terrain

This section maps the terrain of my area of interest and allows the reader a view of the phenomena this research project is trying to understand and provide evidence supporting my claims. It can be seen as an epistemological and philosophical framework to contextualise the work.

This exploration begins with the attempt to understand phenomena evoked by my own work and to position it within the context and tradition of existing artworks and thoughts. These ideas and artefacts emerge from different disciplines within the 19th and 20th century. They include the telephone and radio as well as robots or wind actuated sculptures. What they have in common can be described as three distinct areas partly overlapping each other as follows;

Firstly, there is the area of *telematic art* which includes communicating over unnatural distances or the control of remote devices. Secondly, the phenomenon of *transformation art*, where this research focusses on the *transformation of data from one sensorial medium to another*. Thirdly, the focus is on the idea of *global awareness*, an enhanced, dissociated state of awareness of the planet which may also include enhanced awareness of the physical process or nature and a different perception of self as a result.

Part of this exploration is to become aware of these distinct similarities and to develop the ability to critically frame, compare and communicate them, but also of realising that some of the effects experienced could be more generally seen from a telematic perspective as *live data* from remote locations is involved.

The selected pieces show a concern for the earth as a habitat, for geographical distances, interest in different cultures, time-zones or communicating with people across unnatural distances. All in all they try to create a certain awareness of the physical world. Some do so with advanced technology and equipment whereas others achieve their goal by more reduced and poetic means. The works had something in common that was difficult to point out, a captivating immersive experience being one of them.

So what are these similarities?

During the research process, I began to understand that some of these interesting experiential qualities were technically achieved through telepresence effects, biofeedback and the transformation of data from one sensorial modality to another. From their content they circumscribe an interest in the natural process (weather, wind, earthquakes), geography and distances (time-zones), the orbital view of the earth and experiencing these qualities with multiple senses, a fascination with simultaneous and synchronous processes. Overall they beckon an interest for a “holistic overview of the world” and “interconnectedness” in one way or another.

Some of the values and affordances have been recognised and described before, some have not. Namely some aspects of Telepresence have been documented well since the

1980s by HCI, while aspects of communication art have been documented in artist's texts; the area that this research project engages, telematic experience and transformation of data, has only just recently been recognised by HCI and has only rarely been consciously explored by artists or designers.

1.2: Global awareness and the physical world

As we have seen in the introduction there is a distinct difference between McLuhan's "global village" of the perceived shrinking of the world and Fuller's "one-town world" which emphasises more a global perspective and interconnectedness. Peter Weibel (Weibel, 1990) distinguishes between two different experiences of global awareness: A *global consciousness* as a result of a growing awareness of the simultaneity of actions in the world as a result of the disappearance of distance, duration and global networking. Secondly, an *orbital consciousness* as the result of an orbital perspective of the world, a holistic overview of the planet Earth. This we see in art that is made to be seen from space down on earth, or art made in space to be seen from the earth's surface.

This reminds of the comment made by the astronaut Eugene Cernan "*We went to explore the Moon, and in fact discovered the Earth.*" (Krausse, 1998, 270) It appears that inherently global consciousness has the potential to create an awareness, rediscovery and attachment for the physical world. When our attention is directed towards planet earth as a whole it becomes close and comprehensible, instead of being abstract and distant. In that sense the global awareness experience makes us aware of the immediate physical world surrounding us as part of the whole world we are now able to fathom through technical images such as satellite imagery that we can interact with.

Philosopher Paul Virilio warns that our engagement with the world is more and more substituted by images that we take for the real world. Virilio describes that the visualisations created by television, surveillance cameras, microscope, telescope and satellite turn inside and outside around and that this resulted in the virtualisation and amplification of optical density of the real world (Virilio, 2000, 14). As a result we would see an "*end of geography*" (Virilio, 2000, 9) and warns that the monitor may become the new horizon of our world.

Abraham Moles also commented on the dangers of these vicarial¹ technologies in 1992: *“As we enter the age of telepresence we seek to establish an equivalence between 'actual presence' and 'vicarial presence.' This vicarial presence is destroying the organising principle upon which our society has, until now, been constructed. We have called this principle the law of proximity: what is close is more important, true, or concrete than what is far away, smaller, and more difficult to access (all other factors being equal). We are aspiring, henceforth, to a way of life in which the distance between us and objects is becoming irrelevant to our realm of consciousness. In this respect, telepresence also signifies a feeling of equidistance of everyone from everybody else, and from each of us to any world event.”* (Moles in Kac, 2005, 145)

This may also be seen as a challenge for media designers to think about solutions for the negative results of Moles' experience of equidistance. Just as tele-technologies are changing our perception and expectations of the world we could also state that once becoming aware of this characteristic bears in itself already an awareness for these dangers and a vigilance towards them. I believe that artistic projects that make critical use of telematic technologies are an inherently advantageous and beneficial contribution to becoming aware of these dangers - instead of actually contributing them. This requires artists as well as an audience that are media-literate enough, inclined and susceptible to a certain extent to these issues. An interest in design could be beneficial for artists in that respect in that they better understand how the audience perceives their work and expects from it.

1.3: Transformation of data into a sensual experience

Transformation involves the process of *transforming* data from one sensorial modality into another. Two of several examples are visual plug-ins for MP3-Players that transform properties of the music into animated visuals on a computer screen, or changes in gravity which are transformed into a spatial sound experience. Both examples transform data, in one case music and in the other indiscernible changes in gravity to a different sensorial modality, and effectively allow us to experience the data in deeper and sometimes more meaningful ways.

Other data may be of numerical kind and convey the strength, duration and location of earthquakes. Yet, whereas a scientific transformation would have to be accurate within

1. Vicarial referring to a vicar, serving in the place of someone or something else.

constraints and transparent regarding the rules it performs upon the data, an artistic application would allow more freedom, as for example the transformation of remote earthquakes into vibrations of a local media installation piece. This would give the visitors a sensual impression of these distant geological events without exposing them to a real and dangerous situation. We can also envision the same set-up from a scientific perspective where the data is accurately simulated. The transformation of the information into a sensorial experience, from an abstract description to an actual experience dominates the overall character for participants in fundamental ways. It may be compared to synaesthesia a neurological phenomenon where, for example, individuals perceive sounds also as visuals.

Fundamentally the idea behind this concept of transformation is that dry data can be transformed into a sensual, tangible experience that allows us to understand and engage with information in an embodied and physical manner, moving us in different ways than reading numerical data, charts or graphs, may. By transforming them into the sensual realm they may move us in a visceral manner and not a cognitive and rational, mind-focused one, as we are multi-sensorial beings and exist with all our senses in the world.

With the proliferation of computers this possibility has become more accessible and easier to achieve. Potentially it may change the proverbial cold computer technology into something associated with a sensual and more humane realm.

Several different labels are used by different disciplines to describe the transformation process. Among these labels are *morphologically analogous* (Popper, 1968, 158) used by Etienne Souriau in 1912. *Transformation* (Reichhardt, 1968, 43) by Roger Dainton in 1968 and just recently by Lev Manovich as *Visualisation Art* and *mapping from one domain to another* (Manovich, 2001). The first HCI symposium about “Non-visual & Multi-Modal Visualization”¹ took place in 2004 in London. While visualisation refers solely, to the visual sense, this label does not seem appropriate for most of these sensorial processes that involve the other senses as well. I prefer using the term Transformation, which is used in Roger Dainton’s 1968 essay *Simulated Synesthesia*.² (Reichhardt, 1968, 43) Transformation emphasises the change of form and appearance the data undergoes and not the sensorial modality it addresses as it can be the very same sensorial modality it originates from e.g. speech being transformed into music. This is where context becomes relevant and is the explanation why the classical information theory model developed by Claude Shannon and Warren Weaver (Shannon, 1948) is not suit-

able as a descriptive model. Although it allows for different *media* such as television, radio or discrete telegraph signals it does not include the role of the *spatial dimension* and *sensorial modality*, which in the telematic connections under investigation is concerned about.

Transformation is a rule-based process which allows for data to be processed according to certain procedures from its original raw state and displayed in a new medium or additional medium. Computers treat data indiscriminately and the data of origin can be of almost any kind, from actual, live figures of an earthquake or gravity to asynchronous statistical data of a region or physiological data of a body. It is only humans that give, and can give meaning to this data.* And it is only this recipient for whom the content in form of meaning can make a difference.

The benefit of this transformation is that we are engaged also with our body and not with our mind only. We *feel* and experience the world with our whole body and all our senses and Transformation Art should make use of this, instead of cold, rational and cognitively intake of information. The process of transformation makes the fundamental

*. There also is a deeper problem involved in using the term data. We cannot speak in such an abstract way of data as such; also digitisation makes it appear this way. Data is content on several layers. An intractable conceptual problem of this research was recognising the necessary distinction between synchronous and asynchronous data and becoming aware of the difference between the dialogical, engaging and active “communication art” and the monological, contemplative, passive and observant “telematic art” (with or without true interaction or agency). The technical setup in both systems is sometimes identical, and even the signal format. Yet they are perceived very differently. “Global windchimes Project” creates a sense of global awareness while “Hole in Space” (Wilson, 2003, 487) in the end is a video conferencing application. Data, or the information into which we turn it, is not neutral, it is political, it has a meaning, an agenda, sender and receiver bring with them history and context. So we cannot speak of data as such, also the digitisation of it makes it appear the same: it is not so, only for the computers that relay it indiscriminately through the networks. It also pertains to connecting people with people, or people with places. We are social beings and talk is not only a medium, but a way of expressing our personalities of becoming oneself in a conversation with others. Talk is a social process. We become who we are by mirroring ourselves in others. Something captivating and engrossing is happening to our minds and our behaviour when we engage in a dialogue with others. The more “natural” this dialogue is the more captivating it becomes, even when this dialogue is computer mediated.

difference between the abstract knowledge of something and actually experiencing it. We trust our sense of touch more than what we read. (Singer, 2004). This also suggests a hierarchy of the senses.

Employing the transformation process to experience data on an embodied, physical and spatial level instead a rational and cognitive one will result in a deeper and more moving and memorable experience. A balance of the two would be desirable.

The following diagram (Figure 3) attempts to visualise the transformation of data from its origin to another location and a different medium. Assuming that it is a telematic set-up connecting two distant places it consists of the gallery space (here) and the place of origin (there). In this example, Ken Goldberg's non-interactive installation work "Mori" (Wilson, 2002, 241, 531), a remote seismograph measures the constant movements of the earth's crust and sends the data over the Internet to another computer about one mile away. Here the data is transformed into an animated curve on a computer screen and into a low frequency sound made audible in the space. A visitor needs knowledge about the background of the installation to understand what is taking place and create meaning from it, in this case that the ground beneath her feet is not as stable and permanent as it seems, thus alluding to the title of the piece, *mori*, latin for a "reminder of mortality." The imperceptible vibrations of the earth's crust can now be perceived by the visitor through different sensorial modalities, visual and audible.

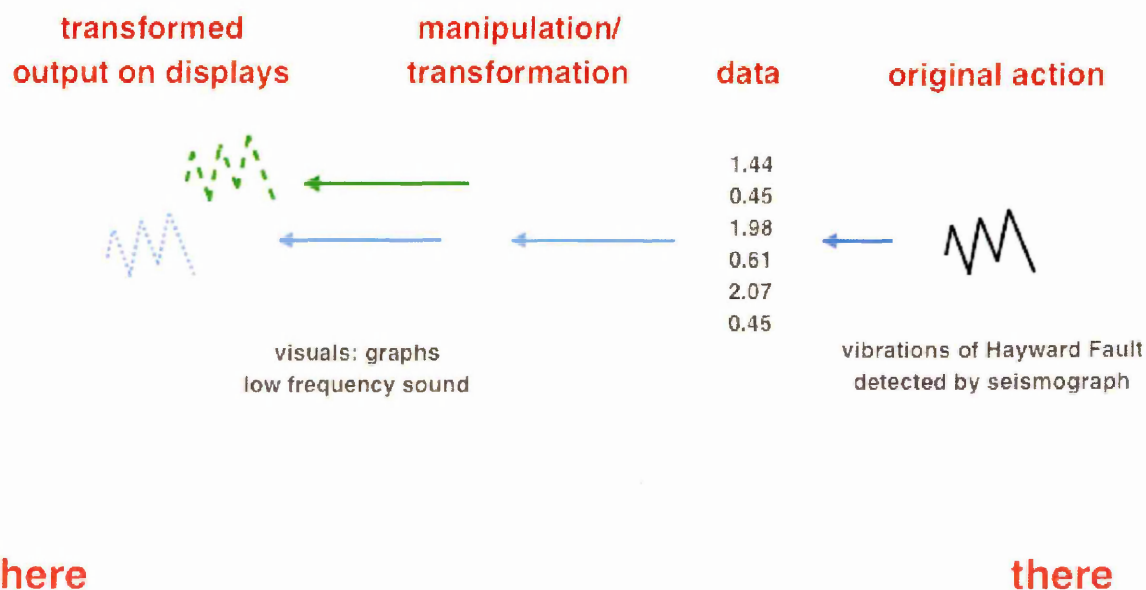


Figure 3: Transformation, from There to Here. Ken Goldberg's installation "Mori" the permanent trembling of the earth's crust is transformed to a visual and music at another location. This diagram evolved into the diagrams in Figures 6, 7, 8.

Partly this diagram is limited as it requires a connection to a *remote* location to depict the transformation process. What about local processes? Visualising the transformation of a *local* process hidden from the range of our senses cannot be displayed.

This diagram (Figure 3) was considered an addition to Figures 6 and 7, finally merging with the “Here, there: Transformation and Spatiality” (Figure 8) diagram. It visualises the concept of *transformation* of data into another sensorial modality and shows its close relationship to telematics.

1.4: The dimensions of Transportation, Spatiality and Artificiality

The text “*Understanding and Constructing Shared Spaces with Mixed-Reality Boundaries*” by Steve Benford et.al., describes different properties of “Shared Spaces” in commercial applications especially tele-conferencing and shared workspaces where remote parties can jointly act in a CAVE or an Interactive Workbench (Benford et.al., 1998).

Interesting for this research are the different dimensions between which they distinguish as they relate to a certain extent to other remotely connected installation pieces.

The interesting concepts drawn from this text are Transportation, Spatiality and Artificiality. They were used to create a framework that informed qualitative interview questions and the diagrams to gain a better understanding of these experiences.

Transportation is the “*extent to which a group of participants and objects leave behind their local space and enter into some new remote space in order to meet with others, versus the extent to which they remain in their local space and remote participants and objects are brought to them. It therefore characterises the essential difference between local and remote.*”

Artificiality can be understood as “*the extent to which a space is either synthetic or is based in the physical world. This spans the extremes from wholly synthetic to wholly physical environments.*” This definition is related to the researchers own term “transformation” described above as it may also involve computer mediation.

Spatiality concerns the environments “*level of support for fundamental, physical spatial properties such as containment, topology, distance, orientation,, and movement [...]. Its extremes are characterised by the notions of space, a context that further provides a consistent, navigable, and shared spatial frame of reference (e.g. Cartesian coordinate system).*”

Benford's categories theoretically contain the concept of Telepresence as well, when it is not about "going there," to a remote location and controlling a remote device. Theoretically it also includes a "staying here" as in a traditional video conference where one stays in the local space, or, meeting in a virtual place, where all parties involved experience leaving behind their local space and entering a virtual one in VR.

Artificiality refers to the extent the environment is generated by computer mediation as opposed to being natural or physical; of which video-conferencing would be a special case. As the process of transformation requires in most cases computers as well it is of importance to understand this relationship as well.

Transportation provides a new understanding of the concepts of local and remote in a telematic context. It introduces *here*, the gallery or place where the work is presented and *there*, the place of origin of the data. As these dimensions concern video-conferencing and collaborative workspaces they are not flexible enough to include multiple *theres*. When we make use of telematic technologies we receive information from a remote place, maybe also exchange information with it. Depending on the technology involved we get drawn into these images, the degree of this transportation depending on the resolution and quality of the displays or the degree of agency we have and the immediacy of the feedback. Here we also see how intricately the psychological effects of Transportation, Immersion and Presence are dependent upon each other. The visual sense in combination with visual display technology is more likely to transport us somewhere else than the sense of touch, although the audible sense can be very immersive, as we know communicating via the telephone.

It also may occur that an experience is regarded as unmediated and natural yet it may be entirely simulated with high realism. We could see high-quality video-conferencing as a special example of that.

Benford's definition of artificiality states "*video-conferencing and telepresence applications are typical for the physical extreme, as their information is directly drawn from the physical world.*" (Benford, 1998) By this is meant that no properties of the image are perceived to be artificial although the experience as a whole is entirely computer-mediated! The perceived image is in fact digitised and the realtime update upon the screen creates a functional illusion. This allows for the conclusion that the own concept of transformation could be positioned within this schema.

We realise that the quality or grade of Immersion relies on the quantity and quality of display technology! Whereas display technologies refer not only to the visual sense but include the other senses as well (touch, smell). In that respect it agrees with the paper “sensible, sensible & desirable” (Benford, et.al., 2003) as the different display technologies depend also on the material resources. The more resources we have available the more convincing we can create an immersive illusion.

The following diagram is prepared with examples from the discussion introduced in the following chapter 2.0.

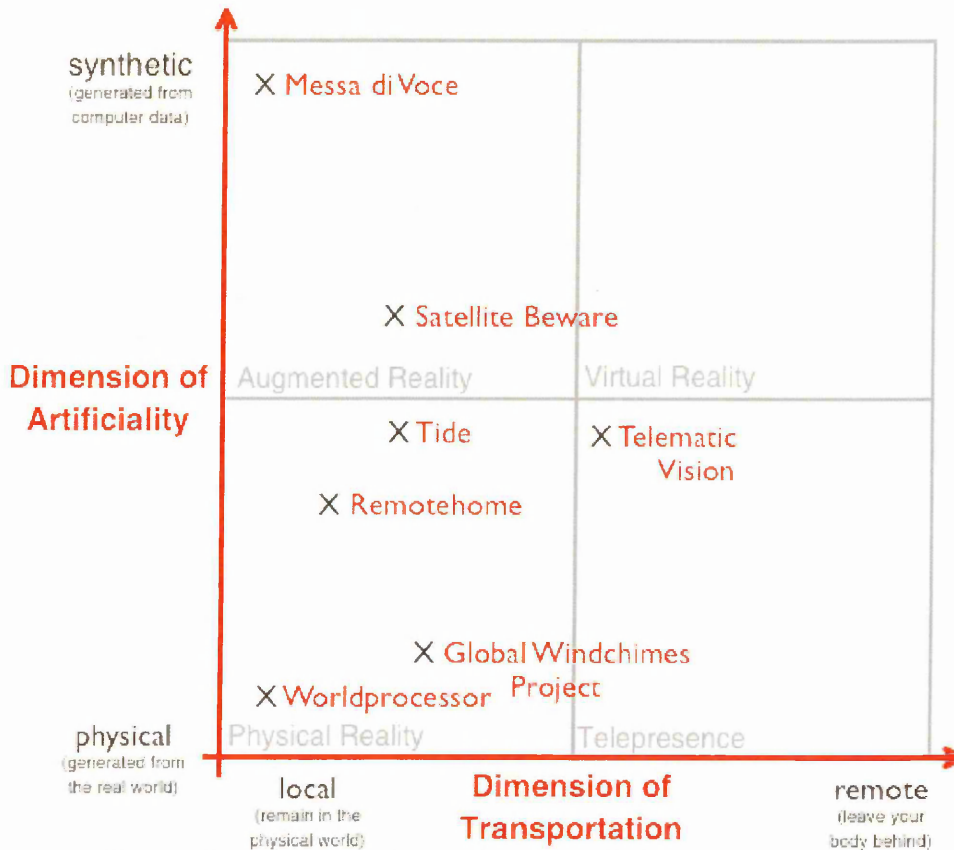


Figure 4: Original by Benford (et.al.) (Benford, 1998), titled “Broad classification of shared spaces according to transportation and artificiality.” The examples used are discussed in detail in chapter 2, the contextual review.

The vertical axis displays the degree of Artificiality or computer mediation ranging from physical and based in the “real world” to synthetic. The horizontal axis describes the effect of Transportation, remaining in the physical world or leaving the body behind. Virtual reality, located in the upper right, being completely synthetic and participants perceiving leaving the body behind. These two axes form four distinct quadrants which describe different classes of experiences. The quadrant “Physical Reality” defines remaining local and experiencing data in physical space. Quadrant “Augmented Reality”

which allows the participant to remain aware of the immediate environment yet augments the surroundings with additional data. The extreme case of this is augmenting a complete environment which in this visualisation would be the quadrant Virtual Reality. Here local is being left behind and participants perceive being at a simulated place. The unmediated version of this being a conventional telepresence experience where the person is operating remote device. This can either be achieved with a Head-mounted Display (HMD) where participants lose the sense for their body, or via a CAVE or CUBE where they are able to physically interact and aware of their bodies. Michael Heim author of "Virtual Realism" is propagating a balanced view between a virtual lifestyle while being grounded in the real world with specific rituals and everyday exercises. Heim writes that one of the first reactions of people taking off a HMD is patting their limbs, reassuring themselves with gestures of the physicality of their bodies, *"... and affirm the return to primary presence. [...] [T]he landing back in the **primary world** takes much longer. Re-orientation takes time until the participants can walk away safely, and it takes even longer before everyday feeling tone returns."* (Emphasis by the researcher). (Heim, 1998, 54)

Benford et.al. developed the diagram to display Collaborative Virtual Workspaces and VR. A different diagram would be needed to display the relationship between transformation (possibly the horizontal axis) and the type of transformation taking place and its relationship to the original data. This type axis could describe the *code* that is applied, if it is meaningful and transparent or ambiguous; for example the noise and activity in a room could be transformed into sound. To avoid displaying loud noise at the origin analogous with loud sound of the display it could be increasing in pace. This would be an obvious and direct relationship yet benefit from not increasing in volume. The qualities and quantities of such a display would, from an experiential point of view, difficult to categorise. Their experiential quality would be determined by the artistic concept, the potential of imaginativeness of the piece. Its technical set-up and quality of displays conveys little of experiential quality.

1.5: How real does it feel? The concepts of presence and immersion.

Lombard, Ditton 1997

HCI has undertaken extensive research to understand how participants experience computer mediated environments. Two key dimensions they isolated are determined as Presence and Immersion whereby the later is a condition for the experience of Presence. In their 1997 report “At The Heart Of It All: The Concept Of Presence” (Lombard, and Ditton, 1997) Matthew Lombard and Theresa Ditton give a detailed overview of six conceptualisations of “presence” and related concepts. The technologies they describe include virtual reality, simulation rides, video conferencing, home theatre and high definition television.

Presence: *“Presence is defined as an experience “that seems truly “natural,” “immediate,” “direct,” and “real,” a mediated experience that seems very much like it is not mediated; a mediated experience that creates for the user a strong sense of presence.”* (Lombard and Ditton, 1997)

“Presence is the effect of immersion and refers to the specific sense of self-location in an environment.” (Lombard and Ditton, 1997)

We could enquire here about the definition of terms, what does “truly natural” “immediate,” direct” and especially “real” in this sense apply? The visual surrounding? The behaviour of the objects to interaction? An environment may be highly abstract yet provides as a pleasurable illusion. We see that it is not the realism that makes a game “work,” but more the interdependent logic of its content and behaviours. They provide the necessary sense of self-location and presence. Early computer games as Pac Man were far from the visual 3D realism of current computer games yet they were perceived just as captivating as the current ones. As unclear and unsatisfying these terms seem, they do provide a framework that informs questionnaires to capture participants experience.

Immersion: *“Presence as immersion also includes a psychological component. When users feel immersive presence they are involved, absorbed, engaged, engrossed. This psychological state typically is best measured via subject self-report (although observation of involved media users might also be a useful indicator).”* (Lombard and Ditton, 1997)

Anthony Steed, researcher at University College London stated (Steed, 2005) that self-reports of individuals regarding immersion were unreliable and that observation was better suited to understand its degree. His group observed participants in a CAVE environment experimenting with different, uneven terrains. They made the observation that participants intuitively avoided simulated depths in a CAVE environment, treating them as real as in real life. These observations have given more palpable evidence of immersion and presence of the CAVE environment than self-reports of individuals did.

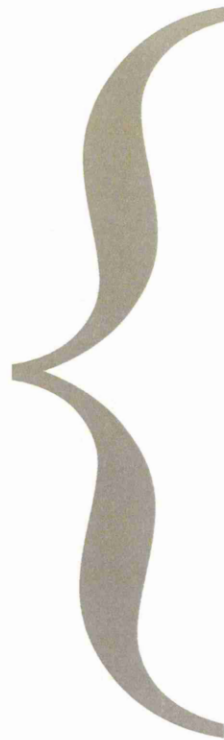
Michael Heim reminds us in this context that “*immersion must immerse the psyche as well as the senses if it is to fascinate.*” (Heim, 1998, 55) I would add to this *fascinate in the long term* as it usually fascinates during initial sessions when visitors adapt and explore the medium as such. Depending on their media literacy they expect content which sometimes may lie in the engagement with the *medium* itself facilitating the activity or communication with other participants.

We have seen that there are different definitions of immersion. Physical or perceptual immersion in the sense that the person is immersed in the environment as in water, the environment being all around the individual, and cognitive or psychological immersion, being absorbed by an activity which could be reading a book or physical exercise.

Also important is the “*suspension of disbelief*” (Slater, Usoh 1994), the willingness of an individual to submit to the illusion and accept the rules of the game. Something we all do in the engagement with children when for example a box becomes a spaceship.

Although there are different opinions, evidence of experiences of immersion and presence can be obtained by observation, interviews, discussion or questionnaires.

conceptualisation:



1. social richness

“sociable, warm, sensitive,
personal or intimate

2. realism

“how real does it feel?”

3. transportation

here, there, we are together

4. immersion

perceptual, psychological

**5. social actor within
medium**

tv, virtual character

6. medium as social actor

talking to computer

Figure 5: Lombard, Ditton (1997), conceptualising presence and immersion.

Lombard and Ditton see Presence and Immersion intertwined and the perceived presence as a result of the degree of immersion. Their conceptualisation of Presence and Immersion includes six items that can be distinguished as unique factors of the experiences which together contribute to the overall experience. For example the social richness, how sociable, warm and sensitive the interaction is. The realism of the experience is also determined by the size, resolution and quality of display technologies and subtle behaviours of the interface; also the effect of Transportation, to which extent a party leaves the local space behind, the other party “comes here” or they are meeting in a virtual place. Additionally there are the different types of immersion, being perceptually immersed in the interactive environment or being cognitively and psychologically immersed such as in reading a book. The last two concepts concern the technology and how it may become a social actor, for example like a television becomes a social actor within a home. From this point of view we also understand the last concept as the medium itself becoming a social actor when for example people begin talking to their computers.

Four aspects of Lombard & Ditton's conceptualisation seem relevant for Radiomap as they also link to Benford's concept of transportation:

The social richness: The screen-based version is explored alone, the interactive environments is explored together with others. How does this affect the experience?

Realism: As Radiomap is a representation of something real, the world, its photorealistic appearance is an important aspect. The behaviours of the interface and how participants perceive it relates to this concept as well. What does realism refer to in this context?

Transportation: How do people experience the telematic characteristics? Is there coming here or do they experience going there?

Immersion: How immersed or engrossed are participants? What kind of immersion do they experience? Is it perceptual or psychological?

1.6: Bringing there here

As we have seen before Benford et.al. associated Telepresence mostly as "going there" and "meeting in a virtual place." Theoretically there should be a "bringing the there here" experience as well. But would this still be telepresence? From that perspective we could say that television is "tele-present" as it brings *there here*. And it also may be very immersive. Is this a type of telepresence?

This idea inspired me to create the following diagram as a speculative visual aid to visualise properties of a number of diverse telematic media art works. The purpose is to see if it is possible to gain new insight and a better understanding of some of their intrinsic qualities as a result of this process. What can we learn through this diagrammatic depiction?

Hierarchy of telematic presence:

from passive perception to active connections with remote places

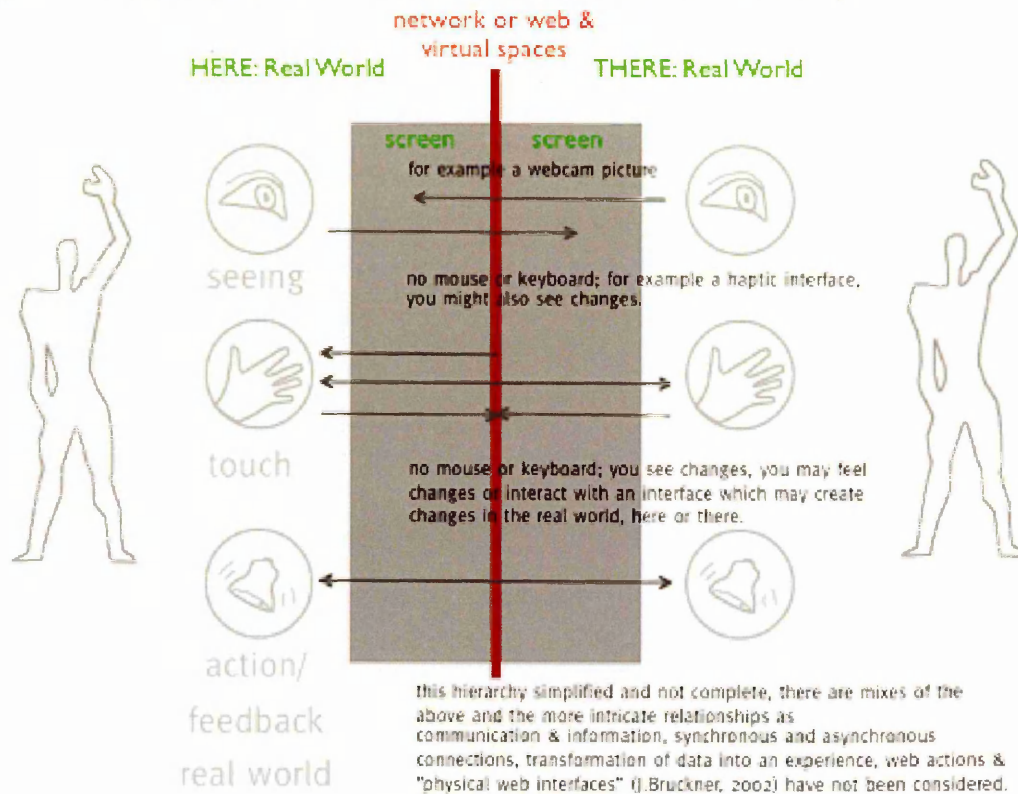


Figure 6: A first sketch visualising the concept of “here” and “there” and the variety of possible connections. It emphasises that some connections are complex and involve other senses beside sight, such as touch or hearing or combinations of these. Some connections require a screen, while others require physical space.

Figure 6, “Hierarchy of telematic presence,” emphasises sensorial modalities, but not the spatiality involved. It allows us to distinguish though, that some connections are one-way, while others are bi-directional and allow for feedback. In the second rendition (Figure 7) this distinction is becoming a little clearer. It shows that every dimension from visual to spatial to physical/tangible expands and adds to the possible sensorial modalities. From the screen-based domain that has sound, colour, texture and that moves the spatial dimensions adds that now I may move as well. The next dimension, physical, allows for all of these properties and for tangibility, temperature and movement. Also clearer becomes the problem of synchronous vs. asynchronous connection, indicated by arrows that either point in one direction - or both. While a telephone conversation involves a bi-directional connection, sending a fax is one-directional only.

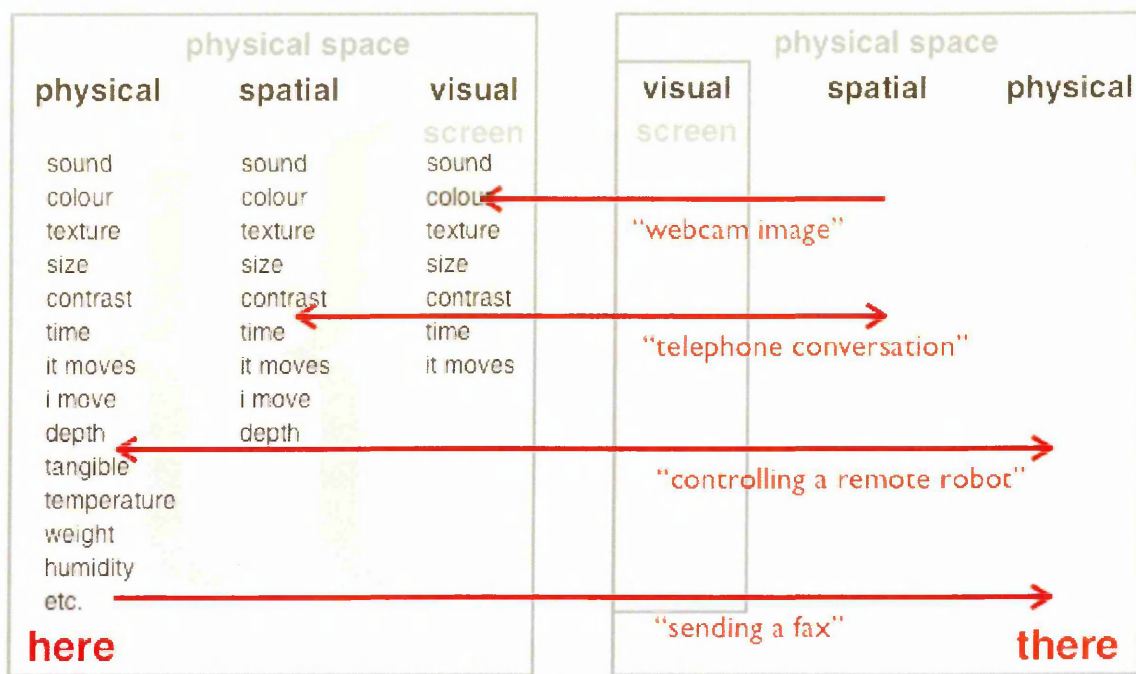


Figure 7: Here, There: Telematic Spatiality: Another early, more abstract version of the diagram attempting to depict the different properties of a telematic connection between here and there. Most telematic connections are visual only and screen-based, while other connections involve spatial or even physical output and input.

The next iteration of the diagram shows two places, “here” and “there.” Here, ideally represents a gallery or other venue where a media art piece is experienced by visitors, but it could also be an individual accessing the work from home via the Internet. *There* being the remote place from which the data is received. This diagram can depict screen-based interactive installations and immersive environments that connect with one another. The degree of *Spatiality* is shown as whether the data is visualised on a screen, spatially (such as a projection upon the floor) or palpable in the physical world as a tangible interface. This spatial output can be immaterial such as a visual projection upon the floor or sound. The diagram represents changes that are tangible, such as vibrations, the temperature of a surface or other tangible displays.

The diagram went through the different stages, shown above, which refined its capability to display different media types indicated by the addition of colours and was suited better to display the relationship between the spatiality of a content, *there*, at its place of origin, and *here* where it may be perceived in a different spatial dimension. It is provided with a legend that describes the different types of media connections. The most important enhancement being the colour-coded media connections combining *Transformation* and *Spatiality* in one diagram. Spatiality is indicated by *where* in the

diagram the arrow begins: as visual (on the screen), spatial (in space, as movement) or from a tangible device. The process of a *transformation* of data, the difference between its form at the origin and its form at the second, receiving, location is indicated by dotting the line of the arrow. The *type* of transformation, for example from audible to visual, is indicated by different colours of the arrows comprising the most basic media such as audio, visual (graphics), video, audio-video - including a category of “other data,” for example that of earthquakes, weather or statistics.

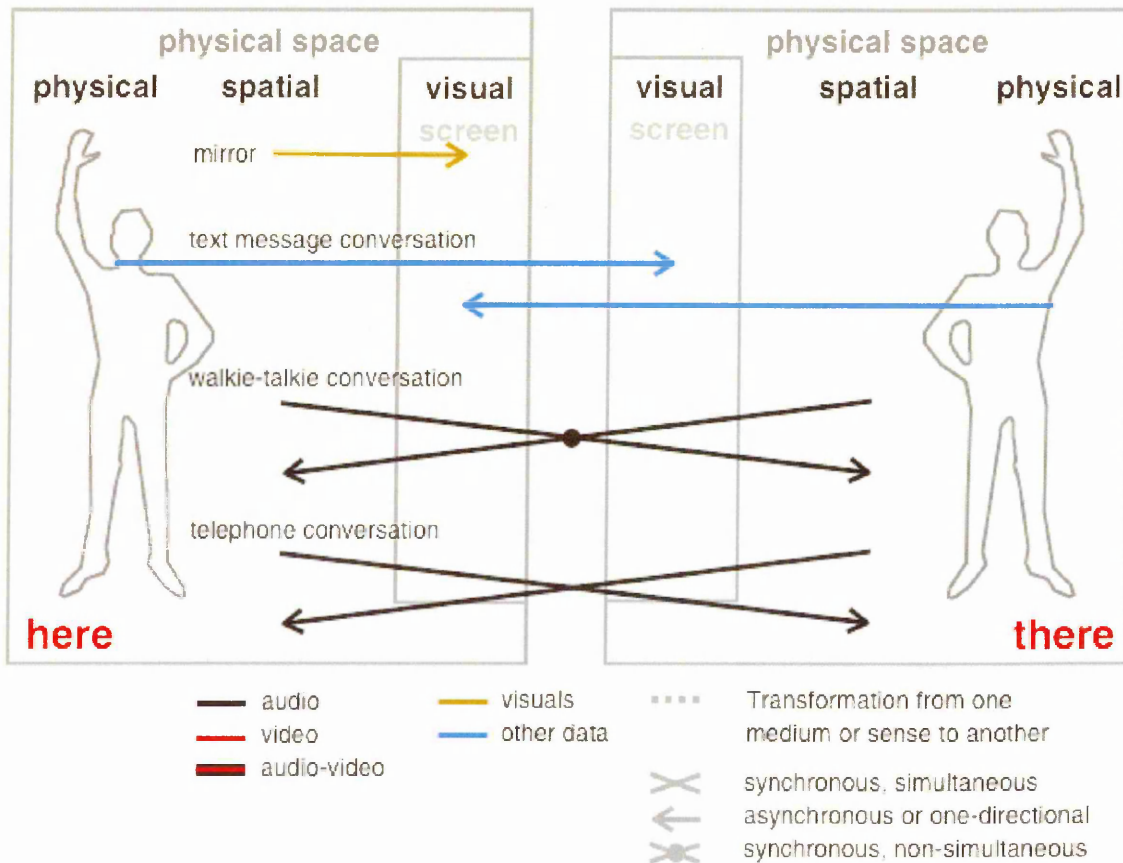


Figure 8: The current version of the diagram: “Here, There, Transformation and Spatiality” merging Figure 3 and Figure 7. Three everyday applications of telecommunication in their spatiality and trans-formed mediality. Text messaging is an asynchronous or one-way connection and originates in physical input while being received on the screen. A walkie-talkie conversation allows only one party to be active while the other passively receives only. The telephone conversation is synchronous and simultaneous. The mirror was added as a basic reference example.

This further developed diagram (Figure 8) shows three examples of everyday cases of telematic connectivity, non of which involve any transformation. Text messaging via mobile devices, a walkie-talkie conversation and a telephone conversation, increasing their synchronous and simultaneous character. (A mirror was included as a basic refer-

ence example.) Another development of this diagram is that it distinguishes between synchronous, and asynchronous connections. The synchronous connection allows both parties to communicate in real-time. Asynchronous implying that either there is a perceived delay between the creation or sending of the data and the time it is received in that the recipient can choose to respond at his own leisure, or that it is a one-directional connection only with the sender not being involved in a true dialogue with the receiving party. Another, and finer distinction is made between synchronous *and* simultaneous connections (such as a telephone conversation), and synchronous but *non*-simultaneous connections (such as a walkie-talkie conversation where only one party is active while the other passively receives).

The purpose of the diagram is to compare different telematic art works and their type of connectivity with each other and thus get a better understanding of the relationship between their spatiality and the mediality of the data before and after it is transformed.

It also clearly displays to which degree *actions* in physical space create changes on the remote output devices. Some connections are one-way only, others bi-directional. To allow parties to communicate a bi-directional connection is necessary.

The diagram can display a range of different properties such as:

- screen-based activities and work
- spatial activities and work
- installations in physical space, (encumbered and unencumbered)
- bi-directional or dialogical data exchange, distinguishing between synchronous and simultaneous, and synchronous but non-simultaneous.
- processes visualising network activity
- works that transform *local*, indiscernible / imperceptible data
- and all variations and mutations of the above*

*. Some notes on mediality, medium and sensorial modality: While developing this diagram I recognised the importance of subjective judgement upon the concept. Most of it related to transformation and the difference between a medium, its mediality and to which sensorial modality it referred. In the past a content was bound to its medium; books came on paper. Today with media convergence this is rapidly changing. We can read a book on a

1.6.1: Limitations of this diagram:

The concept has several shortcomings, among them the ability to display numerous exhibition place or multiple there-locations. Therefore it treats an installation in a gallery setting identical to a single client connecting from home.

The diagram has difficulties in clearly distinguishing between synchronous and asynchronous connections yet the “Live Effect” is mostly constituted by a closed loop of *simultaneity* which provides participants with the responsiveness and feedback necessary to create these sense of *presence* and *immersion*. This is also a question of media convergence. Just as a *continuous* telephone conversation is perceived as more synchronous than a *discreet* and factually *asynchronous* conversation via walkie-talkie. Again this depends on subjective perception and is debatable. We may also speculate that what is perceived as synchronous underlies exposure and is culturally defined. For

computer screen, on the screen of a mobile device or listen to it on an mp3 player as an audio-book. It still remains a book only its mediality changes from written text to spoken text. As we have seen above, a text adventure can be an immersive experience creating a high degree of immersion in this virtual, textual space. This immersion is psychological, a state of consciousness. This virtual geography, is inhabited by other beings which we can engage with in a dialogue does not physically exist, except inside the minds of the explorers and as processes on the remote server.

This has to do with the medium, its mediality and the sensorial modality it engages us in. The medium seems to be text, interactive text that reacts to our input. The mediality is visual; but the experience of being immersed in an interactive world is a psychological one. The sensorial modality is visual. We are reading it from the screen, but it could also be spoken by the voice of the computer’s operating system. Then its modality would be auditive. There are examples for this in MUD’s for visually impaired people.

The same goes for 2D representations: We could listen to a jpeg. The medium is sound, either encoded in language, someone describing the image to us or the operating systems voice reads the binary of the compressed format to us. (Which would tell us little about what the image depicts.) The mediality would be text. We could also have this text displayed on an LED ticker. The mediality would then still be text yet the medium would be visual.

Unravelling the relationship between mediality, medium and sensorial modality is an intractable problem that is becoming more complex and confounding through the current media convergence. Perhaps this is an avenue for future research?

example e-mail or text messaging is asynchronous, two parties can engage in a near-real-time a dialogue.

Following this example two crossed arrows pointing in both directions describe *one* channel used for simultaneous and synchronous exchange of data (telephone), while two crossed arrows with an dot interrupting the intersection are *two* simultaneous one-way channels (walkie talkie). From the variety of examples we see the subtle nuances of these different roles of exchange that may be perceived differently depending on context and medium.

Another limitation pertains to some installations that cleverly disguise the fact that they are screen-based by intelligent placement and mapping, as “Hole in the Earth” by Maki Ueda³ does. The project continuously connects the antipode cities of Bandung, Indonesia and Rotterdam in the Netherlands by concealed screens which are embedded into the ground of a public square, playing with the notion of a hole in the ground that allows parties to communicate via a video-conferencing link. Factually it is a conventional video-conferencing application, yet the mapping of the screens onto the ground and other contextual refinements enhance the subjectively perceived “spatial” quality and allusion to the antipode idea.

Another limitation is the categorisation determined by the content of a piece which necessarily is a subjective one. Another installation measure the influence of the moon upon a gravimeter in the local space. In this case the question arises does the measurement pertain to the local space here - or does it measure *the moon*? It clearly alludes to the moon, but the measurement is made here. At another occasion the constant local trembling of the earth’s crust is measured with a seismograph, yet the seismograph is located about one mile away from the exhibition space. Is this still local data or is it already remote? What about local data that is beyond the reach of our senses and has to be transformed? All these decisions are highly subjective and will vary from person to person and the rigour applied to the concept.

As described above, immersive environments and telepresence systems have in common that their effectiveness is a “*quantifiable property of technology*,” (Sheridan in Benford et.al. 1998) to be precise display technologies and their different output media. The larger and better the quality of these displays, such as screens as speakers are, the more effective they become. This pertains to sound-systems as well as to screens and other output devices. Evidence for this would be, for example, that a small black and

white television with bad reception and low-quality speakers will be perceived as less effective in immersing us in an action film, then a larger, colour television with high-quality audio would do.

The diagram displays the technical level and not the content level, so it cannot distinguish the experiential quality the context provides, the actual poetic or artistic message. An involving communication art piece is displayed in the very same manner as a video conference.

1.7: Classification of Media Art Installations

Inspired by Frank Popper's "Classification of kinetic art" (Popper, 1968, 251) the following own classification schema is structured after Popper's diagram. It allows for hierarchical display of selected media art installations classifies by distinct characteristics which determine the dependency of other attributes. Covering screen-based multimedia terminals and custom tangible interfaces, as well as unencumbered interactive environments, and artificial reality as well as virtual reality pieces. It does not cover performance art, locative media or emphasise the communicative aspect of telematic art.

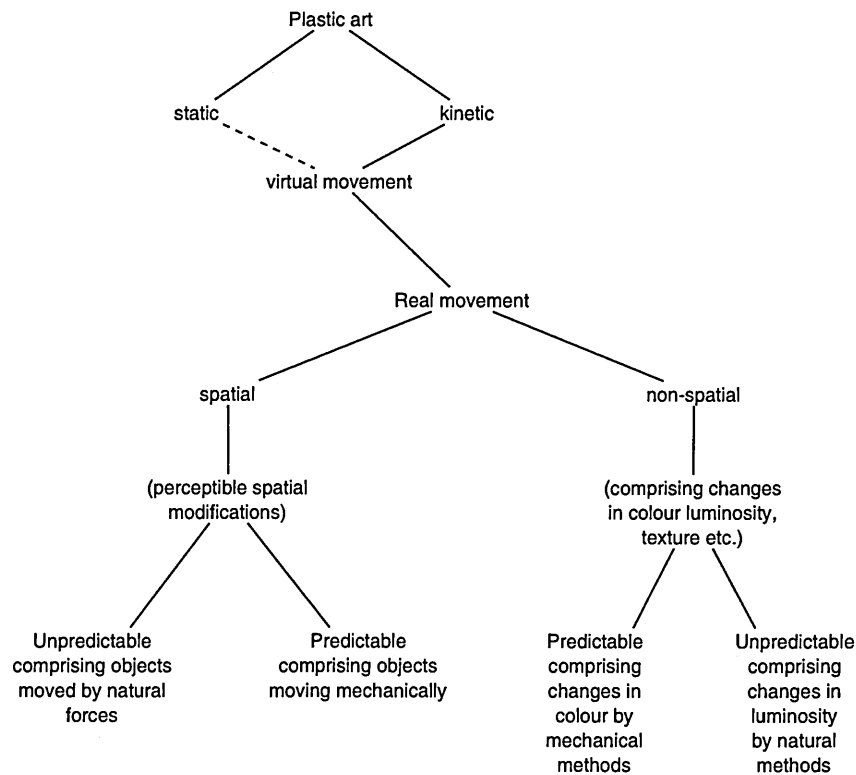


Figure 9: Frank Popper, Classification of kinetic art, 1968 (Popper, 1968, 251)

The benefits of the schema provide

- a novel method to classify and compare media art installations
- to discover new areas worth investigating

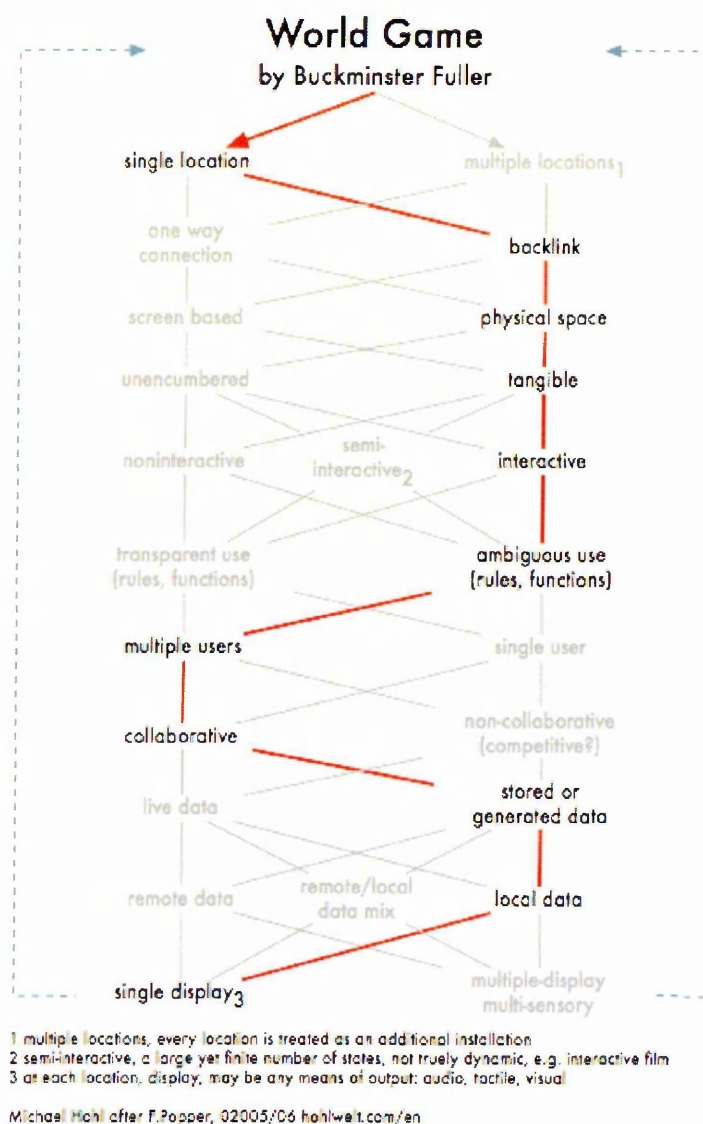


Figure 10: “Classification of media art installations” Example: Buckminster Fuller's, World Game as seen in the classification schema. World game is discussed below in the contextual review.

The collapsed hierarchical diagram develops a narrative of properties in the form of oppositional pairings based on their mutual exclusivity. For example, a piece is either screen-based or taking place in physical space. Each stage of this narrative defines a condition for the superseding properties. It has somewhat problematic and speculative sides to it beginning with the difference between “screen” and “physical space,” as the screen is undeniably part of the physical world. From a conceptual point of view it allows to distinguish and compare installations that *appear* different and reveals their technical set-up and their similarities. When performed on a number of different examples the results give a better understanding into the similarities and differences of media art works. It allows to depict works from diverse backgrounds and technologies.

2: Case Studies

2.1: Introduction

This section is outlining and defining the areas of interest by giving selected examples of relevant art works to establish the arena this research is focusing on from an artistic perspective. It gives the reader a clearer view of the phenomena this research is investigating and provides evidence that supports the claims concerning experiences of global awareness, feelings of interconnectedness and the holistic overview of the world. It also is part of the framework, the methodological structure to frame own work.

A change in *Weltanschauung* came into existence within the 1920s (Kac, 2005) with the proliferation of telecommunication technologies which was perceived as a shrinking of the world by some, respectively the Futurist movement and Buckminster Fuller with his sketch of the “one-town-world.” These ideas received increased attention in the 1950s especially the “global village” phenomenon of the shrinking globe that Marshall McLuhan alluded to. In the late 1960s and the 1970s the *orbital view* became another important perception as a result of the first photographs of the earth taken by astronauts. In the 1980s interactive artworks started to appear, that made us aware of global distances, natural/physical phenomena and the planet earth itself. Some of these pieces are technology led while others make bold statements in the absence of technical assistance. Telematic Art, and the two related fields I define as Transformation Art (a wider term for Visualisation Art or Sonification Art encompassing other modalities), and Global Awareness Art, form the structural basis for these case studies. The following passages attempt to define the concepts behind these fields.

Telematic art is technology-based and uses networks to connect to a remote location, often in realtime. It induces an *enhanced* experience brought about by the *unnatural distances* the connections involve and their *synchronous* character of realtime connectivity. Occasionally it consists of controlling a device at the remote location and engaging in activity *there* (at the remote location). This can include a sense of leaving behind the immediate, physical space and *being* at the remote location. In some works the installation connects people to people and the predominant characteristic is the exchange of a dialogue.

When the process of communication becomes the art itself it can be called communication art. In the past this has been achieved with audio-visual broadcasts, telephone and

telefax; meanwhile the most common technical medium has become the computer connected via the Internet. While the Internet technically facilitates all facets of telematic art, through its indiscriminate exchange of *data* it is the telecommunication characteristics that establishes Communication Art as a sub-category of telematic art.

The area I call Transformation Art involves the process of *transforming* data from one sensorial modality into another. An example would be astrophysical data transformed by sonification software into music or the transformation of the nucleotide bases of DNA through a Java-applet into sound (Ackerman, 1990, 175). These examples seek for a deeper understanding of hidden orders and relationships within the data itself which is achieved by its transformation into audible or visible realms but can also be considered an artistic technology-led exploration. Essentially the transformation converts dry, abstract data into a vivid sensual experience which touches and moves us in fundamentally different ways than abstract, cognitive information does. Transformation art may be considered a sub-category of Information Art, a very broad area Steven Wilson has extensively published upon in his 2002, 945 page volume “information arts: intersections of art, science and technology.” (Wilson, 2002)

Global Awareness Art is another area I invented for this purpose. It generally involves a raised consciousness of the planet earth which includes a focus upon nature. This may constitute an overview of the planet as a whole but can also emphasise different facets of global occurrences such as earthquakes or other natural activities. Some works emphasise distances, remote locations or the geography of the earth. Others use technology to engage us further with the natural process including weather, water, gravity, plant activity and bodily functions. Those works that directly engage us with the *natural/physical world* form a subcategory I would include into Global Awareness Art, although its appearance may be very different.*

The area of emphasis, where telematic art, transformation art and global awareness art overlap, we encounter a body of works which deliberately engages us in the sensual realms, connecting us to remote or indiscernible areas in the world, evoking within us a global consciousness, distinguished as a global awareness.

*. Some artists engaging with the natural, physical world are Andy Goldsworthy, Helen Chadwick, Richard Long, Ned Kahn or Olafur Elisasson. Some of them perform this in a demonstratively non-technological approach.

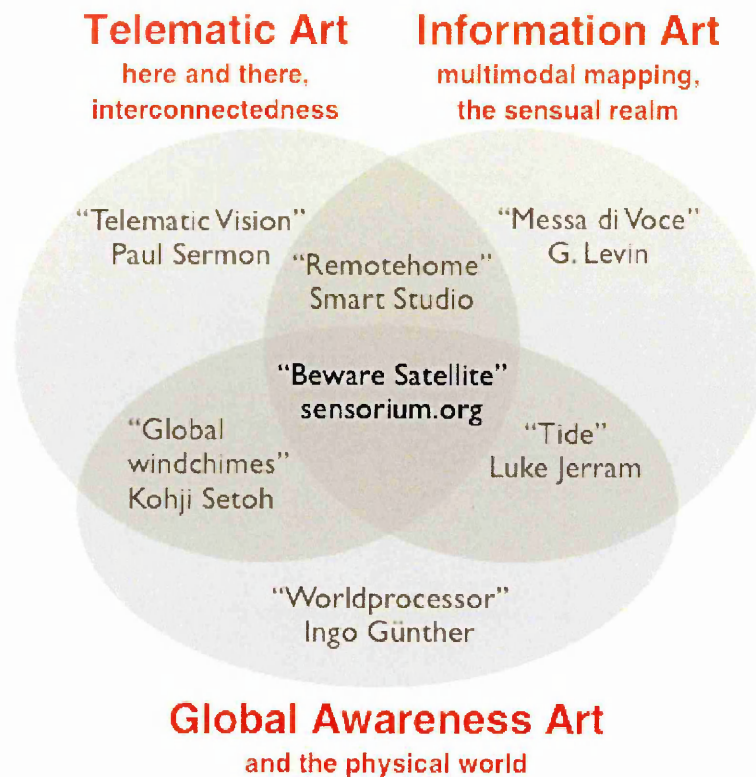


Figure 11: Venn diagram of the areas of interest: Telematic Art, Transformation Art including multimodal data mapping and the sensual realm. Other artworks investigating the physical world or an interest in the globe, global distances and geographies forming overlapping circles. The category telematic art contains communication art. Paul Sermon's "Telematic Vision" was chosen as an example of communication art. Located at the centre of the diagram is global awareness art, "nurturing our senses" through a transformation from one sensorial modality to another involving a telematic connection.

The selected case studies consist of a few historical examples and of pieces which show distinct characteristics that aim to illustrate the above mentioned areas of Telematic Art, Transformation Art and Global Awareness Art. While Telematic Art is a well established discipline led by technology, Transformation as a process has been recognised as a distinct area as early as 1912 by Etienne Souriau (Popper, 1997,158) who described it as "morphologically analogous." Transformation Art distinctly emphasising the process used in an artwork has not been recognised as a distinct area, yet Roger Dainton uses the term "transformation" in his essay "Simulated Synesthesia" (Reichhardt, 1968, 43) to describe his own artwork which produces all the colours of the spectrum from the frequencies of the music. Generically the term visualisation is used, recently also non-visual multi-modal visualisation, which incorrectly emphasis the visual sense as most transformations indeed are visuals, or sonifications transforming data into sound. Transformation seems the most appropriate term for the procedure. Lately media theor-

ist Lev Manovich in 2003 referred to this process as the “*mapping of one type of representation to another*” (Manovich, 2002) and adds that it “*represents one of the most fruitful research directions in new media art.*” Manovich does not use the term visualisation in this context and regards it as a subset of what he calls data art.

While telematic art and Transformation art are technology led and may even emphasise this technical genesis as part of their artistic concept, Global Awareness Art is primarily about the content, the message and may or may not make use of technology for that purpose. It does not rely on a defined technological background to become what it is.

2.2: Buckminster Fuller's “World Game” or “World Peace Game,” 1964

The “World Game” was conceived by inventor and philosopher Buckminster Fuller in 1964 as a suggestion for the US pavilion at the 1967 World Fair in Montreal. Although the project was rejected at the time, Fuller continued to develop the idea further. He wished to improve the reputation of the United States with this strong humanistic project, and at the same time make a bold visionary statement in favour of computer technology.

The computer-controlled multi-player game takes place mainly around a very large and dynamic display of Fuller's Dymaxion-World Map. The idea of the game was for team players to develop the best strategies of government and social problem solving in the least amount of time that would benefit the largest number of inhabitants of the world. The game begins with the current state of the world's resources, the information being gathered from United Nations statistics. They include natural resources, world population, urban infrastructure, education and scientific knowledge. The computer digitally processes players input and presents the results as visualised output. Participants experience hands-on how their strategies affect peoples lives. Fuller described the message of the game as: “*There should be no losers in World Game, only winners. To win everybody had to win.*” (Fuller, 1981, 198-226), such emphasising cooperation and collaboration.



Dymaxion world map.
World Game scenario for Expo '67
by Fuller & Sadao, rejected.
Notice trees for scale.

© "Your Private Sky."
J. Krausse, C. Lichtenstein

Figure 12: The model of the 1967 World Fair US Pavilion for the computer augmented version of the World Peace Game. See trees for scale. (Rejected) Visitors and participants located on the elevated viewing decks would watch the augmented results of their decisions on the large interactive map in the centre. (Krausse, Lichtenstein, 1999, 466)

The computer controlled installation visualises the effects of players decisions based upon current United Nations statistics in form of a large simulation. It is less an art project than a game-like, large-scale digital simulation for multiple players with didactical, educational outcomes for participants.

"World Game" today

The non-profit organisation Operating System Earth, (o.s.Earth), has developed Buckminster Fuller's "World Game" further with the same philosophical mission of creating a sense of responsibility and global *consciousness*. It organises game events for educational institutions, corporations and organisations and computers do not appear to play a crucial role.

Their playing field is Fullers Dymaxion-World Map which measures the size of a basketball field, which is considerably smaller than the 1964-67 version.

The game is played by teams which either represent different regions of the world, multinational corporations or organisations for health and environment. During the three hour game the next thirty years of global economic development are simulated. Using a system of cards and chips teams trade resources and know-how. Each team starts off with different states of "wealth" which can either be monetary, resource, infrastructure, or wealth of technology and wealth of solution strategies (which can be regarded as level of literacy or education). All information used is based on actual UN statistics.

The importance of the game lies in the profound and memorable insights gained by some of its participants. Some of these are recorded the organisation's website. The most important of which are, long-term thinking, that all actions are interrelated and

cause complex reactions in the world, that it is important to work together as a team. Furthermore, only collaboration and non-egoistic behaviour results in the successful completion of the game. This goes hand in hand with Buckminster Fuller's original "big picture" thinking, of seeing the world as one whole, complex and interconnected system, spaceship earth.

World Game represents a singular facet of Buckminster Fuller's visionary idea of *Weltanschauung* or world view- that the planet earth is one single, complex and sustainable system. The underlying believe being that the worlds' natural resources and energy were sufficient for everyone's needs if evenly distributed and intelligently used. His vision – the *tool* World Game would have allowed people to engage with their world in an immersive interactive environment, using computer simulated projected images, never before used in such a way. This would have allowed participants to recognise, comprehend and analyse, hands on, the impact their decisions would have upon the world we live in. This engagement would have procured a closer and lasting reflection and sense of involvement and stewardship as all the results were based on actual statistical modelling.

From the many recorded* comments made by participants of the existing, present World Game of o.s.Earth, it appears that it achieves some of Fuller's original intention of creating a global consciousness experience and continuously proves a tool in accessing further other attainable strategies for our planet. There is a drawing from 1927-28 by Buckminster Fuller, where we see his "one-town-world" (Figure 2, Krausse, 1999, 99) In the image, we encounter the globe as a whole, displaying the continents surrounded by navigational vehicles – in this, a vision of global awareness and interconnectedness that was far ahead of its time.

2.3: Stewart Brand's "Whole Earth" Buttons, 1966; NASA's APOLLO mission

Stewart Brand has published numerous bodies of work such as the "Whole Earth Catalog" and "How buildings learn." He is also one of the founders of the "The Long Now Foundation" which create awareness for sustainability and responsibility by en-

*. The website of O.S.Earth has a record of comments from a selection of participants that give evidence of the insights that playing the game resulted in. These are available online at http://www.osearth.com/com_comments.shtml accessed December, 12th 2006.

couraging long term thinking of a ten-thousand year perspective.

Back in the spring of 1966, Brand sat on the roof terrace of his house overlooking San Francisco and became aware of what he perceived to be the curvature of the earth. This gave him the idea that from an even further elevated point, the whole earth would become visible. This insight made him realise that seeing the earth as a whole would have a great impact on peoples direct perception of the world. Brand recognised that although space flight had been around for almost ten years still, there was no image available showing the entire earth.

He decided to make badge-buttons reading, "*Why haven't we seen a photograph of the whole Earth yet?*" and sent these buttons to all US senators and their assistants, and to scientists and politicians in the Soviet Union, both countries leading in space exploration.

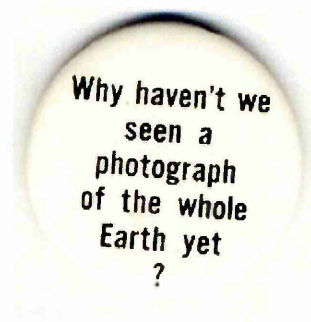


Figure 13: Stewart Brand's 1966 button, sent to Senators, their assistants to soviet researchers and sold to students at Stanford, Berkeley, MIT and Harvard. Image by Stewart Brand.

Twenty years earlier astronomer Fred Hoyle had speculated in a similar way as Brand stating, "*Once a photograph of earth from outer space is seen, humanity will never be the same.*"⁴

Inspired by Buckminster Fuller's earth theories of sustainable systems, Brand thought that once such an image was available showing the world in its insular limitedness, this would create an awareness of the scarcity of resources and its unique, local and interdependent, ecosystem. He speculated that once this image of the *whole earth* had entered peoples minds their world view would change as well.

Brand's button project was a provocative attempt in spreading public awareness of his perceived vision of the whole earth view. This gesture was one of the first of its kind which would succeed in nudging us closer to a new global awareness and a new global perspective which would indefinitely capture us in the future.

Today, as we have become exposed to satellite imagery on a daily basis, it seems difficult to imagine that these views simply did not exist in the late 1960s. No one had ever seen the earth from that far above before with their own eyes! Although globes⁵ had been around for hundreds of years, they were a scientific conjecture. The photograph brought a more direct and palpable evidence.

Why wasn't there an image of the whole earth yet?

NASA had not even thought of producing such an image of the earth at this time.* Their mission was to prove the technical possibility of manned space flight and understanding how the human body reacted to zero gravity. With a set time frame,** their main focus was the challenge of reaching the moon and bringing the astronauts back alive. NASA's mission was to support a vision oriented towards the future and towards the moon. Their project served to provide a greater patriotic and militaristic framework. Looking back upon the earth and taking pictures was not considered at this time.

Once the image of the "Blue Marble" was captured two years later, it immediately became an icon ingrained into the collective psyche of the western societies. Being able to see the world from this new perspective also resulted in the forming of the global ecology movement.

While the official perspective of NASA did not pay attention to looking back upon earth the individual astronauts provided a different account of this experience. For them it was a deeply moving and spiritual moment that changed their lives.

"From the moon, the Earth is so small and so fragile, and such a precious little spot in that Universe, that you can block it out with your thumb. Then you realise that on that spot, that little blue and white thing, is everything that means anything to you - all of history and music and poetry and art and death and birth and love, tears, joy, games, all of it right there on that little spot that you can cover with your thumb.

*. "At the beginning of the [space exploration] program, no one knew for certain whether weightlessness would prevent a man from seeing, or from breathing, or from eating and swallowing. Photography was deemed nothing more than a recreational extra." Quote from the Nasa "History" website: http://www.hq.nasa.gov/office/pao/History/apollo_photo.html accessed June 29th 02006.

** . 1961, United States' President Kennedy's ten year mission of "putting men on the moon."

And you realise from that perspective that you've changed forever, that there is something new there, that the relationship is no longer what it was.” (White, 1987, 38)

Rusty Schweickart, astronaut

“The first day we all pointed to our own countries. The third or fourth day we were pointing to our continents. By the fifth day we were aware of only one Earth.” ⁶

Sultan bin Salman al-Saud, astronaut

The astronauts reported two fundamentally different perceptions. Firstly, from a close orbit the earth would seem majestic and large - and the individuals in their space craft felt small. Secondly from a larger distance as the 200,000 miles to the moon, the earth itself appeared very small and vulnerable compared to the black and cold vastness of space. Frank White, then a member of the Space Studies Institute (SSI) in Princeton became aware of the astronauts reported moving and ineffable experiences of seeing the earth from an orbit and started interviewing them. These interviews became part of his 1987 book “The Overview Effect.” (White, 1987) There he concludes that for some people seeing our planet from above can result in a permanent change of perception of the world and Weltanschauung, an epiphanic moment of insight and transformation; And that it was perceived as a very personal, moving and spiritual experience with long term consequences.

During the last fifty years our view of the world has changed considerably. We gained an entirely new perspective upon our planet, cultures and resources. From their humble beginnings space photography lead to a new perspective of our planet. What Fuller, Hoyle, Brand and White envisioned has today entered the collective psyche of the west and changed societies view upon the world. Possibly the anti-nuclear movement and the environmental movement received a faster recognition and acceptance as a result of this changed perception.

2.4: Ingo Günther: “Worldprocessor”, 1988 - ongoing

Ingo Günther studied ethnology and cultural anthropology before moving to fine arts in 1978. During his studies Günther travelled through Northern Africa, North and Central America and Asia and has been a correspondent for the United Nations inspecting refugee camps in Cambodia. In 1984 he founded the company “ocean earth” which bought raw data from commercial satellite companies and resold the analysed and visualised data to the media. Günther recognised that the information they passed on to the media often reached the public distorted, truncated and unrecognisable from its original

meaning. It was this experience that made him realise the potential power and responsibility lying in the process of visualising statistical data which then finally also influenced the development of his art.



Figure 14: Worldprocessor installation on display in Bonn, Germany. The two globes visualise “Life Expectancy” (globe No.: 008) and “Mountains of Debt” (globe No.: 022). Images by Ingo Pfeil, 2000; Peter Ozvald, 1992.

Since 1988 Ingo Günther has been working on a collection of globes, “World Processor,” that augment statistical data in a variety of ways. Each of the globes bears its own distinct design and physical appearance. Between 1988 and 2005 he has created more than 300 of these globes each visualising one selected statistical “truth” for all countries of the world. For example, one of these globes, “Distribution of Wealth,” (Figure 14) informs us that the 120 million inhabitants of Japan have as much personal income as the 3.2 *billion* inhabitants of the 62 poorest nations of the world.

The collection of statistics Günther visualised in his globes include the following: energy consumption, life expectancy, toxic imports and exports, holes in the Ozone layer of the atmosphere, military budgets, political prisoners, population distribution, UN peacekeeping missions, production and distribution of land mines, depleted fishing grounds, balance of trade, US industrial waste streams, nuclear explosions, time zones, ocean pollution, ocean polluters, a relief globe with mountains of debt, money geography, airplane disasters, company wealth vs. country wealth, Moody's* rating, historical diasporas, car populations, world average temperature, Terrorism, DNA traces, water sheds, prison population.

The mostly brightly coloured and translucent globes are exhibited in a darkened space and are illuminated from inside. As visitors wander from globe to globe they become

*. Moody's rating is a service for investors performing financial research and analysis of the performance of commercial and governmental entities.

immersed in the numerical data that has been augmented into suggestive visualisations. The work gathers its strength through its contrasting nature that places completely innocuous data such as watersheds besides disastrous ones such as nuclear explosions. Visitors make their individual discoveries and create meaning from the information they experience on their journey through the installation.

Experiencing the information in this way creates a staggering awareness of different conditions of life all over the world.

Günther describes this continuous work as, “*navigational aids for the intellectual and emotional comprehension of our world.*” (Günther, 1999) He defines the role of an artist as an “informant” and avoids emotions in this work by presenting the data as cold as possible. He combines artistic, journalistic and scientific methods and uses globes as presentation mediums for social, political, economic and military information. Through this application he presents a variety of facts and brings them into a powerful visual format. This format allows the individual visitor to make their own associations on their individual journey from globe to globe, creating potentially subversive connections from the accumulated information provided.

2.5: Taos Group's “Beware Satellite,” 1996

A Tokyo-based team calling themselves Project Taos⁷ created a collection of mostly web-based works they named “Sensorium” (Wilson, 2003, 552) This body of work was conceived for the Japan site of the 1996 “Internet World Exposition” (IWE). The core members came from a variety of intellectual and artistic backgrounds and together, they explored the potential of the Internet as a tool to sense and perceive the living world. When the Expo was closed in 1996, this dedicated group of members continued until 1998 to build upon Sensorium further.

The activities of Sensorium were rooted in a larger philosophical framework of identity, expression, perception and seeing. It encompassed the idea of a conscious perception of the whole world, and seeing this world as one “living” organism. This organism being a uniquely complex and holonic¹ system in which all humans, plants and animals are a part, similar to Lovelock’s Gaia theory (Lovelock, 2000). Their tool, the Internet, they

1. A holon is simultaneously a whole in itself and a part of something bigger, e.g. a coral. From Greek *holos* “whole” and *on* “entity.” Coined by Arthur Koestler in his 1967 book “The Ghost in the Machine.”

believed, acts as a kind of nervous system - an outer network for communication and exchange. This nervous system, with its potential to connect people to people, also allows us to sense and communicate with the natural world. This encourages a discovery of the self within the sensory medium-Internet, as we take on a new identity. Shinichi Takemura, a cultural anthropologist and one of the main members of Taos states that,

“the Internet has the potential to give rise to a new human common sense: an enhanced and pluralistic sensorium and nervous system that can be shared by all. The Internet is here to connect us to the hidden channels of the wind and water and fire of the earth. Like electronic acupuncturists we will diagnose the body of the planet through our senses.” (Takemura, 1996)

The Taos Group members⁸ came from a variety of backgrounds such as cultural anthropology, network art, graphic-design, journalism, programming, music, university education and earth sciences and formed project teams according to their interests. Their goal is philosophical as much as it is artistic; it is a way of discovering the self and the world, using the Internet as a medium.

2.5.1: Beware Satellite

“Beware Satellite” was Sensorium's first “living” tactile installation which incorporated a new approach and philosophy called “*Senseware*.” Senseware, incorporated their idea of leaving the computer screen and mouse behind to extend a technical projection into physical space and into the sensual realm.

A weather satellite image was projected onto a 9 x 160 cm metal plane. This image, provided by the American National Oceanic and Atmospheric Administration (NOAA)⁹ was updated over the Internet in regular intervals. It was animated as a longitudinal slice following the satellite's movement. The image was available from NOAA in different colour-coded variations indicating water-vapour, infrared rays (temperature) and visible light.



Figure 15: Beware Satellite's touch interface augmenting the projected image with temperature information, controlled with Peltier-elements underneath the metal plane. Image: Centre international d'art contemporain de Montreal.

While the visible light image is projected upon the metal plane, the temperatures encoded within the colours of the infrared image were used to control Peltier-elements installed underneath the metal plate. These elements are small, active pumps that can be used to heat and cool the surface of the plane. Visitors could touch the visible light image projected onto the metal plate (Figure 15) and feel the temperature of the corresponding place on the earth. Mostly they felt coldness as many places were covered in clouds. The accuracy of the perceived data and resolution of the display were controversial and the artists themselves admittedly acknowledged the difficulties.

An additional layer of complexity which disrupted this tangible interface was presented in a second projection of the actual geographical area onto the floor displaying an abstract globe, a grid and typography which made the piece accessible only from one angle. Beware Satellite's information-transformation accuracy is questionable but it provided a vivid and tangible "overview" of different areas of the world by referring to the senses of touch and vision simultaneously. Visitors add this experience to their already existing mental image of the world and may in fact remember the temperatures of Africa or the Himalayas because of this sensorial encounter.

Nishimura points to the early state the Internet still is in, and compares it to cinema which took forty years to “mature.” He concludes: “*The Internet as it is today has been born as a technology, but not yet as an expression. What is required for that stage in design is not “maturity” but “exploration” and “experimentation.”*” (Nishimura, 1999)

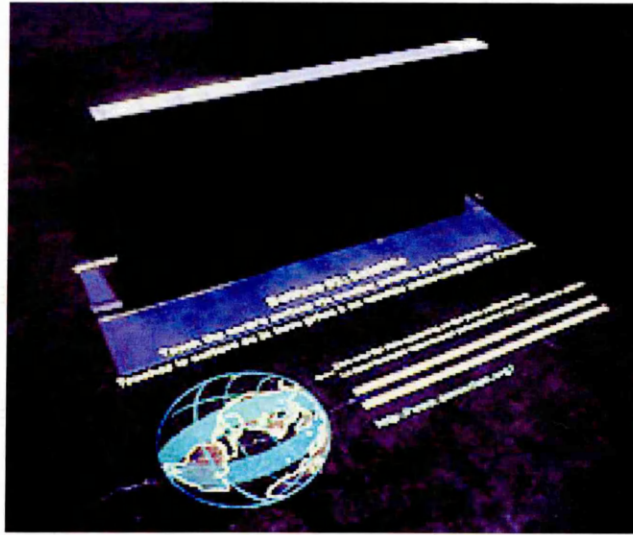


Figure 16: Beware Satellite: Additional floor projection displaying the axial course of the satellite with the highlighted “slice” currently being displayed. Image by Centre international d’art contemporain de Montreal.

The name Sensorium already alludes to the senses and perception. All Sensorium’s projects have in common an informational aspect which is being communicated. An essential principle in this communication is the process of either transforming data into the sensorial domain or an particularly insightful visualisation. The dialogue between the visitor and the piece is sensual and tangible. It is a hands-on experience, reaching the mind through the senses. The essence of Sensorium concerns creating an awareness and insight for indiscernible natural processes that surround us twenty-four hours a day - and in Beware Satellite to the satellites that circulate in the skies above us. This also reminds us that satellites circling above not only *relay* data such as television programs, telephone calls and other network traffic, but some of them also *create* data as they observe us from above.

2.5.2: Transformation and spatiality in Satellite Beware

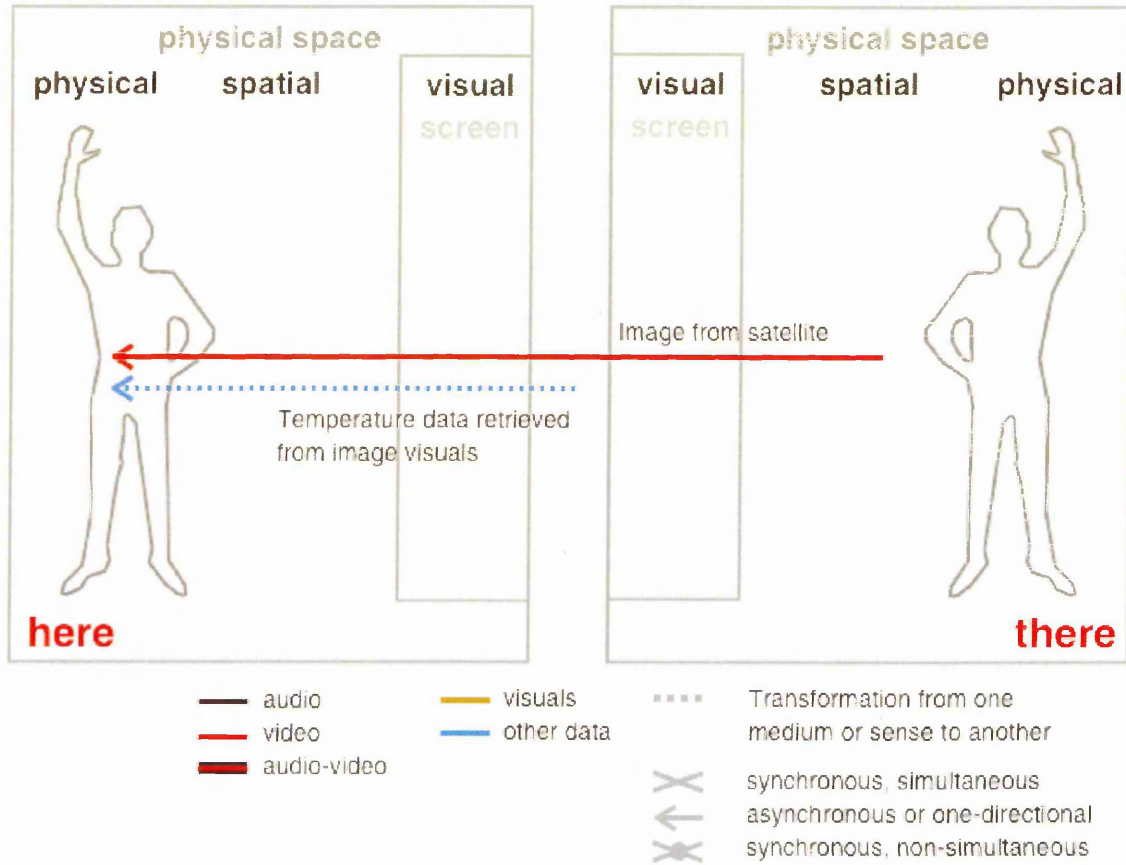


Figure 17: Here, There: Transformation and Spatiality: Diagram displaying the characteristics of Beware Satellite. The moving satellite sends an image (continuous red line) with surface temperature of the earth. Infrared data is gained from the image (dotted blue line) and determines the augmented temperature information. The figure's hand emphasises that there are physical attributes which may be tangible.

Analysing the transformation process for the diagram is to an extent subjective and interpretative. Satellite imagery is heavily computer mediated to create the “natural” impression that we expect to see. The “image” (red line) is actually digitally composed of several different images from different colour spectra. The temperature information is contained within one of these, an infrared image. While one visual composition is projected from above, the colour coding embedded within the infrared image is used to trigger the Peltier-elements which augment the temperature effects. Another decision is to define the *there*. In this case it is the area visible in the image, while the transformation data (blue line) is taken from one of the images during the process.

2.6: Smart Studio's "remote home", 2003

"Remote home"* was created within a period of three months by an interdisciplinary team of practitioners at the Smart Studio / Interactive Institute in Stockholm Sweden in 2003. The team included Tobias Schneidler (architect/team leader), Magnus Jonsson, and Fredrik Petersson (engineers) among others. Here it serves as an example for the combination of Telematic Art and Transformation Art in that it connects two remote homes or partners with one another and transforms activities taking place at one home into changes of the environment at the other.

"Remote Home" connects two remote apartments with each other via the Internet. Sensory devices, kinetic devices and an interactive light installation are the channels of connectivity. The main focus includes two sofa like seating possibilities, each located at one of the two remote apartments. Kinetic devices embedded within each seat enable segments of the sitting surface to move up or down. This creates an uneven surface at the remote counterpart which makes it impossible or at least uncomfortable to use. This change of state indicates that the connected seat at the other home is currently occupied - and therefore this local one cannot be used. The explanation for this seems to be that any regular armchair can only be used by a single person at a given time. This is possibly indicating that the two homes are actually more then *connected places* but seen as a single *shared* space, though spatially dislocated.

A second interactive display indicates *motion* within the two apartments. Motion detectors sense a walking person and activate kinetic devices embedded within a remote textile wall tapestry. There are two such tapestries, one in each apartment connected to each other. Both contain sensors as well as actuators. As people walk about the space their movement causes bulges to emerge from the kinetic tapestry of the remote home, thus displaying movement and presence of a person.

A third possibility, this time allowing for individual expression is connecting a glass tray lit from underneath and a matrix of sensors embedded within the ceiling. The glass tray is filled with fine gravel and allows through manual movement of the gravel the creation of simple drawings or scribbles. The light sensors embedded in the ceiling above the tray control a matrix of lights in the ceiling of the remote home. These remote

*. The project is documented online at <http://www.remotehome.org/> accessed July, 16th 2005

ceiling lights resemble the drawing made on the light tray in the other apartment. This device only exists in one of the apartments. The idea being to enable one of the remote partners to express his or her current mood in a simple scribble or drawing, said to open a gestural, non-verbal communication channel.

A fourth device is a bag, connected to all of the three previously mentioned devices in both apartments. Triggering any of the sensors in any of the apartments seems to actuate a light and a kinetic bulge in the mobile bag.

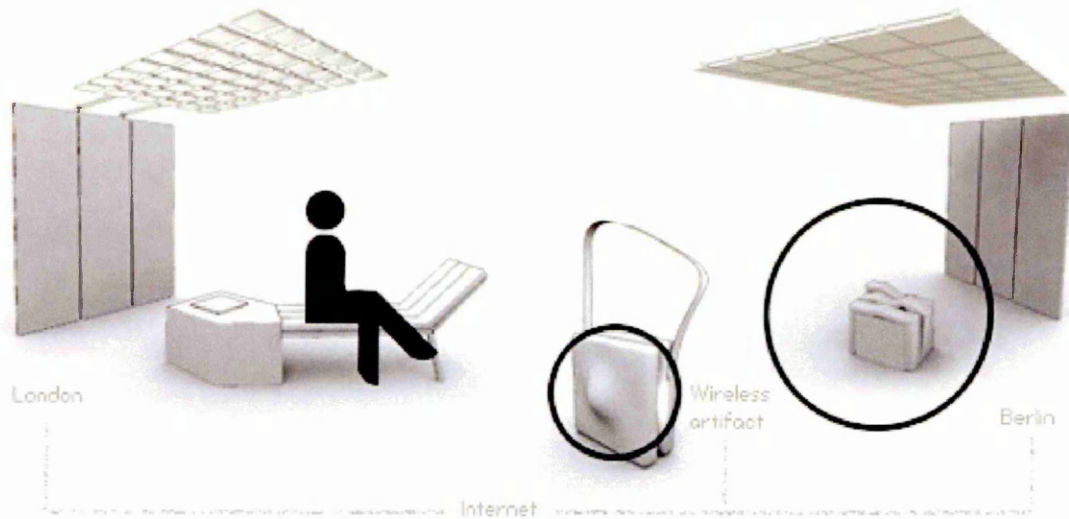


Figure 18: Original graphic by remotehome.org; Sitting on the sofa in London disables the seat in Berlin. It is an asynchronous connection similar to a walkie-talkie where the action of one party “immobilises” the other party.



Figure 19: Sitting on the seat in the Berlin apartment disables the sofa in London. The connection is synchronous, taking place at the same moment, but not simultaneous, only one person can sit, the other person has to wait for her turn.

The project is inspired by the idea to connect two remote partners, or better two remote apartments,, with each other. The Remotehome team assumes that as lifestyles are changing, relationships are changing as well. More and more people live in long distance relationships and consider more than one place their home. The project has also been inspired by an MIT paper of the fifties titled “Miracles of the next fifty years” by Waldemar Kaempffert, a vision of the world in the year 2000. Despite its conceptual weaknesses Remote Home is an interesting case study as it uses concepts of *spatiality*, *artificiality* and *transportation* to connect two remote places with semantic, non-natural and non-verbal cues.

Interesting from this research’s perspective is that in Remotehome people’s *activities* in the environment trigger changes in the *appearance of everyday artefacts* at the remote location. It is playing with the notions of *Here* and *There*, yet there is no *transportation* involved. It is not about *going there*, but more a mix between a playful intervention and an information display. Some initiation and knowledge is necessary to comprehend the changes happening in the apartments. An uninitiated visitor might think of a haunted house where furniture moves and lights switch on and off without a visible cause.

Another interesting point is that although the project is of a technical complexity this complexity is not visible on its surface. It is not task or goal oriented and its usability (if we can call it that) is limited. There is no direct interaction or communication involved. Connectivity could have been created via 2D video displays and audio - yet they happen in physical space and no special knowledge is necessary to trigger the devices. It is an unconscious and mostly unencumbered interaction.

Connecting two *partners* with each other could have also employed a straightforward solution. A live sound or video connection to let the inhabitants *communicate* directly with one another. Yet another more subtle and sophisticated approach was chosen. The connection is not that *intrusive*, but a collection of mostly *ambient* cues that can be described as *presence indicators* or *activity displays*. It is not about enabling the inhabitants to directly communicate with one another but to provide a range of minimal signals indicating activities and presence. Walking through the room or relaxing on a chair are usually not signals that are directed to a person or wilful, intentional gestures but the result of unintentional everyday behaviour. In this context they may be perceived as a kind of communication channel.

2.6.1: Transformation and spatiality in remotehome

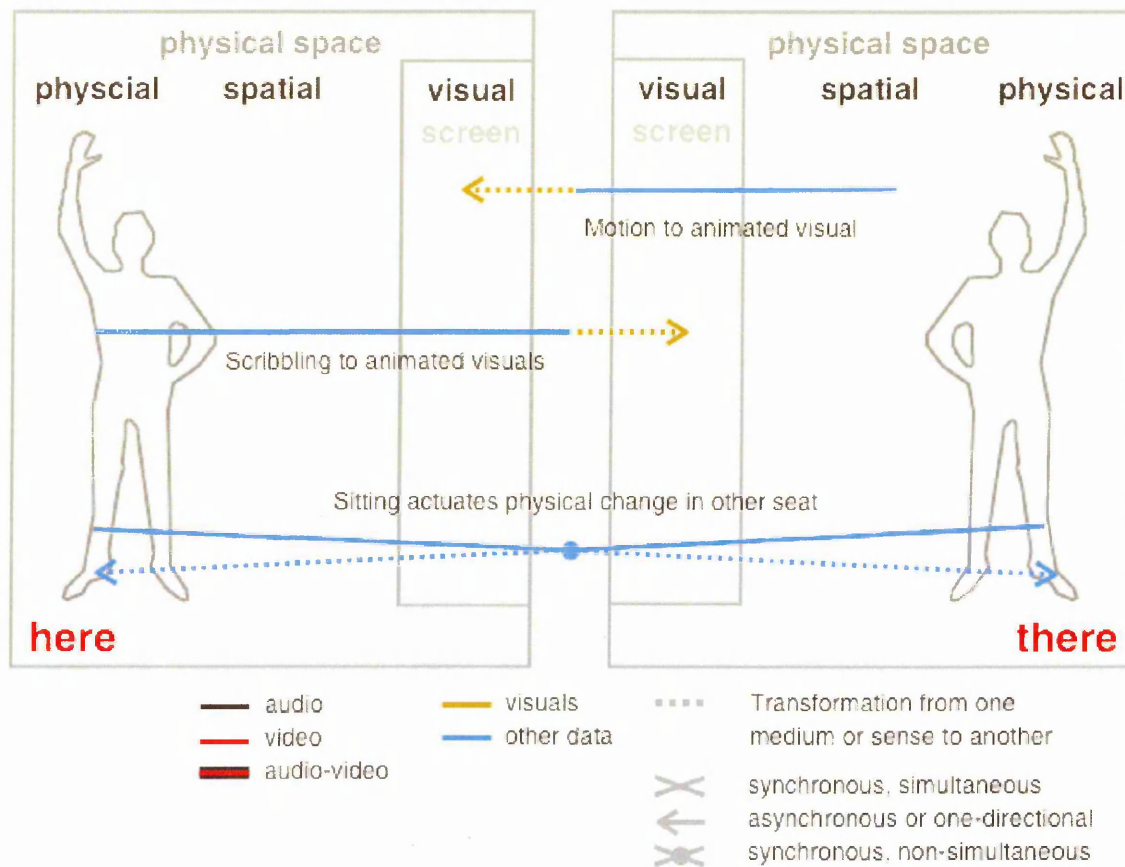


Figure 20: Here, there: Transformation and Spatiality: The bottom graph for “sitting” does not display accurately. There are two one-way connections, synchronous in that they take place in an instance, but not simultaneous as only one person can sit while the other has to wait. Motion there creates visuals here. Tangible scribbling here creates visuals there. Physical actions at both places provoke tangible effects in the same medium. The Remote Home is perceived as one coherent interactive environment.

Artificiality is in the case of Remotehome the arbitrary *cause* (action) and *effect* relationship which is also its main conceptual weakness: There is no *meaningful* relationship between an action and the effect it causes in the remote counterpart. Even when the environmental changes are decoded their semantic meaning stays very dissociated. Bulges in the wall as a result of crossing a room can neither be seen as a deeply connecting experience than a meaningful one. Remotehome's expressions are very abstract while the high artificiality of the code is not necessarily the main problem. The mapping of the sofa interaction principle is clear and direct - yet from a usability perspective not very felicitous.

Remotehome is a complex project that has been realised in a limited amount of time in a top-down approach. It appears that its intent was to prove that it was feasible within this time schedule. Intersecting the areas of fine arts, design, engineering and computer sciences it is an interesting framework for interdisciplinary teams.

2.7: Paul Sermon's "Telematic Vision," 1993

Paul Sermon is based in Manchester, England and has a history of creating vivid and captivating media art projects, often in collaboration with Andrea Zapp. "Telematic Vision" created in 1993 connects two remote parties with each other via a live video connection. The arrangement consists of two blue sofas at different locations, each facing a television screen. Above the television is a video camera capturing the scenery. Both video images are mixed together in real-time via blue-screen technology and sent to both tv's simultaneously. The occupants of both sofas see themselves appearing on their television screen being surrounded, or even "sat" upon, by the occupants of its remote counterpart sofa.

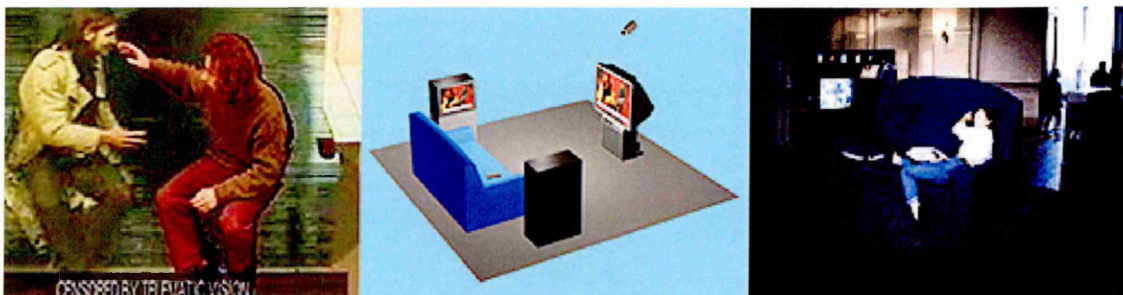


Figure 21: Paul Sermon, Telematic Vision, 1991. The occupants of the two sofas interact with each other in the merged telematic space of the screen. Image: Paul Sermon

The immediate physical space stays behind while the participants are drawn into the telematic space of the mixed scenery appearing on their tv screens.¹ The unusual situation of sharing close - though virtual - physical closeness to total strangers while not being constrained by conventional spatial restrictions leads to a significant change in social interaction. Participants can invade the virtual social space of such a stranger and break the conventional, social and spatial rules in this new situation. They can for ex-

1. In the respect that participants are drawn *into* the virtual space of the screen the piece loosely resembles Myron Kruger's "responsive environment" "Videoplace" from 1969. Here participants playfully interact via gestures with augmented visuals using their own physical shadow (Wilson, 2003, 735).

ample “touch” or interact with the representation of the remote person, and it depends on the spontaneity of the other individual how she reacts to this invasion of private space. This live pictorial representation creates a new social space, a telematic space which the participants inhabit and interact in. The arrangement leads to playful, vivid, non-verbal interaction among the sofas occupants and their remote parties. Sound is not necessary in this work as the body and gestures suffice for interaction. Although the interaction takes place in telematic-space it is a work about physical space, social space and the human body.

2.7.1: Transformation and spatiality in “Telematic Vision”

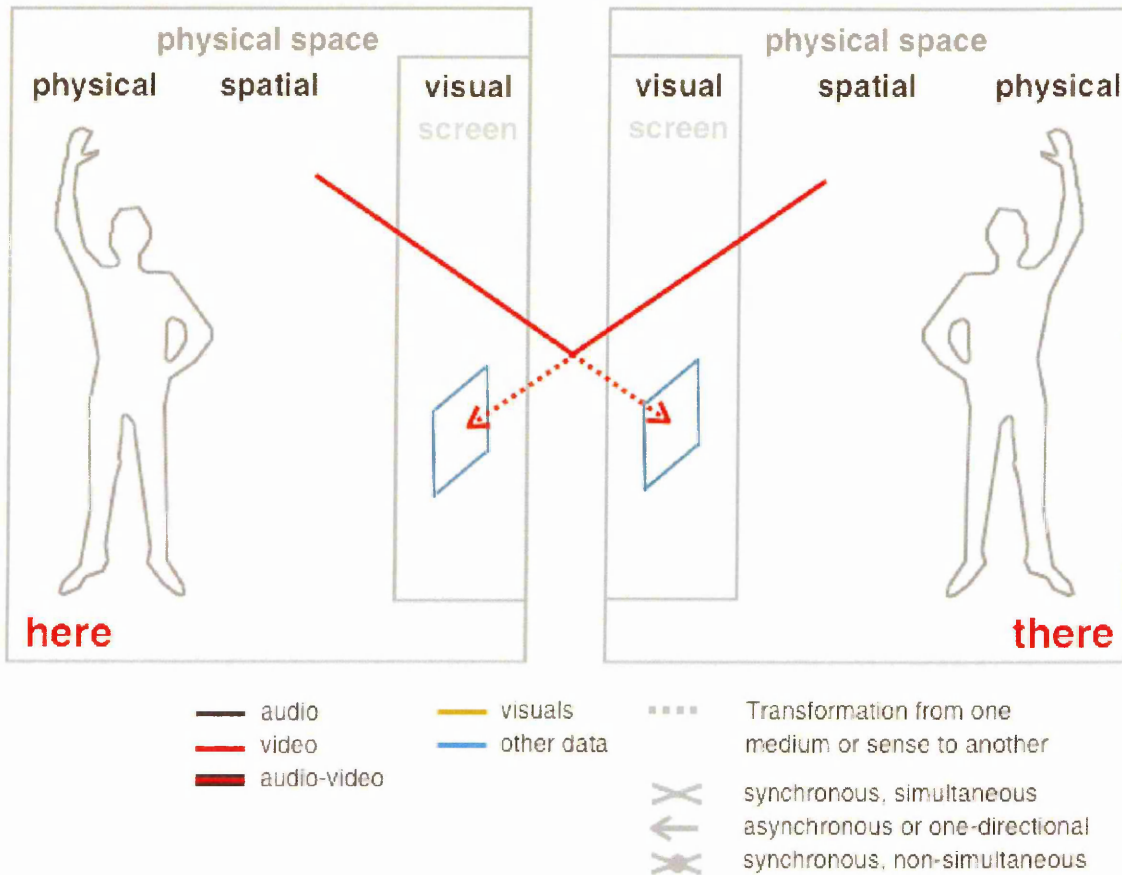


Figure 22: Here, there: Transformation and Spatiality: Telematic Vision: Two live video sources are digitally transformed. Both parties receive identical video streams. The spatial separation characteristic is more important than the geographical location as such. The crossing of the two lines suggests that the connection facilitates a synchronous and simultaneous dialogue and not two one-way connections. The dotted lines indicate that a transformation is applied, in this case a digital conflation of the two different sceneries to a single one.

In “Telematic Vision” participants leave their immediate, physical space behind and focus their attention upon the screen. They meet the other party in a shared, virtual place

which has different spatial characteristics than traditional, physical spaces do. The act of communicating with the other party is the essence of this work which is created by its visitors. The communication is synchronous and simultaneous; in that the participants can interact with each other, together and at the same time.

“Telematic Vision” has been selected as a typical example of Telematic Art. It was chosen among the many classical Telematic Art pieces as it illustrates telematic technology in an application of *communication art*, where the process of communication among participants becomes the work itself. If there are no visitors present at one of the locations - there is no artwork. In his book “Telepresence & Bioart” (Kac, 2005) Eduardo Kac describes this property as “dialogical,” a characteristic which will be explained in more detail on page 121. Another example illustrating Telematic Art was Goldberg’s “Telegarden,” a garden which can be remotely accessed via the Web and where remote participants, one at a time, would tend plants via a robotic arm over the Internet. Yet, in “Telegarden” the collaborative aspects stay behind its tele-present conceptual intent which essentially aims at questioning the realism of the distant scenery from an epistemological point of view.

The two live video streams are transformed into one single video stream which merges the two spaces into one virtual telematic space on the screens. The two red lines point both ways, indicating that the connection is not only synchronous (a real-time one-way connection) but also simultaneous, meaning that both parties can interact with each other at the same time and do not require for one party to wait. Discreet vs. continuous. The magic of the piece lies in the way it allows participants to playfully interact with each other by breaking socio-cultural conventions of communication. The setting allows this to happen in an excusable harmless way. The diagram cannot capture the liveliness of the interaction or captivating social characteristics of the piece, but in focussing on mostly technical aspects it can allow to compare technical setups and similarities of otherwise incomparable pieces.

2.8: Kohji Setoh's “Global wind chimes project”, 1999 - ongoing

Kohji Setoh is a Tokyo-based artist and DJ with a background in computer music and media art. In 1999, Setoh created a web-based sound project called, “Global Wind Chimes Project”¹⁰ which involved two wind chimes hanging in university campus locations - one in Tokyo, the other in Los Angeles. Both chimes were tuned to different tonal chords and were hanging outdoors.

At both locations a fixed video camera continuously filmed the chimes as they reacted to the wind. The resulting audio-video streams of both chimes could then be accessed via the project website all over the world. Visitors of the “Global Wind Chimes Project” would open two windows on their screen, one showing the live stream from Tokyo and the other from Los Angeles. As the wind blew at both locations across the pacific, the chimes sounded together in harmony, forming a global soundscape.



Figure 23: Global Windchimes Project by Koji Setoh, 2000. One wind chime placed in Tokyo, the other in Los Angeles. Image: Koji Setoh

Setoh’s work is about identity and locality and engages us on multiple layers concerning issues such as globalisation, telematic technologies and the independent observer.

Technology, the Internet and telematics form the basis for this piece. Its telematic near real-time characteristics contradict our regular perception of the world as it simultaneously connects us with two remote places - while we remain in our local space. Physically we are located *here*, yet our senses receive sounds and visuals from two distant locations in different time zones. Becoming aware of the aliveness of the work, induces a deeper susceptibility for the experience.

What may be lost in this work through technical means, which contradict our sense of time and space, is counterbalanced with the creation of a poetic gesture of remembrance towards the natural process and a feeling of global connectedness. Additionally, while technology and the Internet are the facilitators of globalisation and its controversial effects such as the ever increasing the speed of information distribution or the migration of work, “Global Wind Chimes Project” uses these very same technologies to show their intrinsic “saving powers” and harmonising capabilities.

Each remote location contributes its individual characteristic to the telematic experience which is represented by the wind chime. Its identity, the tonal quality of its sound, and its locality determined by its weather conditions, form an essential and intrinsic part of the whole. The individual local wind chime is *complete* in itself, yet together they constitute a larger system; creating a gestalt effect in which the whole is more than the sum

of its parts. By juxtaposing one locality with another locality the work emphasises their uniqueness and *difference*. This contrast enables the visitor to become aware of their individual distinct character, their individual identity and diversity. Every entity is a unique, autonomous and necessary part of the whole picture.

2.8.1: Transformation and spatiality in “Global Wind Chimes Project”

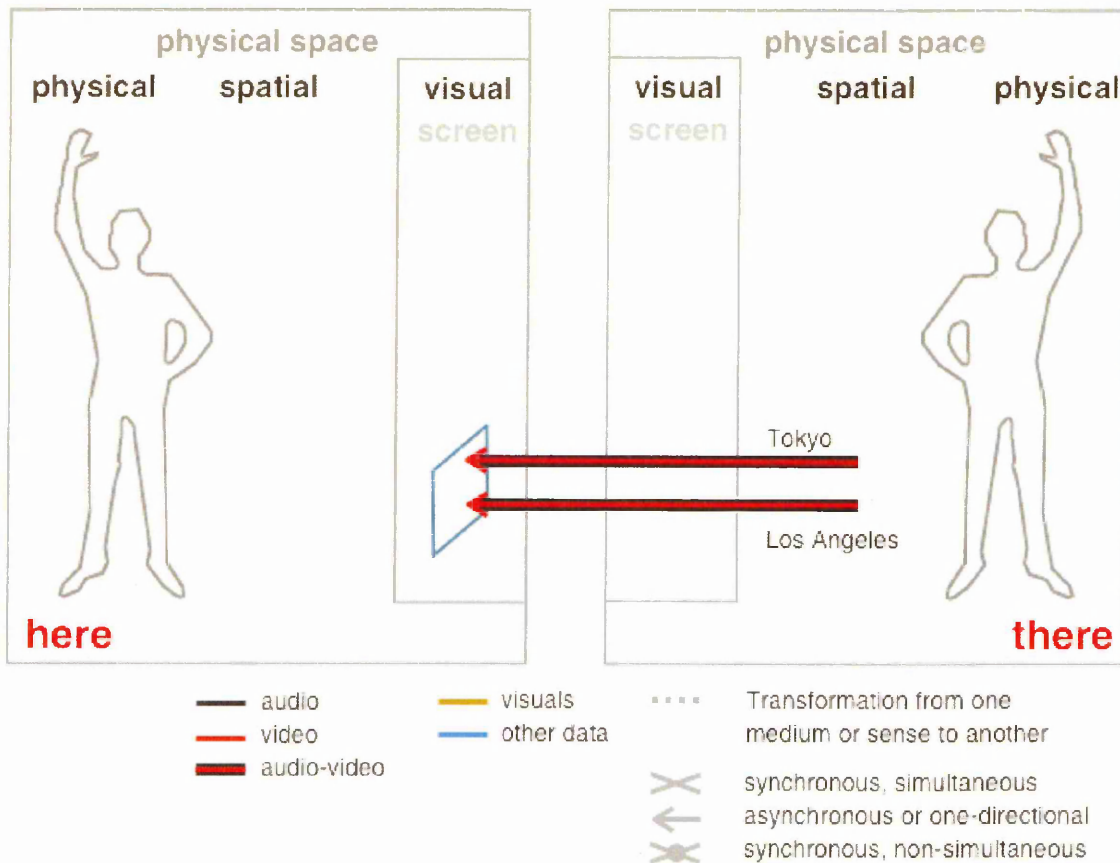


Figure 24: Here, there: Transformation and Spatiality: “Global Wind Chimes Project.”

Telematics disrupting our perception of space. The observer actually creates the piece by her or his presence, visiting the website. “Here” in the local space is the only place where it can come into existence.

The visitor accesses the work as an observer, but plays a crucial role in the works creation. The work depends on the visitors participation. It is their visit to the project website that *creates the conjunction* between the two remote wind chimes. It is here at this third locality, and only here, where it is possible for the two different tonal chords to sound together in harmony. When the observer is becoming the crucial part of this system, we recognise that there is no such thing as an independent observer. The harmonic sound between Los Angeles and Tokyo can only come into existence when the observer participates.

The natural processes wind and sound create the basis for this piece. It is not interactive, the visitor remains passive after bringing the piece into existence. This leaves space for contemplation and an inner awareness of the telematic harmonies which form the intrinsic qualities of the artwork.

Since the 1980s artists have created pieces that used live video connections between remote locations, among the better known “Hole in Space” (Wilson, 2003, 487) by Gallo-way and Rabinowitz, a “Public Communication Sculpture” connecting New York City and Los Angeles. Another piece, “Hole in the earth” by Ueda connecting Bandung and Rotterdam and also “Global Village Square” by deKerkhove, a project that remained in its conceptual stage, attempting to connect traditional markets and shopping malls in several different cities worldwide with each other.

These projects use similar principles and technical set-ups, yet they create fundamentally different experiences. Essentially they all are about communication and dialogue, connecting people to people. This redefines their artistic meaning from being telematic art which draws upon distance, place, synchronicity and an internal awareness to something different. By connecting people to people and thus facilitating a dialogue, they effectively become *communication art*, where the process of communication becomes the work itself.

“Global Wind Chimes Project” with its telematic art characteristics is a slow and meditative project. It creates a contemplative awareness, an inner experience, creating space for a *critical distance* and reflection.

2.9: Golan Levin, Zach Lieberman, Jaap Blonk, Joan La Barbara, “Messa di Voce,” 2003

Golan Levin and Zach Lieberman are media designers, programmers and artists with a history of projects visualising data, real-time animation and sound. “Messa di voce”^{*} is an interactive audio-visual voice performance in which two voice acrobats, Blonk and La Barbara, create unusual sounds with their voices, while interacting with twelve different modules of Levin’s and Lieberman’s software application.

*. Videos of the different modules can be viewed on the project website at <http://www.tmemma.org/messa/>

In their performance the two voice artists move about a stage exerting their voice-art while on a screen behind them colourful shapes and amorphous structures emerge and react to their voices in real-time. In some modules the artists can also physically interact with these virtual shapes, push them aside or catch them. The modules explore different symbolic, tactile and audio-visual effects in a close relationship to the onomatopoeic quality of the sounds produced.

Blonk and La Barbera engage in a playful dialogue with one another as well as with the visualised feedback of their own voices. The direct relationship between physical motion, the sound of their voices and visual feedback appears surreal and lucid at the same time.



Figure 25: Three of the twelve modules of *Messa di Voce* by Levin, Lieberman and voice artists Blonk, & La Barbera

Diane Ackerman compares music to speech and writes that music is a direct emotional language, while speech is a rational one, with no direct relationship to the original objects, ideas and feelings it describes (Ackerman, 1990, 173). If we look at the animated visuals with which the artists interact we see that they have a gestural quality, an isomorphic relationship between volume and pitch of the voice, position of the artist on the stage and dynamic, shape and colour of the visuals. They create a dialogue between their sounding voice and the resulting visuals, which both reinforce each other when they interact creating a loop of action and reaction. This gestural quality of the visuals is not natural but entirely the result of a conscious design process. Every aspect of the appearance and the behaviour of the visuals has been deeply designed and implemented into the software.

The result is a primordial and magical process allowing the audience to experience the transformation of sounds into animated visual shapes. It appears as if a new sensorial modality had been discovered that gives an additional perspective into the meaning of language.

Semantic typography and concrete poetry have historically explored the relationship between the appearance of the written word and its meaning. “Messa di Voce” explores the reverse, the relationship between speech, or the spoken word and its appearance. This is a fundamentally new concept that cannot be overestimated.

The interaction stimulates multiple senses. Firstly there is the feedback loop between hearing, speaking and the visuals that create a synchronous and simultaneous interaction with only the voice as an interface but in the different media transforming each other. Additionally we have the artists interacting and communicating with each other via voice and visuals. The virtual, augmented world complements the immediate, physical world in a very natural way in this performance setting. The dialogue between the artists and their visuals involves the whole body, the voice and it is unencumbered.

2.9.1: Transformation and spatiality in “Messa di Voce”

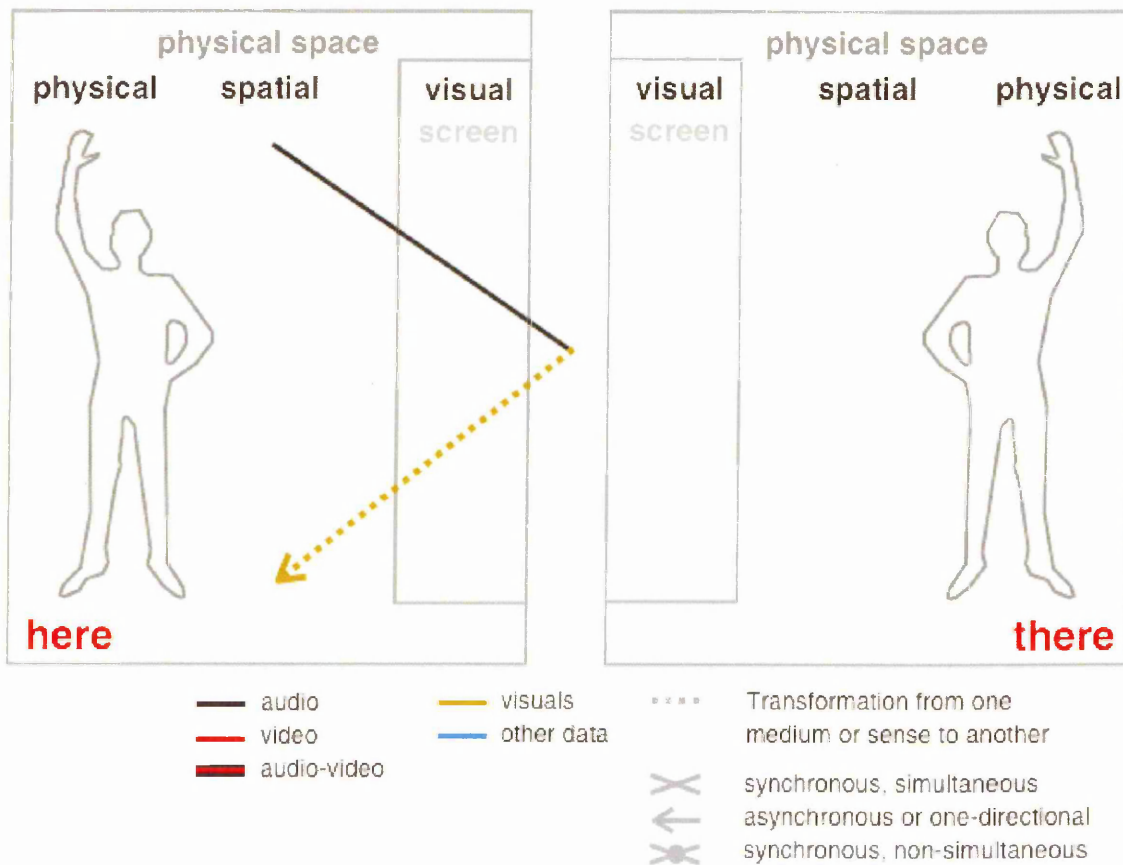


Figure 26: Here, There: Transformation and Spatiality: The sound of the human voice is transformed into visuals that can be interacted with in spatial dimensions. The screen is so large it allows for spatial interaction. It is not a telematic application and thus involves no remote location or “there.”

The twelve different visual modules of “Messa di Voce” are a local transformation that does not involve a remote location. The augmented visuals leave the screen behind and appear spatial as the artists use their bodies and physical space to interact with them, though unencumbered as the visuals are augmented only. The transformation process transforms audio (grey line), the human voice, into visuals in real-time (brown line). The process is a synchronous and simultaneous (bio-)feedback-loop as the artists react immediately to, or interact with the visual feedback. In that respect it is reminiscent of a musical instrument where physical motion and mastery of the body becomes a skill. Here mastery of the voice together with the software application is the instrument. 50% of the feedback loop are the result of human reaction - and the diagram only displays the one-directional, technical side.

2.10: Luke Jerram's “Tide”, 2001

Luke Jerram is an artist based in Bristol with a history of original, imaginative and poetic projects¹¹ transgressing the boundaries between research, science and art. His installation “Tide”¹² alludes to the influence of the moon and the fourteen metres difference on sea level at the height of the tide in the English town of Bristol. “Tide” transforms changes of gravity, respectively of the moon, into a resonating immersive visual and aural experience.



Figure 27: Three rotating glass spheres creating an immersive, spatial sound-experience for visitors while transforming minute changes of gravity induced by the moon.

Images: Luke Jerram, Sandra Fauconnier

The installation consists of three large rotating glass spheres which are filled with water, each mounted on tripod and positioned several metres apart from each other in a spacious gallery setting. These spheres represent the sun, moon and earth. A friction device sitting on the rim of each sphere makes it swing in resonating overtones. The gravitational pull created by the celestial bodies, mainly by the moon, is measured by a gravity meter located in the gallery and streamed to a computer. The computer adjusts the water

levels within the glass spheres synchronous to this live data stream determining its sound pitch. As the gravitational forces change over time the water levels within the glass spheres rise or sink accordingly, changing the sound of each glass in a live synchronisation with the actual movement of the celestial bodies; the resulting resonating room-filling chorus brings to mind the sound of singing wine glasses. Furthermore, to provide context, the ascending and descending curve of the gravitational changes for a 24 hour period are projected against the wall.

“Tide” is interesting for this research project on several levels. Although its complex technical background makes the way it operates less transparent for the visitor, it can be seen as a scientific instrument in a classical tradition; a comprehensive technical instrument to measure, sensual, romantic and poetic at the same time. It uses transformation of data from one medium - gravity - to another - sound - to provide us with a temporary experience of a natural force we are immersed in, but that usually is beyond the capacity of our senses. It has telematic qualities to a certain degree as it reacts in realtime to distant objects, the moon and sun. Last but not least it also challenges our sense of trust. The technology as such is a black-box. We have to trust the artist’s claim that there are a gravity meter and a computer controlling the installation and that their data are accurately represented. The visitor needs a certain suspension of disbelief to fully enjoy the artwork. Technology, transformation, telematics and the physical world come together in this piece forming a poetic whole.

The telematic aspect of the piece is somewhat ambiguous as there is no connection through a distinct channel to a remote *place*. It is about the here and now, and the indiscernible *influence* of celestial objects upon the natural surroundings. The project is more about transforming the indiscernible changes in gravity to another sensorial modality. Other projects do that as well; but while Ken Goldberg’s “Mori”^{*} is solely about the *Here*, this particular ground beneath our feet - “Tide” alludes to the moon above us as well, the “Music of the Spheres,” of the moon and the sun. While “Mori” transforms indiscernible motions of the earth into a visual and musical experience, it aims at making us question the ground beneath our feet. An experience which some may find unsettling or disconcerting. Goldberg also has the intention to make visitors question the validity

*. “Mori” by Ken Goldberg is an installation piece which transforms the continuous trembling of the earths crust into music and an animated seismographs curve on a screen.

of the experience and also the accuracy of his instruments. He challenges our trust by asking: Can we trust our senses? How can we trust these sensors,? A challenging play with our perception, mortality and the *illusion of safety*. Luke Jerram's "Tide" is mainly about the moon *out there* and only secondly about the earth *influenced* by the moon. These influences follow a circular, predictable rhythm, ebb tide and flood tide. A rhythm that imbues many natural cycles on earth and from which our word "month"* has originated. So "Tide" is less an uncanny statement about the accuracy of our instruments vs. the infallibility of our senses or the fragile permanence of our world, such as "Mori," than an imaginative, immersive spatial sound experience that transforms "the macrocosm" to a graspable, human scale.

2.10.1: Transformation and spatiality in Tide

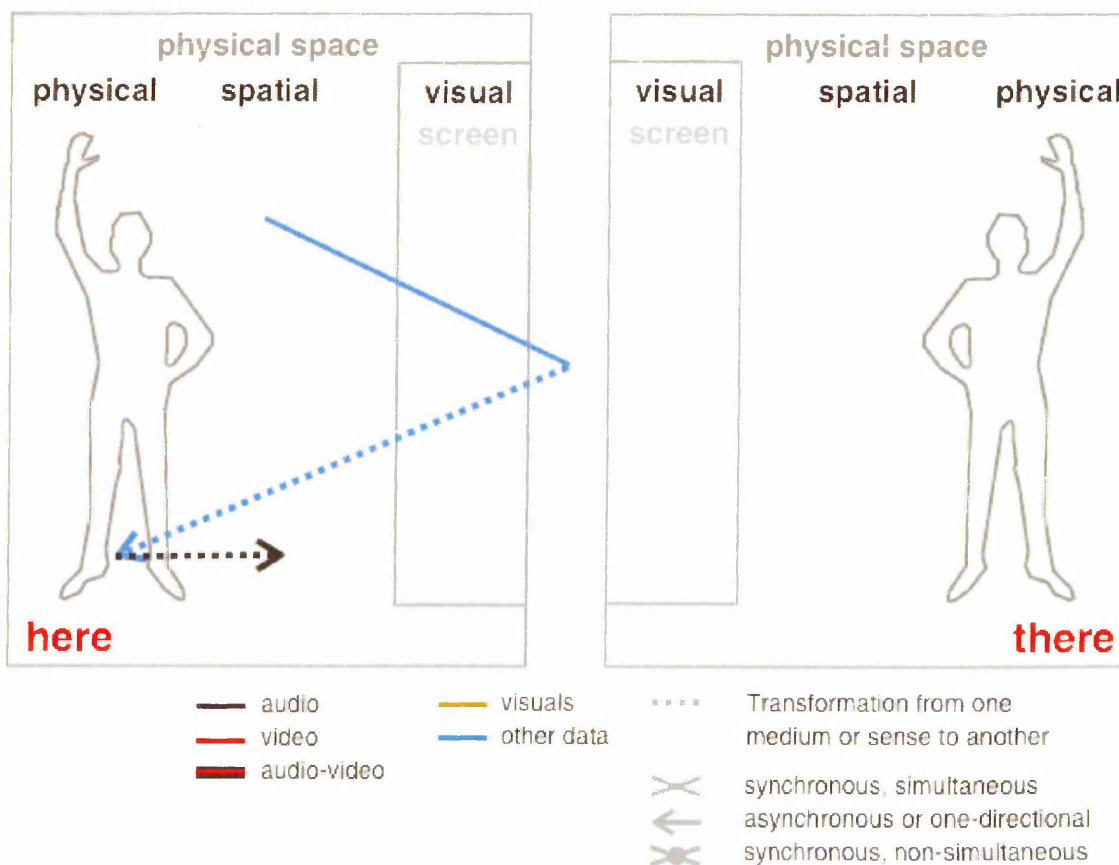


Figure 28: Transformation and Spatiality: Imperceptible local changes in gravity (blue line) are transformed into the visible adjustment of water levels of three rotating glass spheres (dotted blue line) resulting in changes of sound (dotted grey line). The measurement is taken local but alludes to the moon.

*. Etymology: Middle English, from Old English mOnath; akin to Old High German mAnOd month, Old English mOna moon, Merriam-Webster's Dictionary, 2004

Similar to the visitor encompassing the space between the sounding spheres, their macrocosmic counterparts moon and earth encompass' the space of our solar system. This sonic space alluding to Kepler's "sound of the spheres" resonates around the visitors and unfolds its immersive quality, interconnecting them with the celestial objects that are usually beyond reach.

The transformative aspect takes place in two dimensions; as the visual and abstract 24 hour curve that is projected upon the wall (not included in the above figure), and as the physical spheres themselves with their technical appearance and source of the sound. By listening to the sound of the spheres and understanding the way they work, visitors experience the live transformation of the indiscernible gravimeter code into permeating and intermingling layers of harmonic overtones resulting in a visceral physical experience of cosmic dimension.

On one hand "Tide" is an astronomical instrument placed within the historical tradition of technical instruments that enhance the human senses to expand our knowledge, as the microscope or telescope do. In that sense it is exemplary in hitting the sweet spot where "techné," *art* in its classical sense and technology come together again. On the other hand it is an immersive media art installation that captivates the senses of the spectator and evokes an enhanced connectedness with the environment, an immersive experience of sensory perception eluding to other and more mysterious indiscernible natural forces that surround us. An enhanced, reflective state of awareness of the immediate, physical world.

"Tide" also is more an imaginative than a transparent work. Visitors require knowledge to fully fathom the experience. As indiscernible gravitational changes are transformed into the perceptual range of the senses visitors have no proof of the accuracy of this transformation. They have to trust the artist and a certain suspension of disbelief is required to enjoy the piece. They have to trust the artist's claim that the black box arrangement of computer and gravity meter controlling the installation are in fact measuring what they claim to measure: gravity. The computer mediated process is not transparent, there is no interaction or interface available and it could also be a simulation. We cannot trust our senses in this case - yet, to fully enjoy it, we have to believe in the artworks authenticity.

As the daily flow of the tide is mostly caused by the moon, the installation also reminds the visitor of the influence of the moon when it is not visible in the sky. This can be

either during the daytime, during a new moon, cloud cover or the moon being below the horizon. Although highly sophisticated in its technical background, the installation is a singular poetic statement not only *for* the moon and its romantic associations, but actually *triggered* by the moon itself, a chorus literally sung by the moon and made audible for the visitor by the artist.

The direct metaphorical mapping of the rotating glass spheres, representing the rotating planets and also being the source of the “sound of the spheres” adds to its holistic quality.

3: The system of methods

In the past chapter we have mapped the terrain of this research in a contextual review. We began with an introduction of the idea of global awareness and global perspective from different views such as Buckminster Fuller's "one town world" which emphasises a interconnected world, compared to Marshall McLuhan's "global village" phenomenon making us aware of a collapse of geography, turning the world into a *now*. Both views are based upon modern transportation and telecommunication technologies. From there we proceeded to the research into advanced telecommunications technology, which partly are responsible for these perceptions, and how Telepresence and Virtual Reality technologies are related from an HCI perspective in that they both involve dimensions of *transportation*, *artificiality* and *spatiality*. Other concepts were *Immersion*, *Engagement and Flow*, as well as ideas on *Presence* and *Immersion*. Further I introduced my own concept of *transformation* of data from one sensorial modality to another (which is often also referred to as visualisation) and pointed to its inherent kinship to telematics as both involve encoding and decoding data in different media. We also have seen the variety of definitions of *telepresence*. Some practitioners insisted on agency while for others the telephone was already an application of telepresence.

The second part introduced a number of relevant case studies, mostly from the arts, to elucidate and establish the areas of interest. Here we also saw diagrams inspired by the HCI dimensions of transportation and spatiality. This diagrammatic representation "Here, there: Transformation and Spatiality" was developed in different iterations. Two separate versions, one depicting transformation between here and there, the other depicting the spatial dimension were combined in one diagram. Its purpose is to gain a better understanding of the techno-spatial relationship of relevant works which is also hinting at the sensorial modalities that are involved. The three areas established by the case studies are Telematic Art which is an established discipline, Global Awareness art which is a concept I constructed to show an idea visible in different works; and Transformation Art which emphasises the process of transformation of data. Transformation Art has historically been referred to as such, but contemporary contexts limit it to visualisation, or, as Stephen Wilson includes it into his very broad framework of *Information Arts*. (Wilson, 2002) This can be data from a remote place, but also local data which is indiscernible and for which we need technology to enhance our limited senses to perceive it. The important aspect in this transformation being that the abstract data is

transformed into a *sensual* experience. The term sensual is being used deliberately to emphasise the experiential and embodied nature of the experience instead of using the more neutral term “sensorial” which soberly refers to our sensory organs. Being transformed from a *cognitive* process to a sensual and embodied one. This transformation process is a potential artistic discipline yet used by practitioners mostly in relation to visualising or sonifying processes which we can most often be seen today in veejay-tools used for live performances by laptop musicians such as Max MSP or Jitter.¹³

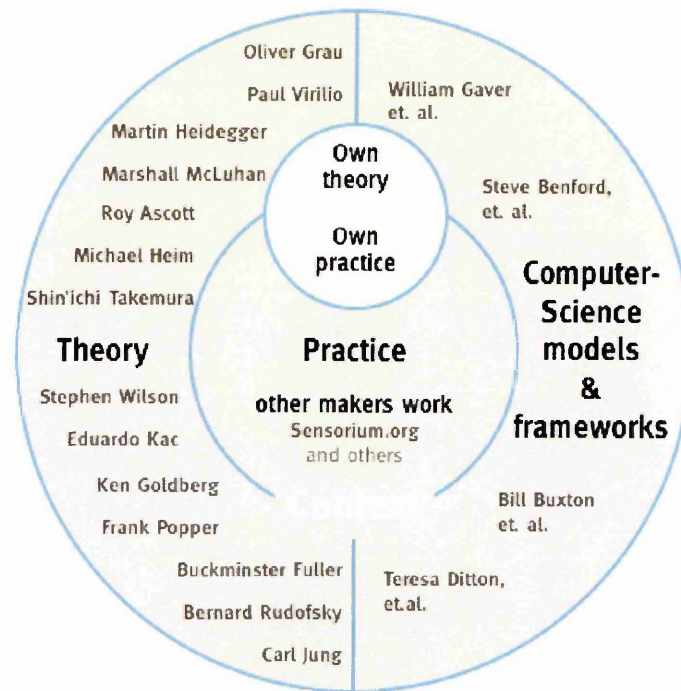


Figure 29: A system of methods for understanding, evaluating and analysing own work, work of others as well as participants experience of the immersive telematic artwork; Other researchers theory and practice from the epistemological-philosophical context which own work is placed in. The size of the “own”-field does not represent the role of own theory or practice in this research but emphasises the comprehensive context.

The case studies began with historical examples to circumscribe my definition of *enhanced experiential qualities* especially global awareness, holistic overview and feelings of interconnectedness and moved on to examples that show the difference between dialogical telematic art which factually is communication art where the process of communication becomes the art itself - and telematic art that connects a viewer or participant with remote places, some times resulting in an out-of-body experience. Theoretically this creates an area of telepresence which is not about going-there, or meeting in a virtual space, but *bringing there here*.

The different perspectives of HCI together with statements from art history and telematic arts, have provided a broad and comprehensive overview of the variety of views upon telematic art and telematic technologies. Together they create the framework of dimensions and paradigms that form the methodology for this research.

As this enquiry is based upon own experience and observations it is rooted in practice and began with initial questions gathered from visitors reactions of a 1997 experience with an interactive map:

These initial questions were:

1. Are the reactions observed related to Telepresence?
2. How is Telepresence defined and described by the computer sciences?
3. Is there a vocabulary or a visual language that helps us to understand the relationship between the spatiality and display technologies of telepresence systems? Or rephrased: Is there a method of displaying the relationship of the spatial dimension together with the sensorial modality at both places?
4. How are telepresence technologies applied in art practice?
5. Are there examples of art practice focusing on experiences of global awareness and holistic overview?

The insights gained through the contextual study allow us to briefly answer these questions.

The reactions observed were not literally based on Telepresence, but on related Telematic experience or, what art historian Frank Popper describes as “telematic awe” (Popper, 1997, 126). It is determined by its live character which emphasises the unique and fleeting moment of a live connection. Literally Telepresence refers to feeling present at a different location than the immediate physical surrounding.

As we have seen before, computer science’s views upon Telepresence are diverse. Some restrict it to the psychological phenomenon of leaving the local space behind when operating remote devices as described before. Other views do not insist upon the ability to *act* there, but simply receiving live data. The Telepresence phenomenon can be seen as a sub-group of telecommunications and telematics. In this more loose sense we could use Telematic experience or Telepresence experience almost interchangeably.

There appears to be no vocabulary or visual language that displays spatiality in relation to telematics. The example diagrams found are either about sensorial modalities and the medium (see Appendix V: secondary sources), or about effects of transportation and artificiality. Diagrams about the classification of multi-modal displays could not be determined. A desirable display showing here and there and the type of display technology did not exist in that form and needed to be developed.

Telematic technologies have been applied in art practice at least since the 1960s. Among the first works were live satellite video links, computer mailbox systems and telefacsimile machines. These early emanations can mostly be regarded as Communication Art as they allow people to communicate and this act of exchange becomes the work itself. Other areas of telematic art include controlling remote devices such as a robot to maintain a garden, interspecies communication connecting a plant and a canary, or controlling body parts of remote individuals (Kac, 2005, 180).

Experiences of Global Awareness, a holistic overview of the planet, play little role in the arts. Roy Ascott's rarely defined term "global consciousness" emphasises communication and exchange and sees telematic technologies as *"The very infrastructure for spiritual interchange that could lead to harmonization and creative development of the whole planet."* (Ascott, 2003, 75) For Ascott global consciousness is a stage superseding planetary awareness (Ascott, 2003, 217). At other occasions telematic arts are engaging with nature or natural processes and, for example raising an awareness for earthquakes or represent weather phenomena. Some have a focus on art that can be seen from space others include art taken to space. Examples that create a true global awareness experience are often functional applications. Among these are interactive globes that augment statistical data (GIS) or screen-based applications such as Google Earth that allow to zoom in and out from a macro level to palpable geographical features, thus creating a vivid sense of global awareness. One of the fascinating details is that they factually are a virtual 1:1 representation of the earth as a whole! A project trying to create a live global awareness experience was Al Gore's Triana project in 1998. Gore had the idea to position a satellite in space sending a near-live picture of the planet to a dedicated HDTV television channel and the Internet (Campanella in Goldberg, 2001, 32). The satellite was built but the project was never realised.¹⁴

As these initial questions have been answered and the methodological framework is established we have to find the adequate methods to gather and analyse the data.

The practice-based part of the research consisted of making a software application, both as an instrument to create a theory of people's experience, and as a work of art in its own right. The instrumental aspect attempts to gain an understanding of participants experience of the telematic properties of the Radiomap application. To get an account of the experience in participants own voice a qualitative approach seems most appropriate.

A variety of qualitative methods were considered, some of which are commonly used in Computer Sciences respectively in HCI. Among these were Case Studies, Task Analysis, Use Cases and Activity Theory, as well as Action Research and Grounded Theory.

Task Analysis (Preece, Rogers, Sharp, 2002, 231) has a broad perspective including the context in which the behaviour occurs and is most suitable for goal oriented, *discreet* applications consisting of menus and tasks. They often imitate real world workflows. This was not applicable as there are no goals to be reached by completing several tasks. It would overly stress the concept of a natural, unencumbered interface to control an explorative, *continuous* and experiential interactive environment. Also, there is no skilled behaviour necessary to engage with the application, one of the requirements of Task Analysis.

Use Case analysis (Preece, Rogers, Sharp, 2002 226), is not strictly a methodology and not qualitative. Use Cases consist of a notation system, or an *extended description model* in the Unified Modelling Language (UML), and are a common means to determine requirements and operations of software applications in a step-by-step narrative. It would be applicable but has difficulties describing a real-time system that is not command based and where are no complex task to be fulfilled as the interaction with the application is natural and explorative with very reduced and limited possibilities of interaction. There are little or no procedural steps following each other on the *interaction* level. Use cases also give little insight into participants experience but rather give a programmer an insight into the processes of the application.

Activity theory is based in practice and tries to understand the unity of consciousness and activity. It tries to describe people and artefacts in their context, situation and practice (Nardi, 2001), how artefacts mediate between people. In recent years it has been successfully used in HCI to understand and improve complex applications and how people perceive them. It also gives an understanding of how people engage in tasks. In that respect it relates to J.J. Gibson's theory of "affordances" (Gibson, 1977) or "task analysis."

Nardi states that the main concerns of activity theory were “*consciousness, the asymmetrical relation between people and things, and the role of artifacts in everyday life.*” (Nardi, 2001, 11) This includes tacit knowledge, skilled behaviour and all the social activities that surround them. This approach works well for software solutions that are based upon activities which occur in everyday life, in a culture and engagement with other participants, such as going to the post office, buying stamps and sending of a letter. This approach is interesting for understanding social activities and modelling these activities into different tasks of a transparent application but it does not appear appropriate for understanding how people use and experience an *existing* application of very low interactivity. In Radiomap people collaboratively explore the map and listen to radio programs.

Action Research is an established informal method that is successfully applied in education, medical sciences and lately also industrial design and HCI (McKernan, 1996). Action research is grounded in practical action and reflection and can include participative elements (Baskerville, 1999). Elliott describes its aims as: “*the study of a social situation with a view to improving the quality of action within it.*” (Elliott 1981 in McKernan, 1996, 3) While Baskerville describes its key assumptions as: “*1. social settings cannot be reduced for study, 2. and action brings understanding,*” It usually involves a spiral method vacillating between stages of action and critical reflection with the aim of better understanding an existing (social) situation. The strength of action research being that the researcher is often participating in the activity, attempting to understand, analyse and intervene in the situation, often together with the participants. The gained knowledge can usually be applied immediately. This process can include grounded theory elements as the study of the situation is *grounded* in observation or other data. Action research is particularly well suited for studies in the field together with users engaged in a specific task oriented activity. This could consist of observing the use of mock-up models or prototypes of artefact and applications. Applying action research in this study could have been an interesting task to use and iteratively improve the application together with participants. This would have given interesting insights yet not a clear, documented record of how people actually experience it. Primary task of this research is less that of improving a social process or the function of an artefact but its primary concern lies in understanding the multifarious stages and narrative of experience as perceived by participants of an existing software application.

The iterative improvements would also have required extensive time in both implementation and recurring field studies and required a different scheduling of the research process. Action research with participant involvement could be a potential method for the further development of the Radiomap environment.

Ethnography (Preece, Rogers, Sharp, 2002, 359) (Yates, 2004, 140-141) can be seen as another qualitative method that involves observation and interview techniques yet is more descriptive than analytical. Its aim is to understand people's needs, experiences, viewpoints and goals. It is grounded in fieldwork and the researcher being immersed in a particular *culture*, for example a business's culture. The phenomena to be investigated may be selected by members of this culture and not by the researcher. The researcher requires an informant to introduce him to other members, which again lead to new informants and build up trust in the community. Ethnographic methods include in depth follow-up interviews (Patton 1987 in Genzuck, 1999, 2003), observation, photographs, copious field notes including own feelings, experiences and thoughts (Genzuck, 1999, 2003). They may also include group discussions, material collections and different types of observations from observant to different stages of participative. Usually the setting is in the field and not an experimental set-up. The strengths of Ethnography is that the researcher is participating in the culture and thus acquires intimate knowledge of peoples goals and needs. From my impression this is not the adequate methodology to engage in the study of the interactive environment as I am interested in the reception and perception of the effects of the software application. Most visitors are and will be first-time users only and they may not always know their collaborators. The aim of this research is not about understanding the culture around people and the interaction but analysing and understanding individuals perception of the novel experience. Ethnographic methods, as described above, may be useful, especially interview techniques, observation, memos and note-taking.

For understanding participant's experiences with the *Radiomap* application a strategy that incorporated an adapted Grounded Theory approach seemed best suited. *Grounded Theory* is a type of qualitative research that often includes interviews and observations. It uses a prescribed set of procedures for analysing data and constructing a theory out of this data. The theory emerges out of the data itself, while the questions are informed by the *phenomena under investigation* (Yates, 2004, 201-210). The phenomena under investigation being the enhanced experiential quality of the *Radiomap* application, and how people perceive its use. Among the enhanced experiences we are interested in are

those of *global awareness, holistic overview of the world and feelings of interconnectedness* and which properties of the application constitute them. The framework for cues of different perceptions is largely based upon the dimensions and theories we have encountered in the HCI theories above, such as *transportation, spatiality, presence and immersion* among others. The interviews are first transcribed and then coded in three different steps. It begins with Open Coding followed by axial coding and continues with the process of selective coding, followed by developing a theory that emerges from this process.

The process of coding is open and the themes emerge from the data. It is later in the process that relations to the HCI concepts and dimensions as well as own hypotheses are made. Although the interview data may appear constricted, as the experience is not completely open and the result of interaction with an interactive application I created, it covers the range of experience, the phenomena, that the research is interested in. The data is very rich and in peoples own voice. The interviews are semi-structured and open-ended. Initial questions were clear and distinct, while the majority of following questions served the task of keeping the conversation flowing and allowing visitors to express themselves.

In the *open coding* process visitors replies are *coded* into general themes which give evidence of the investigated phenomena. These general themes can refer to an experience such as “emotion” or “perception” and how it reappears from interview to interview. As the process is open and the data rich the context and circumstances in which themes appear often allow for other significant themes to emerge as well. Often it is this neighbourhood that provides crucial and interesting, sometimes contradictory, evidence in the next step of axial coding. Conditions emerge in their relationship to categories.

Axial coding begins after general themes and categories have been identified and new patterns stopped emerging at this stage. The axial coding process then tries to learn more about each category, examines its context, relationships to other categories, their conditions and their consequences. Here the context becomes important and similarities or differences between the experiences of different persons. Patterns and relationships within the data begin to emerge through thorough and repetitive examination of the text. Categories begin to get refined and finer. These patterns are giving new insights into the concepts behind categories and create meta-patterns of peoples variety of experiences with the application.

The following *selective coding* process links the categories connected by the emerging meta-patterns. This process creates a rich narrative of participants experience and its diverse stages. This narrative allows to develop a theory of experience grounded in the original data in peoples own voice, forming a broad and comprehensive picture of the different aspects of peoples perceptions.

A valid Grounded Theory approach is usually a field study that gathers data about an environment from the people that live in that environment. In this case this environment was an artefact, a software application that I created. I conducted semi-structured interviews to gather data about *specific phenomena*, about how it was perceived and also to gather data concerning *general phenomena* of the overall experience. All patterns and categories emerged from the data itself in visitors own voice.

The methods chosen are participant observation, note taking and open-ended semi-structured interviews applied in an adapted Grounded Theory approach (Yates, 2004, 201-210).

The adapted Grounded Theory approach consists of:

- analysing other makers work informed by theories and concepts from the computer sciences and media arts to understand approaches towards telematics, telepresence and related areas
- developing diagrams, adopting terminology and models from these approaches
- creating an immersive telematic work as an instrument to test hypotheses
- observing participants and note taking
- conducting semi-structured, open-ended interviews
- data analysis, developing and refining concepts of experience from participant's own statements describing the experience
- creating a theory of the experience out of the data

Two studies will be conducted, a pilot study with the screen-based version and a main study with the interactive environment version of the application. Both studies involve participants that will be observed during, and interviewed after they used an application. These interviews are transcribed and systematically analysed bringing insight into key concepts of participant's experience of both, the screen-based version of the application and the unencumbered immersive interactive environment. This comprehensive com-

bination of applied research, contextual analysis and HCI and art history concepts informed the development of methods and their strategic refinement and allows for a grounded theory to emerge from the data gathered in the process.

Studies in practice: immersive telematic environment

1: Introduction

This chapter consists of two main sections. It begins with an account of the conceptual and theoretical issues that Radiomap explores as well as the underlying thoughts behind the project. This account covers a diverse range of subjects including embodied experience, Telepistemology, radio programming, the sense of hearing, maps and their visualisation and the role of exploration and immersion in the shaping of the experience.

The second part of the chapter engages in the different aspects of practice. It begins with a detailed description of the software development, its affordances and constraints. Followed by two practical studies, one as a screen-based version the other as an immersive environment version of Radiomap, followed by the analysis of the data gathered from interviews with “users” of both applications. This chapter will conclude with reflections and evaluations of the artistic aims and background.

A short description of the software application

Radiomap is a photorealistic, interactive map of the world that allows people to listen to a selection of live radio programs from all over the planet. The immersive environment (Figure 30) consists of a large, photorealistic map of the world that is projected upon the floor of a darkened space, measuring 4 x 8 metres. The map is live, in the sense in that it gives a current view of day and night hemispheres, that is updated every five minutes. Once a person steps upon this projected map, an augmented ring element attaches itself to the persons position and physical movement, following her all over the map. This unencumbered interface is used to select the radio stations which are indicated by small red dots that blink upon the map. Once the ring moves within closer proximity to such a radio station the live broadcast begins to play. As no instructions are given, discovering the purpose of the application relies on exploration or observing other participants.

Most of the stations included in Radiomap have a strong local program format and rely on local news reports, traffic updates, talk radio and local weather conditions. The application is easy and intuitive to use. During the exploration of the map the visitor may become aware that it is 4 p.m., Wednesday afternoon in St. John's Newfoundland with sub-zero temperatures, and 9 a.m., Thursday morning and Summer in Sydney, Australia, both at the same time.

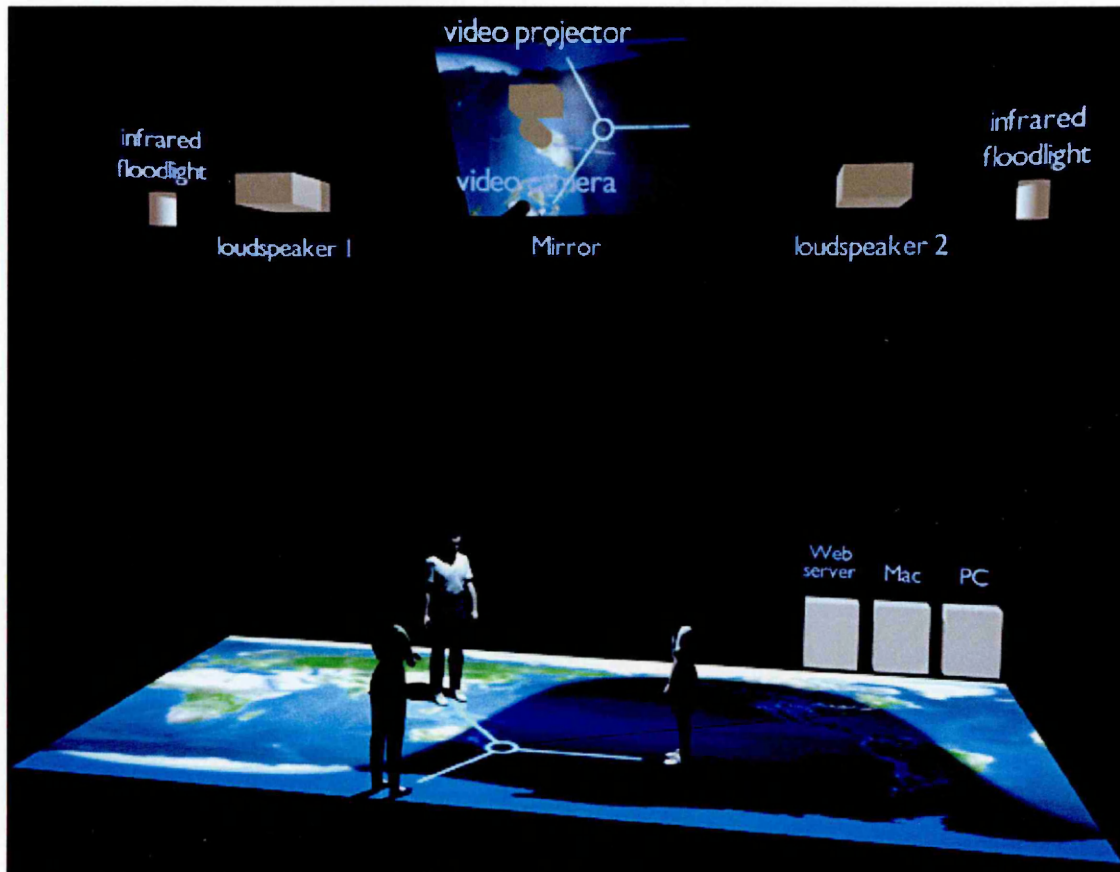


Figure 30: Three collaborating participants exploring the immersive, telematic environment version of Radiomap. The individual lines are connected with the augmented ring interface used to select radio stations.

These telematic characteristics of being so instantly live-connected to remote places all over the world creates a vivid live experience for susceptible individuals. The conjecture is that these broadcasts together with the unconventional, disorienting viewpoint of standing *on* a map image instead of merely being an observer, create Gestalt effects¹

1. Gestalt effect refers to the psychological phenomenon that we perceive forms that are arranged in a particular order, shape, size or colour as belonging together, in other words that the whole is perceived as more than merely the sum of its parts.

that enable participants to perceive the earth and other cultures from a new perspective. The aim is to create a collective and holistic experience of exploration, surprise, longing and belonging, mediating between the individuals in the installation and the cultures of the broadcasting places, creating an intense *Presence* and awareness that is expected to last beyond the active participation itself. In that it follows the ideas of Buckminster Fuller or Steward Brand in creating a sense of global awareness.

The software application exists in two different versions, as a single-person screen-based version and as an immersive, telematic environment that may be used alone or together with up to two more collaborating participants.

The screen-based single-participant mode of the application functions similarly (Figure 35) as the interactive environment. Again, the main interface is a photorealistic map but in this case it is navigated with a pair of crosshairs moved with a computer mouse.

Technically, the application consists of two components that run on two different computers simultaneously. The photorealistic map is rendered and updated every five minutes and accessible from the web-server, as is the database containing the details of the radio stations such as their position on the map, or the URL of the streaming radio program. The main application runs on the second computer. It loads the map and the list of stations during start-up from the remote server. While in the screen-based mode the interactive map is navigated with a mouse, in the immersive environment version it requires a third PC, which is running the video-tracking application. A video camera is filming the map from above and the application analyses these images frame by frame, sending the positions of participants walking upon the map to the main application via a peer-to-peer connection. Here participants position, speed and direction of movement is translated into behaviours of the augmented interface. The video tracking application and the main application are both created with, or part of Macromedia Director MX, the online database is based on PHP/MySQL and the map is created by the application xPlanet.

2: Conceptual issues the artwork explores

The philosophical implications and theoretical aspects that Radiomap engages in, take place in a historic context of telematic art and what may be called global awareness art. I have consulted texts by Heidi Grundmann, Frank Popper, Oliver Grau, Roy Ascott, Eduardo Kac, Ken Goldberg, Michael Heim, Marshall McLuhan, Paul Virilio, Martin Heidegger, Stephen Wilson and others. Their views upon media art and its relationship to communication art and immersive telepresence are taken into account* and have provided relevant insights into the practice and its history.

Radiomap is the first iteration of a prospective cultural exploration facilitated by an interactive map, once it has proceeded to a more advanced stage it should include multiple sensorial modalities. The general theme being a holistic experience of exploration, surprise, longing and belonging, mediating between individuals in the installation and the cultures or conditions of the place of origin. These connections take place on multiple layers and among the data under consideration are earthquake data that trigger actuators underneath the floor, weather conditions and temperature, but also statistical data such as birth rates or death rates. Together they should create an intense presence, an overview over the planet creating an experience of global awareness that is expected to last beyond the active participation itself. It reminds of a selection of instruments to probe global conditions that together should create a harmonious experience like an orchestra where every instrument has its purpose and voice.

The well known 2-dimensional image that the astronauts provided has now become accessible and visitors can explore it themselves in 3-dimensions. This is not comparable to the first hand experience of the astronauts but an embodied exploration of the 2-dimensional image they brought back with them. The cultural exploration includes both, the senses and the intellect, the sentient as well as the rational. Participants discover themselves, in a process of experiential self-awareness, their own culture, in the comparative view together with other cultures, through a sound-window into these cultures.

*. The scope of these conceptual issues is necessarily limited and focuses on telematic art. It does not elaborate on interactive globes, ubiquitous computing, mobile technologies, visualisation of GIS data or tele-embodiment as we see it in Second Life or similar technologies, although they are related in that they create a global or geographical awareness.

They perceive the relativity of their own culture while at the same time becoming aware of it. In that respect it reminds of a traveller who recognises and compares mundane differences in other cultures with an unbiased glance - and upon returning home retains this view for a while, recognising cultural idiosyncrasies he or she had numbed to. This view places one's own culture among many others while at the same time emphasising its uniqueness. What if the other cultures are not that different in days of globalisation? There, the other becomes perceivable with the senses, yet the exploration requires a cultural literacy, a literacy of maps. Without this literacy the experience will probably remain confounding and less vibrant. This is where the sentient and the reflective sustain each other in the creation of the experience.

It strives not for a *total* simulation that suffices for *going there* but creates something *going there* cannot create: the imaginative position of a careful observer, accessing and probing from a cool and comparative perspective into a vantage point of accessibility of multiple layers of experience upon a synchroptic global vista. When we go to a real place, we are there, we are involved, touch, smell and feel - and probably reflect upon the situation later. This artificial and selective perspective is not a substitute for being there and does not attempt to be. Its goal is to create a balance between sensual as well as cognitive properties; a distanced yet engaged encounter with multiple cultural foci. The engagement with these cultures may at some times be poetic and close and at other occasions superficial or banal. In the current iteration the experience depends to a large extent on the content of the radio broadcasts.

These live broadcasts are deeply embedded in our telecommunication culture and form the actual foundations of it. Most of the mass media such as radio and television are live or suggest to be. They have become part of the world we have grown up in, a world of disembodied voices and acousmatic¹⁵ spaces. We can regard these as telematic experiences but they are not perceived as such as their utilitarian ubiquity has superseded associations with their geographical origin. Radio receivers of the 1950s still emphasised the relationship between radio and geography by placing the names of cities on the tuning dials. Then the geographical location of a station was still associated with what it broadcasted. Today using the telephone, television, telefax or Internet to communicate or be entertained has become an everyday commodity in which the geography matters less than the content.

Radiomap attempts to make us receptive again to the engrossing properties of live information from remote locations by placing participants in a geographical context, engage their senses and give them a certain degree of control and to allow them to become immersed and involved in an embodied live-experience.

In Radiomap the artistic side and the designerly side are interwoven. The artistic side lays out the goals and meaning of simultaneity, cultural diversity, globalisation and holistic overview of the living world by telematic means, while accessibility, the user experience and transparency of the application are design aspects.

As such it is linked to the history of telematic culture which is heavily technology-led and requires a deeper understanding of the technical aspects of the devices and how they are used in the interactive exchange of information.

2.1: Telematic Culture, Telematic Art

What is telematic culture? What is telematic art? Telematics came into existence through modern technologies. All tele-technologies such as television, telegraph, telefacsimile, telephone and now the Internet converging all of these media, allow us to receive information from distant places and communicate with remote parties. Some times we receive information from a machine, at other times we exchange information with people and thus communicate actively. I am deliberately vague with my definition, as I think the difference between communication and information is difficult to make and determined by the media used, its synchronous or asynchronous character, the nature of the medium and the context it is received in. Radio, for example, is a one-way information medium but it communicates to us. Norbert Wiener, author of "Cybernetics," speaks of "messages" only, of messages exchanged between man and machines, between machines and man, and between machine and machine. He emphasises that "[...] *the theory of control in engineering, whether human or animal or mechanical, is a chapter in the theory of messages.*" (Reichardt, 1968, 9) Wiener's definition is about control which automatically requires a form of feedback channel. In the context of this thesis it is not helpful to adapt this model. Speaking that neutral of "messages," in this context is fallacious, as we use tele-technologies to exchange information with people, and these informations always come out of a context, are received in a context, have an owner, an agenda and a medium.

But back to the main question: Why did it take a longer time for artists to discover tele-technologies than it took them to explore film and video? Perhaps this was a combination of different reasons. On one hand technology was perceived as having little to do with art, technology was a means to an end and, for example, the work of engineers (Drucker, 1978). Most of the makers of the pieces exhibited in Jasia Reichhardt's London exhibition "Cybernetic Serendipity" were made by engineers or technicians (Reichhardt, 1968). Another reason may have been that there were prohibitive costs which are often mentioned by early telematic artists (Grundmann, 1984). On the other hand the telephone was ubiquitous and affordable. Stephen Wilson writes: "*Given the symbolic richness of the telephone, it is strange that artists have not done more with the technology.*" (Wilson, 2002, 489)

Lev Manovich also remarks more generally that telecommunication technologies did not inspire a new discipline as film or tape did: "*Despite persistent experiments of avant-garde artists with the modern technologies of real-time communication - radio in the 1920s, video in the 1970s, the Internet in the 1990s - the ability to communicate over a physical distance in real time did not seem by itself to inspire fundamentally new aesthetic principles the way film or tape recording did.*" (Manovich, 2001, 162) Manovich emphasises that tele-technologies did not inspire fundamentally new aesthetic principles as film and video did. But why was there no revolution happening in telematic art as it did in film? Perhaps this was a result of the numbing effect that McLuhan alluded to? The future shock effect? Or perhaps its utilitarian usefulness did not appear too appealing? If we compare this void to Gene Youngblood's 1970 book "Expanded Cinema,"* (Youngblood, 1970) an idealistic manifesto for the future of cinema and its

*. Interestingly the term "expanded cinema" had been used four years earlier by John Brockman in an interview with the New York Times on September, 4th 1966 conducted by Elenore Lester. Brockman was then coordinating events around the 'independent film' sessions of the New York Film Festival and speaks in an article entitled "So What Happens After Happenings?" of the "*expanded cinema*" world in which a film is not just a movie, but an Experience, an Event, an Environment. This is a humming electronic world, in which multiple films, tapes, amplifiers, kinetic sculpture, lights and live dancers or actors are combined to Involve Audiences in a Total Theater Experience. Unlike Happenings, which often involve audiences in complicated relationships with plastics, bottles, sacks, ropes and other objects, Intermedia Kinetic Experiences permit audiences simply to sit, stand, walk or lie down and allow their senses to be Saturated by Media. No Way Out : "You can't escape from an Intermedia Kinetic Environments the way you can from a play or any art form that

conflation with computer technology, there is no such manifesto emphasising the inherent artistic possibilities of tele-technologies in combination with the computer in a similar passionate way. This took much longer.* Perhaps the reason was that in employing tele-communications artists became facilitators for activities and were not in control. In film and radio experiments they were in creative control even if participants were involved. In telecommunication they stepped in the background just having arranged a particular situation of communication. The result is ephemeral and volatile. Nothing physical remains but photographs, film and documenting texts.

A tele-communications revolution in fact did take place over the past years with the proliferation of mobile technologies and media-conversion, yet this revolution is based on the different kinds of input methods, protocols and API's, technology led and often serves to inform and communicate. At other times it is a technological exploration that merges mapping and locative media in performative ways. It seems as if once a communication channel between people is opened the communication properties with all their social conventions completely captivate and immerse. Verbose and direct audio-visual contact appear to leave no space for critical distance. It is all here and now. I have made the personal experience that a telephone conversation can be close and intimate with a strong sense of presence.

reaches you through language," Brockman adds: "Their performances result from an awareness of the reality inherent in the new technologies. Their function is to make visible the perceptions of science. They use the environment as an art form, and have abandoned the notion of art as metaphor to deal with man in time and space." (The New York Times, 1966/09/04) The original term "expanded cinema" can probably be attributed to Jonas Mekas and grew out of conversations between Brockman and Mekas while the former was organising the Bowery's "Filmmaker Cinemateque" in 1965. Personal email from John Brockman on October 13th, 2006.

- *. Randall Packer created the "Telematic Manifesto" in 1999. It includes texts and quotations by practitioners such as Mark Amerika, David Ross, Marc Lafia and Yoel Slayton among others. It is available online at <http://www.zakros.com/manifesto> Ted Nelson's book "Computer Lib" and his Xanadu project, Rheingold's "Virtual Community" were about the application of computers and hypermedia.

I have never had this experience in a video-chat although it is *more* in the sense that it adds an image to the sound. Why is that so? It resembles more natural communication properties (though no true eye contact) than the disembodied voice on the telephone. It is an example where less is in fact more and perceived as of a higher quality experience.

The term *telematic art* was coined by Roy Ascott in the 1980s (Packer, 2001, 334) and is interpreted by Ascott in the sense of many-to-many interactions instead of one-to-one communication. This fact is also supported by the structure of Eduardo Kac's book "Telepresence & Bioart" (Kac, 2005). Kac a veteran practitioner of telematic art introduces a synopsis of his works in this publication. Most remarkable is the distinction he makes in this book between "Telecommunications and Dialogism" and "Telepresence Art and Robotics" both being introduced in two dedicated sections. Although both require very similar technical set-ups they are perceived as distinctly different by the audience: One being an experience of communication and dialogue for several people, the other an experience of remote agency and control for a single person. Both being two entirely different experiences. As most examples of early telematic art support this argument, beginning with Slow Scan TV (Grundmann, 1984, 83) projects, to Ascott's "Pleating of the text" (Grundmann, 1984, 59) we can argue that early telematic art was *communication* art, facilitating in one way or another *communication* among distant parties. The artists role moved, so Ascott argues, from that of an arbiter to the role of a facilitator, thereby changing the role of the viewer to that of a participant. The point of interaction is the *interface* which is determined by the artist and which predominantly defines participants experience. Such an empowered participant experiences an enhanced capacity of action and creative thought and factually becomes a collaborator in this process. Ascott emphasises collaboration, communication and collective interaction as the main aspects of telematic art. No participating visitor - no art. Packer and Jordan write about the projects of these days "*This collective interaction **between** viewers shares much with the Happenings of an earlier era.*" (Packer, 2001, 334).

Perhaps it is here, in the idea's of Happenings, where we find the reason why artists only thought of connecting people to people or facilitating agency among remote people: The essence of their work was to allow people to connect and communicate. What could be more exciting than to allow people to communicate and connected in novel ways? The technologies that were used in these events, tele-facsimile, the Sharp's mailbox network and Slow Scan TV, were rare and prohibitively expensive which may have contributed to the experience of using corporate, inaccessible business technology

in subversive and unintended ways. It took more time before exploring telecommunication media in other ways than to communicate gained popularity.¹⁶

Marshall McLuhan describes tele-technologies as an “*extension of our nervous system*” as we can see and hear people or events taking place on the other side of the world, as if they were present in the immediate physical space, a wilful suspension of disbelief they succumbed to. Together with modern transport, the train and the aeroplane, these technologies have not only made the world “smaller” in the sense that information and people move from place to place faster, an effect Marshall McLuhan describes as the “global village,” but is also perceived as an acceleration of culture. An experience of information overload that is registered as unnerving by many. During the 1960s more artists became interested in technology. Peter Drucker provides this insightful view about how the view upon technology changed during the 1960s:

“Enmity to, and disenchantment with, technology was the ostensible “cause” of the sixties and seventies. (...) But what went on in this decade only looked like “anti-technology.” Actually, the decade discovered technology. Until then technology was something that could be left to technologists. Engineers built dams; Humanists read Joyce (...) Suddenly, in the 1960s, technology was seen as a human activity; formerly it was only a technical activity, (...). Technology moved from the wings of the stage of history to which the “humanist” had always consigned it, and began to mingle freely with actors and even, at times, to steal the spotlight.” (Drucker, 1978, 245).

Three prominent occasions where they were in the spotlight were Jasia Reichhardt’s 1968 exhibition “Cybernetic Serendipity” (Reichhardt, 1968) in London and K.G. Pontus Hultén’s exhibition “The machine as seen at the end of the mechanical age” (Hultén, 1968) in New York City and Jack Burnham’s exhibition “software” in 1970, taking place also in New York City. The exhibitions included works by scientists, technicians and engineers as well as artists, blurring somewhat the boundaries between the disciplines. Scientists creating artworks and also artists applying science and engineering in their pieces. Many of the exhibited pieces were inspired by cybernetics and robotics, while the title “Cybernetic Serendipity” is directly referencing Norbert Wiener’s book “Cybernetics” which was published in 1947.

If we regard telephony, among telefax and television, simply as an exchange of data with a remote place in real-time, then since the early 1980s we have seen a great rise in artistic as well as professional applications of these data exchange projects. On one

hand there are near-live tv channels such as CNN but also video conferencing technologies used by companies that turn into large-scale video conferencing environments. The Internet enabling Collaborative Virtual Workspaces, increasing numbers of webcams all over the world, fax machines, live-broking websites and also medical out-patient applications, used for uploading the data of their pacemakers to their doctors via the mobile phone. More and more devices allow us to connect to different places in the world and pursue different tasks. Also often similar in their technical structure these application create different experiences for their participants. In an artistic context this includes attempts of inter-species communication (Kac, 2005) and also epistemological enquiry, questioning the authenticity of the remote data involved (Goldberg, 2000).

We see a multifarious discipline in which some practice focuses on connecting and communicating, while others emphasise geographical distance or explore the medium and our perception.

2.2: Experiences of interconnectedness, global awareness and holistic overview of the world in Radiomap

Radiomap investigates geography and live communication. It attempts to create an association with the planet, realising the own location upon it and perceiving the whole as a single complex system without political borders. To a large extent this includes a mental perspective, a change of a view of the world for an individual, where the participant feels connected with a larger macrocosm, a change of the relationship between self and world. A new paradigm of world-awareness, of *Weltanschauung*. For one part this new paradigm has been strongly supported by the space missions of the 1960s and the iconic photographs distributed by the media. Fritjof Capra describes this paradigm as “*an holistic worldview, seeing the world as an integrated whole rather than a dissociated collection of parts. It may also be called an ecological view, if the term 'ecological' is used in a much broader and deeper sense than usual. Deep ecological awareness recognises the fundamental interdependence of all phenomena and the fact that, as individuals and societies, we are all embedded in (and ultimately dependent on) the cyclical processes of nature.*” (Capra, 1996, 6) Both experiences, that with the Radiomap application and those outdoors in nature require thought, contemplation and imagination.

These experiences changed my view from a perspective of dislocated places to one of a “bigger picture” that encompasses the whole world, which is more than the sum of the places I know and includes one’s own geographical as well as cultural position in it.

This awareness is less the result of cognitive and rational thinking then placing this rational thinking in an emotional and irrational frame. The experience is multilayered and comprises geographies and distances as well as places, languages and cultures. It is rooted in the perception of self and the world. It is a view of possibilities or probabilities where the notion of local becomes relative and part of the whole system. To think is very different to experience, both seem oppositional polarities. I either think or I experience; which is a polar Western notion of one or the other.

Before we investigate the role of the global, we have to explicate shortly on the role of the self, the construction of reality and the world, and how this relates to the global awareness experience in Radiomap. We usually experience the world as separated from us, as an experience of one self, me, and an objective reality “out there.” Participants explore the installation and connect to the world “out there.” Yet, some theories suggest that what we consider reality is an active construction that we create ourselves. We can experience evidence for this idea in the multitude of optical illusions, the blind spot in our eye, and many other physiological illusions of our bodies,¹⁷ that make us realise how much construction is involved in our perception. Heinz von Foerster described this beautifully in the phrase: “*Believing is seeing*,” as opposed to the common phrase “*Seeing is believing*,” implying that perception is inseparable from action and that we actively construct perceiving the world. Wolf Singer, from the Max Planck Institute for Brain Research writes: “*The brain is a highly active self referential system that falls back upon innate (internal) knowledge; that, based upon stored information - genetical as well as those acquired during biological evolution - creates a coherent image of the world from the little that is supplied by the sensorial system. The brain creates models of the world, compares the incoming signals with these models and searches for the most probable solutions. Those models do not necessarily have to agree with physical reality - and in fact do not in many cases - , then it depends upon evaluating variables that are relevant for behaviour and beneficial for survival. It is of importance to be thereby as fast as possible. Our cognition is grounded in probability calculations and inferences.*” (Singer, 2004, 75) (translation by the author) We can only see what we already know, what we are ready to see. We expect to see what we have seen before. Only when this model does not work we actively develop a new one. Our perception of reality is partially correcting itself continuously. Once we have “recognised” something we stop actively seeing it. This may be one of the reasons why we recognise new buildings when they appear in the city, without being able to remember the building that

stood there before. We replaced (the process of actively) seeing the old building years ago with a memorised model of it.¹⁸ In some respect these aspects of human perception relates to Wiener's theory of cybernetics, described as "[...] *the theory of control in engineering, whether human or animal or mechanical*" (Reichardt, 1968, 9), yet in this extended notion we are not only looking outward at the world, but inward to the self and consciousness. Our self-awareness and consciousness is part of this reality we construct. There is not only evidence that we construct the world around us but also what we perceive as self. The perception of the world includes our own self-awareness. Ernst von Glasersfeld writes "*If the self, as I suggest, is a relational entity, it cannot have a locus in the world of experiential objects. It does not reside in the heart, as Aristotle thought, nor in the brain, as we tend to think today. It resides in no place at all, but merely manifests itself in the continuity of our acts of differentiating and relating and in the intuitive certainty we have that our experience is truly ours.*" (von Glasersfeld, 1997)

Humberto Maturana described this as autopoiesis (or self-creation), a bottom-up model that originally refers to a dynamic self-referential mechanistic model biology, but may also explain the construction of the world by consciousness together with the construction of consciousness itself, which form one system where structure and function are complementary (Maturana, 2005, 54-88).¹⁹ Of course this does not affect reality "as such" but only the way it is perceived. Reality as such does not exist independently from observers, creating their own realities. Every voice, every view is always that of an observer. From this perspective we do not share a completely objective reality. However, the experience of an environment and how we converse about it may shape our conceptualisation of this world and our socialisation and this may create the shared common ground of perception within cultural boundaries.

So how can we be sure that the world is the way we think it is? We cannot be entirely sure and there are many different ways of perceiving the world. Stanislav Grof describes how our consciousness and feeling of self can fundamentally change through altered states of consciousness when how we actively perceive changes. Grof describes these as holotropic states. Holotropic is defined as "*oriented or moving toward wholeness*" (Grof, 1998, 5) including the Greek word *holos* meaning *whole*, and *trepein* implying "*moving towards*." Usually the borders between us and reality, the world, are very clear and holotropic states change this in fundamental ways. Grof describes that we experience the world as "skin encapsulated ego's." We experience the world with our whole body from the perspective of a self and a world "out there." In a holotropic state

this perception of self changes and can extend beyond the skin and include things, such as this table I am writing on, or even other beings. An individual can see himself from the outside, identify strongly with an other individual, or even a group of individuals. These holotropic states give an idea of the many different ways of perceiving the world, and that what we experience as our self is merely one of the many different constructions our brain is able to create.

How do holistic overview of the world and the global awareness experience go together with the perception of a self? Does it require a self to *experience*? How much contemplation, reflection and self awareness are necessary for the experience? It sounds paradoxical, but perhaps we experience best when we are not aware of ourselves such as in peak experiences described by Csikszentmihalyi as flow experiences (Csikszentmihalyi, 1981). If we assume that holistic overview and global awareness experience is best achieved when people are *not* aware of themselves, but engrossed and captivated in the outer world that they are in a flow experience where they loose themselves. People again become aware of themselves when they are communicating with others, becoming themselves by mirroring themselves in others and begin to reflect and contemplate in phases or after the experience. With a combination of qualitative and quantitative methods we could measure participants physiological reactions and also interview them about their experience. This would allow us speculations of the different roles that *thinking* and its distinction from *experiencing* play in the engagement.

These speculations have encompassed cybernetics, psychology, consciousness, philosophy and technology. Martin Heidegger saw a foreboding of these methods when he proclaimed that the completion of philosophy was approaching with the advancement of the sciences. He wrote: "*The development of the sciences is at the same time their separation from philosophy and the establishment of their independence. This process belongs to the completion of philosophy.*" (Heidegger, 1993, 433) He continues that "*Philosophy turns into the empirical science of man, of all that can become for man the experiential object of his technology, the technology by which he established himself in the world [...]*" (Heidegger, 1993, 434) All our *speculations* about the world, the cosmos, consciousness and self may one day be answered through science and technology. We have just recently seen an example of science giving an answer of a philosophical enquiry in whether a person in a vegetative state does or does not perceive the environment. A question one could before only speculate about, without ever receiving a satisfying answer. In this case, a person in a persistent vegetative state was told by the re-

searchers to think of walking and playing tennis while being examined in an fMRI scanner scanning brain activity. The researchers found clear evidence of activity in the brain regions usually active in these activities, and thus evidence that the person was indeed conscious and fully aware of her surroundings while merely being incapable of communicating at all²⁰ (The Guardian, September 8th, 2006). We see how technology fundamentally challenges our perception of the world and that there is evidence for Heidegger's remark about the completion of philosophy. Looking at the global awareness experience in Radiomap and the holistic overview of the world we have to acknowledge that it is a combination of experiential qualities such as its telematic live-character, acoustic and embodied experience, which are supported by imaginative, reflective and contemplative properties combined. The artistic content of the piece alluding to the new paradigm of global awareness is a conceptual *suggestion* made by the artist. It may or may not be accepted by the participant who is creating the experience for him or herself.

But back to the history of the global perspective. When and where did this global perspective take its beginning? People have been exploring and travelling the oceans for hundreds of years and globes have been reportedly around since at least the 15th century, perhaps longer. Yet, with radio, modern transport and the telephone our perception of the world changed.

An early, hypothetical project was initiated by the Futurists F.T. Marinetti and Pino Masnata in 1933. The project “Drama of Distance” is sketched in a poem-like form and emphasises simultaneity and distance from a distinct perspective.

“Three Futurist Radio Syntheses from 1933” by F.T. Marinetti and Pino Masnata.

Drama of Distance

11 seconds of a military march in Rome

11 seconds of a tango danced in Santos

11 seconds of Japanese religious music played in Tokyo

11 seconds of lively folk dance in the countryside of Varese

11 seconds of a boxing match in New York

11 seconds of road noises in Milan

11 seconds of a Neapolitan aria sung in the Hotel Copacabana

in Rio de Janeiro

(Kac, 2005, 52)

The narrative collage created by the military march, the tango, religious music, folk dance, a boxing match, road noise and a Neapolitan aria lasts 77 seconds. In this written and abstract form it creates a picture of diversity of culture and the different atmospheres at different global locations while gaining its effectivity by creating an idea of synchronous events, a live-experience which emphasises the unique moment that cannot be repeated. It juxtaposes distant simultaneous events. But it stays cold and abstract - not involving us in the cultures or geographical distance. It is a narrative juxtaposing the incommensurable reminding of a Dadaist sound poem. The image that is created is less one that emphasises a global perspective and interconnectedness but one that haphazardly draws one into an (imaginary) acoustic space without reference or control. In fact the actual sound collage might be less interesting than the knowledge about the live-connection, its imaginative quality. It is comparable to the - nowadays banal - experience of switching from one tele-vision channel to another which also is not about geography and most often not dominated by its live-character, but about entertainment. And were one has a choice. Yet the “Drama of Distance” was less about the content than about its transcontinental technical feasibility of instantaneous connection.

2.2.1: Transformation and spatiality in Drama of Distance

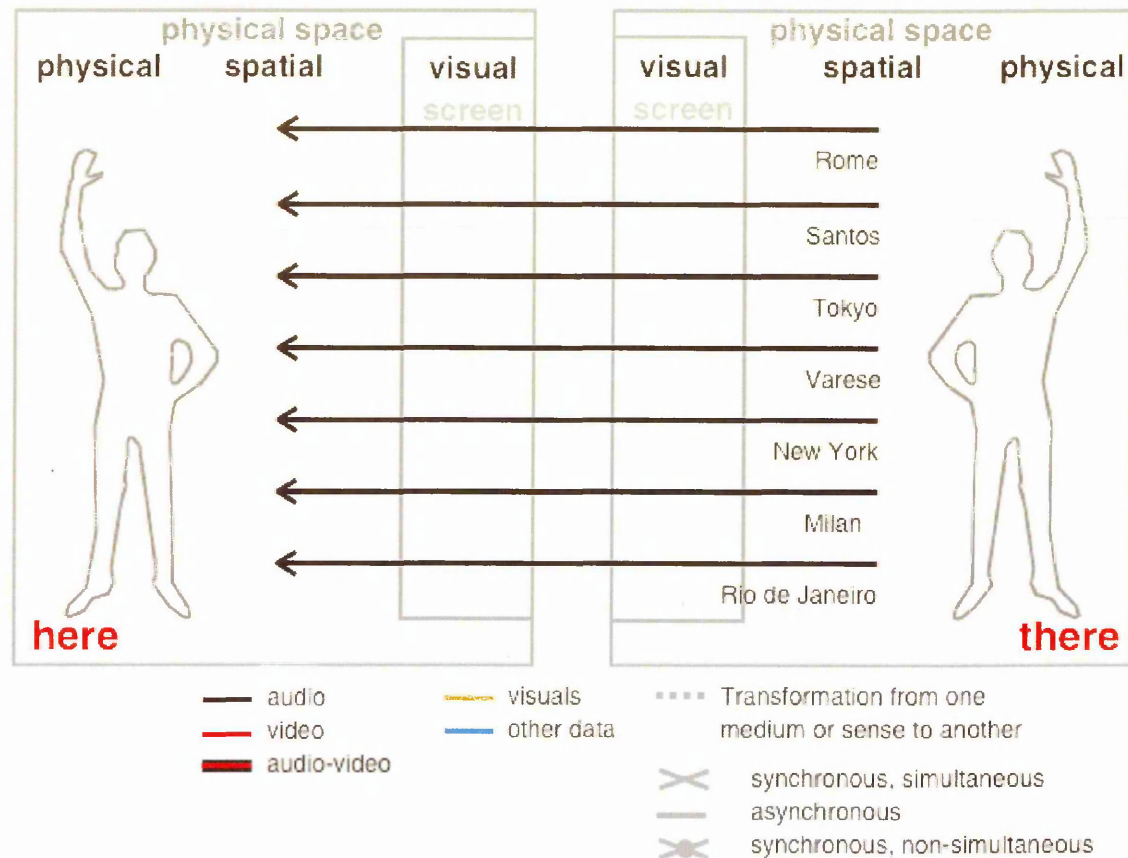


Figure 31: Transformation and Spatiality in “Drama of Distance” by Marinetti. Live-streams of audio arrive here from 7 different locations. The diagram depicts spatiality and transformation, both of which are not of relevance in this work. It does not depict the successive order of events each lasting 11 seconds.

In Radiomap participants also tune right into other cultures but they experience this in geographical relations that provide the necessary context of orientation, and they can inter-act, in the sense that they exert an embodied degree of control in this visual as well as acoustic environment.

In 1873, sixty years before Marinetti Jules Verne wrote his “Around the world in Eighty days.” His fictitious Phileas Fogg travels physically around the world and the facilitators of these travels are the then modern means of transportation steamboat, steamer and steam powered train. It is a journey that symbolises man’s technical conquest of the earth’s distances by modern means of transportation. His traveller is not interested in the countries and cultures he visits, he merely has the goal in mind of circumnavigating the globe in the assigned span of time.

The route that Jules Verne suggested:

"From London to Suez via Mont Cenis and		
Brindisi, by rail and steamboats	7	days
From Suez to Bombay, by steamer	13	"
From Bombay to Calcutta, by rail	3	"
From Calcutta to Hong Kong, by steamer	13	"
From Hong Kong to Yokohama (Japan), by steamer	6	"
From Yokohama to San Francisco, by steamer	22	"
From San Francisco to New York, by rail	7	"
From New York to London, by steamer and rail	9	"

Total	80	days."

(Verne, 1872, 2004, 13)

In 1989 British actor Michael Palin followed the route that Verne's fictitious Phileas Fogg travelled in 1872. Palin took the time to experience the local cultures and writes how this *"journey around the world gave [him] a sense of global scale, of the size and variety of this extraordinary planet, of the relation of one country and one culture to another which few people experience and many ought to."* but also the experience of loss when *"each time looking at the map becoming painfully aware of the countries [he] didn't visit."* (Palin, 1989, 9) And adding *"Travel of this kind, travel when the hands get dirty, when contact is made, brought home to me how much we all see of the world on television and in the newspapers, and how little we know of it."* (Palin, 1989, 256)

Both examples, Marinetti's and Jules Verne's have about them a historical European²¹ perspective of conquering and subjugating the world by technical means and are less about cultures than about quantitative measuring. Measuring the precise time intervals that means of transportation dictate and the names of exotic locations. They both convey a spirit of technical achievement which is not concerned about the aesthetic and sensual qualities of circumnavigating the globe. Although about sixty years passed by between the work of 1872 and 1933, they both are very similar. Dry lists of successive place names connected by time intervals; A quantitative approach and intellectual exercise of, perhaps, armchair travellers? Another 60-70 years later we have Palin's emotional account where not the listing of exotic places matter but the journey as such, the complete, physical, aesthetic and sensual immersion - which could not be more different. Perhaps this is also a result of the fact that the photographs taken by astronauts of

the earth from space did not exist until then? The planet earth was an abstraction and mental exercise as not one person had seen it until then. It did exist as the ground beneath one's feet and of distances on printed maps connecting exotic places. The paradigm of the global perspective, global awareness did not exist until then.

Today we can experience live information from remotest corners of the world all day long through the television, the radio and the Internet (the latter merging both media on a very personalised level). But again I see this as taking place less in geographical relations and real space than in the narrative accumulation of worldwide *events*. *It is a flat succession of events* without personal relevance and context that is passively consumed. Paul Virilio refers to this as the loss of the horizon which is substituted by an electronic horizon, the screen (Virilio, 2000, 66) He also emphasises the loss of geography: "*Here no longer exists - everything is now!*" (Virilio, 2000, 122) While television is passive and pushes its imagery towards the recipient, Radiomap allows people to choose their own speed and level of engagement, allowing for a higher degree of selection and critical and reflective action. The radio programs may still be commercial or mundane but they are placed in a different context and have become the focus of an interaction, and not an ambient background sound for other activity. In Radiomap the participants have a horizon in the sense that they are immersed in the presence of the experience with the interactive map. The live radio programs they can choose are displayed in their geographical relations surrounded by their neighbouring stations. Music and languages are embedded in their geographical context and their current state of day or night all of which provides a sense of context, control and comprehensive graspability.

Among the software applications that take this sense of control further are Google Earth,* Earth Browser** or the Geosphere*** globe, all of them interactive 3D models of the earth and not physically immersive. Google Earth and Earth Browser are screen-based and allow for seamless zooms from a macro level that shows the earth as a whole, all the way down to a micro level displaying an neighbourhood or house. Although they are not perceptually immersive the interactivity creates a different state of consciousness, a different way of perceiving the world, even if they only give an enhanced sense of distances, proportions, relations and directions of towns, countries and continents to each other. Other applications**** emphasise Buckminster Fuller's original Geoscope

*. Google Earth is an interactive computer based application, a 1-to-1 model of the planet earth made from satellite imagery and elevation data. It allows the user to seamlessly zoom in and out of this spherical model of great detail and even embed own data as map overlays and GPS paths. Google Earth has been created in 2005 and reminds of Terravision an installation created in 1995 by Berlin based company Art+Com to embed and augment distributed GIS data. <http://earth.google.com>

** Earth Browser is an interactive application with a low resolution model of planet earth as an interface. It was first released in December 1999 by Matt Giger and allows current cloud overlays, weather data, webcam images, earthquakes and data from volcanoes to be augmented over the main model. It gives a limited live experience of the earth as a result of showing the night hemisphere, clouds and current weather data. <http://www.lunarsoft.com>

*** Geosphere is an interactive installation which is not screen-based but an interactive globe over six feet in diameter. It allows to augment different types of data such as population distribution, weather, political boundaries, energy use, waste disposal, plate tectonics among others. The project was initiated by Tom van Sant in 1990. The original idea was conceived by Buckminster Fuller in the 1950s as the Geoscope. A computer controlled sphere of 200 feet in diameter for Roosevelt Island, NYC, close to the United Nations.

****. Among these applications are the Buckminster Fuller Institute's own "Earthscope," a screen-based application that uses layers of maps and GIS data to allow people to model, connect and communicate <http://earthscope.com>; NOAA's "Science on a Sphere" project that augments GIS data onto a model of the earth at <http://sos.noaa.gov/>; the product "Magic Planet," a spherical screen connected to a computer that allows to display and animate data as real-time weather, earthquakes and others, at <http://www.globalimagination.com>; "OmniGlobe" another spherical screen technology augmenting data visualisation of Earth by ARC Science Simulation at <http://www.arcscience.com/omni.htm>.

idea of augmenting statistical data upon a model of the globe. These have educational and scientific purposes and allow to visualise complex sets of mostly scientific, data that are animated over time and give palpable insights into otherwise dry statistics from continental drift to global warming and migration. Earthscope and similar applications also allow to communicate, collaborate and develop models for trends and future scenarios such as biodiversity and human impact upon the environment.

Not everyone regards this perspective as positive. Philosopher Martin Heidegger said in an interview in 1966 that the images of the earth taken from the moon had scared him and compared their negative potential of uprooting people from the earth to that of the atom bomb. He emphasised that it was no longer on earth where human beings lived today.* (Heidegger, 1976) While writing about the dangers of technology he emphasised that technology also contained within itself the *saving power* the possibility to use it to save and reverse dangerous processes. He did not anticipate that the image of Earth from space, a result of sophisticated technology, would exactly have this effect of a saving power. Several sources, among them Krausse (1998) and Brand (1999) are convinced that once this image was published it had several powerful effects upon western societies. Among these triggering the anti-nuclear movement, the worldwide environmental movement and was also the initial moment for James Lovelock's Gaia theory (Lovelock, 2000) developed while he worked for NASA in the early sixties. It appears that in the moment we become aware of the uprooting, a reflective counter reaction is already taking place, a moment of awareness we often see in the arts, a change of perspective or paradigm after which we cannot move back to the old view.

The initial idea behind the Radiomap environment is less didactical then experiential. Its aim is not to increase knowledge but to create an implicit insight and awareness, a change of attitude which may become evident in the data analysis of participants utter-

*. Martin Heidegger said in the 1966 interview published posthumously in 1976: *"Everything functions. That is exactly what is uncanny. Everything functions and the functioning drives us further and further to more functioning, and technology tears people away and uproots them from the earth more and more. I don't know if you are scared; I was certainly scared when I recently saw the photographs of the earth taken from the moon. We don't need an atom bomb at all; the uprooting of human beings is already taking place. We only have purely technological conditions left. It is no longer an earth on which human beings live today."* (Heidegger, 1976)

ances. Participants engage in an embodied, cultural exploration which is less about accuracy of data than about imagination and a sense of locality. The exploration itself is innocuous, the interaction basic and functional, yet the synchronoptic juxtaposition of the multiple *live locales* mapped all into one space, the variety of languages, dialects, seasons, times of day and weather conditions allow participants to come to conclusions on their own. The number and diversity of the experienced cultures may be perceived as a certain relativising effect upon the the own culture while also emphasising its uniqueness in this context. It is intimately familiar - and yet one amongst many. The experience of listening to radio programs has functional and informative sides to it but in the global dimension of Radiomap creates a different context for deeper insight and contemplation, combining the rational with a physical and embodied experience.

2.3: Telepresence and Telepistemology: How can we trust remote data?

Much of what we know about the world reaches us through media. It is as if we lived in two different worlds. The *personal world* of our immediate physical surrounding, of our homes and friends and local town, and the *media world*, all the places out there we have never been to represented to us by television and other media. While our immediate physical world is perceived as continuous and a whole - the world presented by media is necessarily incomplete, at times haphazard and disconnected. Throughout our lives we have been exposed to these two different worlds. But what happens if we ourselves can get involved and physically influence the state of a situation far away? How can we trust that what we experience is really taking place and not merely a simulation? We are developing strategies of trust-building, approving authenticity and scrutiny, have learned to look for clues which approve or disapprove the factuality and trustworthiness of mediated experiences.

This is what takes place in Telepresence set-ups which create an experience of being present at a remote location. In 1996-97 Ken Goldberg created the installation "Telegarden" in 1996-97 that enabled individuals to control a robotic arm over the Internet to plant seeds in a small garden at the Ars Electronica Center in Linz. The individuals connected over the World Wide Web to the robotic arm, watered their plant and watched it grow. Several visitors to this garden questioned the validity of the experience and doubted that the garden existed at all. As a result Goldberg (Goldberg, 2001) began his enquiry into Telepistemology. Epistemology being the philosophical discipline of hu-

man knowledge and cognition, tele- meaning distance, so telepistemology being the study of knowledge acquired at a distance.

This distance does not have to be a physical distance, it can also be a distance in the extended sense of not being accessible to our senses. The instruments that extend our senses include X-Rays, the telescope, the microscope and all those other instruments we use to become aware of hidden or otherwise inaccessible aspects of our reality. Most of these tools apply to our visual sense and are imaging technologies that are heavily computer mediated. This mediation process has been designed in detail by humans, who decided what we see and how it appears to us. For example satellite images are heavily processed before they look as “natural” as they do. How do we know that what we are seeing is truly depicting reality? To use McLuhans phrase of communication technologies as the “extensions of our nervous system” we can ask with Goldberg: *“How do I know this is real?”* How can we trust information that reaches us from an unnatural distance and how can we prove its authenticity, when what we experience does not originate from our own senses but we rely on extensions of them?

In Radiomap the external data are radio programs that begin to play when participants pause over a certain location on the interactive map. But how can they be sure that what they hear are in fact live radio programs from those locations? They cannot be sure but have to trust and be critical of the experience.

The stations used in Radiomap could be recordings and not live, playing stereotypical local folk music instead of radio programs. The programs could be live - yet from a different location somewhere else in the world. The only possibility for participants is to be vigilant and listen for evidence that allows for conclusions regarding the time of day, season or other objective local and external factors supporting evidence for its authenticity that would be difficult to simulate. These do not only have to be based upon speech. Musical formats often are chosen according to time of day. Areas where it is between midnight and early morning usually play melodious and non-rhythmical music in the early morning hours. Together with the day and night display of the map that allows for speculations about time of day. These indicators support the live-character of the application and were the main criteria for their inclusion into the maps database. Mostly stations with a local “flavour” such as local news, weather and traffic reports were included. Music-only or national stations were avoided if possible. Other technical trust-building signals of authenticity, similar to that of grainy amateur video, are the expected

or perceived, static that disturbs the streaming radio quality. We can assume that the further the geographical distance to the station the more disrupting static is not only tolerated but even expected and makes the experience more believable, authentic and real. Depending on participants experience also the time-span between initialising the connection and the beginning of the sound could play a major role. The further the geographical distance to a station, the longer one would expect to wait. Vladivostok, one station in part of the Russian Federation close to Japan usually plays within a fraction of a second. A fact that I personally always perceived as surprising and very suspicious making its authenticity less believable.

Overall, part of the Radiomap experience is exploration, exploring what the experience is about and part of this activity is listening, reflecting and making deductions.

2.4: Hearing and Radio

Part of the Radiomap experience is about hearing. Our culture emphasises the visual sense upon the other senses and we live in a world that is dominated by images, hearing is to some respect a neglected sense (Berendt, 1991). Marshall McLuhan writes "*Until writing was invented, man lived in acoustic space: boundless, directionless, horizonless, in the dark of the mind, in the world of emotion ...*" (McLuhan, 1967, 48) such emphasising the former importance of the acoustic perception.

The English term *hearing* is based on the Old English term *hīeran*, based upon the German term *hören* (Onions, 1966) which is closely related to *gehören*, meaning to be owned, and *gehörchen*, to obey. When intensely listening to a musical piece, says Jessica Wahl an expert studying the relationship of the human voice, sound and its effects upon the human psyche and body, one belongs to the music (Wahl, 2003), one becomes one with the music. No comparable experience is possible by the visual sense, except perhaps the hypnotic effect of repetitive moving patterns such as fire or moving water that may captivate our gaze. While *seeing* emphasises the subject - object relationship hearing merges the two, to an extent one permeates the other, subject and object temporarily become one. As such we can regard intense hearing as an act of deeply involving with the other while letting it be what it is (Berendt, 1991). The German term for reason is *Vernunft* and has its origin in *vernehmen*, to hear; while *versehen*, literally to miss-see, means a lapse or oversight (Kluge, 1995). It seems that hearing is closer to reason than seeing, while seeing itself can be regarded as so unreliable that it is associated with an oversight or lapse.

While seeing delivers an instant 2-dimensional overview of our surrounding, hearing is a narrative, an ephemeral, volatile process that unfolds in time. The sounds that reach our ears are translated into “hearing” within the brain. Hearing creates an acoustic holo-neurogram inside the brain, while vision is delivered as a complete 2-dimensional image. *“The ear favours no particular “point of view.” [...] We hear sounds without ever having to focus. [...] Where a visual space is an organised continuum of a uniformed connected kind, the ear world is a world of simultaneous relationships.”* (McLuhan, 1996, 111) Hearing is a special sensorial modality in the sense that it is deeply related to what makes us human: speech. Not being able to hear and participate in the thoughts of others leads to a more drastic dropping-out of culture than a loss of sight does. Poet and writer Diane Ackerman comments on this: *“In Arabic, absurdity is not being able to hear. A “surd” is a mathematical impossibility, the core of the word “absurdity,” which we get from the Latin surdus, “deaf or mute,” which is a translation from the Arabic jadri asamm, a “deaf root,” which in turn is a translation of the Greek alogos, “speechless or irrational.” The assumption hidden in this etymological nest of spiders is that the world still makes sense to someone who is blind or armless or minus a nose. But if you lose your sense of hearing, a crucial thread dissolves and you lose track of life’s logic.”* (Ackerman, 2000, 175)

French physician Alfred Tomatis has done extensive research into the psycho-acoustic effects of hearing and developed a theory of listening and hearing (Tomatis, 2003) that is somewhat related to Gregory Bateson’s idea that the environment determines culture (Bateson, 1973). Georg Eska, Professor for experimental physics and author of a book about the physics and psychology of hearing writes: *“[T]he perception of sound depends heavily upon psychic factors. Much of what we hear we had to learn first. During this educational process we have been affected by our environment, our culture.”* (Eska, 1997, 159) In Tomatis’ Audio-Psycho-Phonology the way we listen, which is determined by our culture, fundamentally defines all aspects of being, perception and social characteristics of individuals. In his theory which he refined over the course of the 20th century the ear has three main functions: hearing and listening, spatial dynamics of the vestibular sense, and charging the body with energy, the latter being regarded as somewhat speculative, but nonetheless evident when we look at the urge of young people to listen to music, dance and the large global market that results from this practice.

Diane Ackerman writes that music, the playing of music can be traced down to earliest civilisations and was an emotional language, just as words were rational sounds for objects, emotions and ideas, music was the non-rational sound or language for feelings. She suggests that while words were arbitrary, as there is no relationship between the word and what it represents, music creates a more direct response and emotional state for the listener (Ackerman, 1990, 173). Lyricist Edgar Yip Harburg allegedly expressed the point: *"Words make you think a thought. Music makes you feel a feeling. A song makes you feel a thought."* These songs, words, music, language and feelings are the essence of radio programs.

"Radio affects most intimately, person-to-person, offering a world of unspoken communication between writer-speaker and the listener. That is the immediate aspect of radio. A private experience. The subliminal depths of radio are charged with the resonating echoes of tribal horns and antique drums. This is inherent in the very nature of this medium, with its power to turn the psyche and society into a single echo chamber." (McLuhan, 1964, 261)

In Radiomap all these intrinsic cultural properties of the spoken word and music come into play, yet they are not confined to one society but to a global echo chamber, the whole world represented in the interactive environment. Visitors participate in an acoustic cultural exploration with many cultures from all over the world. The listening experience is controlled by physical motion of the full body. Visitors encompass the map to its full extent in all directions. If they want to listen they have to pause and remain still. They are not only aware of their bodies but have to physically interact with them. The sound of a station playing is the feedback of this embodied interaction. Participants are drawn into the telematic space of the map, yet stay in the local space, being aware of their bodies. Maurice Merleau-Ponty about perception: *"My perception is [...] not a sum of visual, tactile and audible givens: I perceive in a total way with my whole being; I grasp a unique structure of the thing, a unique way of being, which speaks to all my senses at once."* (Maurice Merleau-Ponty cited in Goldberg, 2000, 58) In Radiomap this becomes an embodied listening experience.

This embodied listening creates an acoustic environment, an acoustic geography. The space represents the world filled with disembodied voices from certain places. We have different relationships with radio today. Sometimes we listen attentively but more often it may be an ambient experience; we do something else while we listen to it (Ishii,

1998a, 1998b) such as drive a car or converse with others. Historically its position was different. Joachim Ernst Berendt writes: *“Some of my older readers may remember how the radio got started in the 1920s: You’d sit in front of your little crystal receiver set - [...] delighted when you were able to identify music as music with all the squawking and scratching static. It was even more sublime if you picked up some stations from a distant country - snatches of Italian or Spanish works ... That is how my listening experience began. It was like a great adventure, an expedition into a strange land: an expedition by ear! [...] There is an entire generation that, as Austrian writer Stefan Zweig described it, found out about the world by listening to the radio, by hearing - and that in a state which Zweig called “drunkenness.””* (Berendt, 1991, 140)

Today this has changed and we associate radio more often with providing a background for other activities. In Radiomap this ambient signal becomes the focus of the embodied interaction, the centre of an activity. This acoustic space is represented by a seductive sentient map of the world that has no direct relationship to the context of the radio broadcasts. The map changes almost imperceptibly slow so there is little perceived visual dynamics. This lack of visuals remind of the live radio features and music concerts of historical radio where the family gathered around the receiver. These traditional receivers still had tuning dials that listed the names of the cities the stations were located in, thus emphasising the geographical relationship between the origin of the signal and hearing. In Radiomap this state emphasises the listeners receptivity and focus and he or she will be drawn into the radio programs and into the telematic geographical space. This attention results in a deeper experience, a recontextualisation of known radio formats, of the quotidian or mundane of one’s personal radio culture in the acoustic mirror of the foreign and unfamiliar radio cultures. Foreign languages and unfamiliar sounds received in a dark and immersive space. In that respect it attempts to renew some of this spirit and awareness of early radio culture. McLuhan writes about this primordial radio experience: *“If we sit and talk in a dark room, words suddenly acquire new meanings and different textures. They become richer, [...]. All those gestural qualities [...] come back in the dark, and on the radio. Given only the sound of a play, we have to fill in all of the senses, not just the sight of the action.”* (McLuhan, 1964, 264) This darkness supports the immersive state and enhances the presence perceived by participants and draws them into the telematic-acoustic space.

2.5: The map image

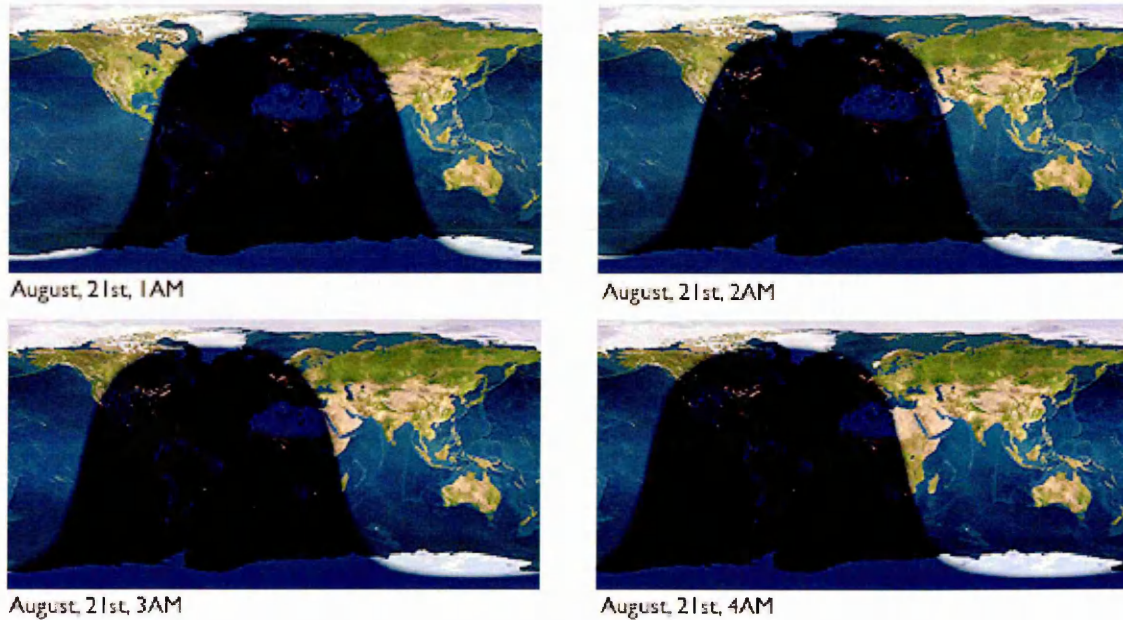


Figure 32: Four photorealistic live maps over the course of an hour's difference. The application updates the map in much finer intervals every five minutes.

Centre of the interaction with Radiomap is the large photorealistic map of the world participants walk upon. To use this map requires an understanding of maps to “read” it. Maps are a cultural convention and reading them has been learned over time, although visitors engagement with it seems natural and intuitive. Other cultures use different maps, and although the map appears photorealistic, suggesting that it is objective, it is not. All maps are political to a certain extent and have an agenda. With Europe in the middle it is European-centric, which is a historical view from the days European sea-farers travelled along the Latitudes to explore the world. There are multiple ways of mapping a spherical area into a plane, each with its own advantages and disadvantages, agendas and political points of view. Mark Monmonier, author of “How to Lie with Maps” even suggests that “*Lying with maps is not only easy, but necessary.*” (Monmonier, 2004, 13). Necessary because reality needed to be distorted to fit on a two-dimensional plane. Peter Turchi shows a variety of maps in his book “Maps of the Imagination” (Turchi, 2004) which, among others displays a map of the world upside-down, thus reminding us that our point of reference is relative as there is no up or down in space. These concepts require the experience of gravity, a fact that astronauts reminded us of. Other maps place the USA or Japan in the middle and some even Australia in the centre of the map with all other continents severed and truncated.

The map used is a traditional Mercator-projection and was chosen for its aesthetic qualities of natural colours, its high realism and attention to detail, especially its display of actual day and night regions distinguished by a relative darkness and city lights appearing in the night hemisphere.

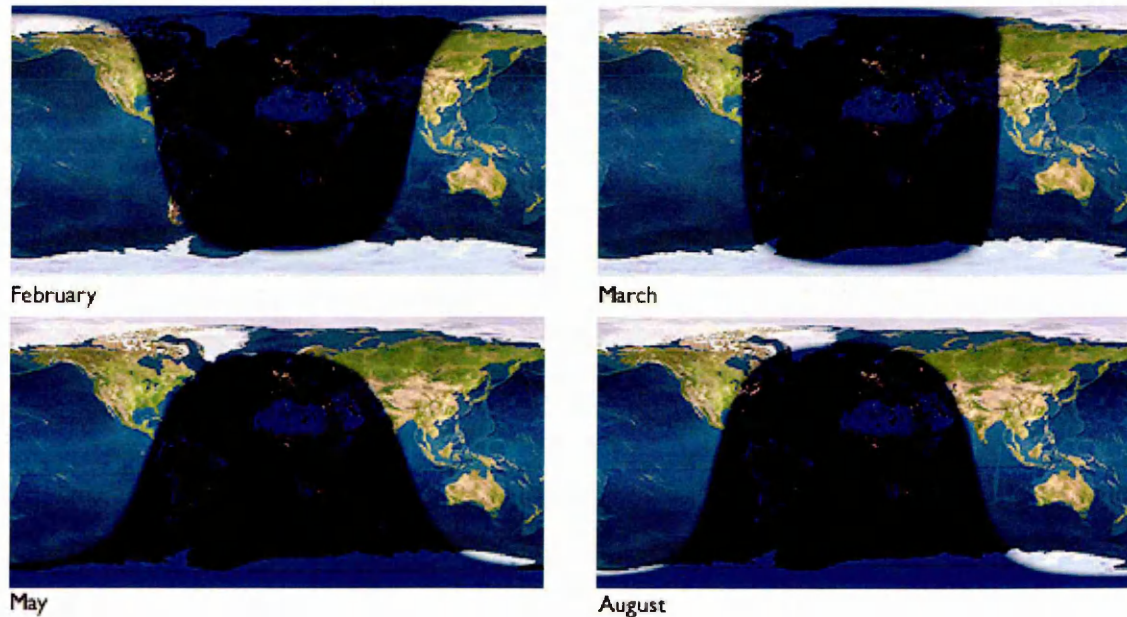


Figure 33: The photorealistic map using a Mercator projection. The day/night curve shows a distinct profile on every day of the year.

An other map would have been Buckminster Fuller's "Dymaxion one-island-in-one-ocean world map" (Krausse, 1999, 99), a projection method that results in almost no distortion and is equiareal, meaning the continents are shown in their true relative size.



Figure 34: Buckminster Fuller's "Dymaxion World Map" from 1954 (1946). The continents are shown as connected to each other, or as one-island-in-one-ocean as Fuller described it. The projection method creates less distortion than a Mercator projection. Figure 76 shows it in a simulated day-night view.

Albeit important for the project was the live-character not only of the sound but also of the map showing the night hemisphere, including city lights, in an animated form. The Dymaxion map with the continents placed in the centre as one-island-in-one-ocean looks very unfamiliar. The display of the night region would have added to participants disorientation of the already unfamiliar perspective of walking upon a map that appears entirely unfamiliar (Figure 76, Dymaxion World map with day/night accentuation). The conventional projection method that was used in the end proved to be beneficial as the “Dymaxion Map” may have been too confusing and required too much time for orientation. Walking upon a large map is a confounding experience especially if the map uses an uncommon projection method which would have required a longer time to get acquainted with it. The conventional Mercator projection was still useful because of its photorealism, aesthetic qualities, size and interactive properties are still unusual and thus create a novel experience for visitors. As the map used has a western-centric view it would be interesting to find a map that can be recognised and accepted by different cultures and used in another iteration.

Other methods could include projecting into a hemisphere that arches above the participants or a large interactive globe. The projection would be very immersive but would not allow for viewing the whole world in a synchronoptic overview. At any given time only part of the world would be visible and it would require a distracting interface to control the application. The interactive globe would be less immersive as it is not an environment but an object. It would be merely perceived as a tangible interface and has the same impediment that only part of the world surface was visible.

2.6: Exploration, immersion and collaboration

Exploration plays with the innate human element of curiosity and desire to understand, to learn. In Radiomap exploration can result in a moment of insight or a gradual process of developing a mental concept of the aims and the purpose of the interactive experience. Collaboration in Radiomap means to act together in the shared activity of controlling the interface and negotiating its use. The experience of immersion can be twofold in this experience. Firstly the space is dark, the large map the only visual point of reference and as people walk upon it they are immersed by this environment that is all around them. Secondly, this immersion also has a psychological aspect, being engrossed in interacting with the content; together with collaboration and exploration they constitute the main experiential qualities of the telematic environment. While interaction in

artistic work has been around since artists began involving their audience, collaboration among members of this audience has particularly risen in technological art. Here the artist is becoming the *facilitator* of these actions.

Creating an interface that offered a collaborative and communicative experience was a choice and part of the artistic concept. Instead of providing participants with headphones that would allow for a very intimate and personal experience of the radio broadcasts I regarded these as a too uncommunicative and solipsistic experience. Encouraging participants to collaborate and communicate was essentially connected with the concept of creating a global awareness experience. I expected participants to realise the relationship between the necessity of local collaboration in the interactive experience - and the necessity of global collaboration on a planetary scale. Bonnie DeVarco even titled a paper: "Earth as a lens: Global Collaboration, GeoCommunication, and The Birth of EcoSentience." in which she describes the close relationship between applications for visualisation and communication technologies. DeVarco states that Google Earth, mobile technologies and GPS together with the open file formats for Global Information Systems (GIS) create a generation of people that participated and were "location aware." (DeVarco, 2004)

At the heart of the experience of the interactive environment lies the combination of collaborative exploration, shared agency over the interface and its immersive telematic characteristics.

2.7: Telematic Art: the dialogical vs. the contemplative*

Telematic Art is a broad term comprising different artistic applications of telematic technologies such as Telepresence Art, Communication Art and Transformation Art.

Telepresence is described by Oliver Grau as "*unit[ing] three technological principles: robotics, telecommunications and virtual reality.*" (Grau in Goldberg, 2001, 226) We see the same principles applied in Telematic Art. Often a person or persons can manipulate the state of a remote object and immediately review this effect at his or her physical location. An example of this is "Light on the Net" by Masaki Fujihata (Kac, 2005, 81) from 1996, a webpage interface allowed to turn 49 light bulbs arranged in a matrix in a

*. The term "dialogical" has been adopted from Eduardo Kac (Kac, 2003, vii) who distinguishes between telematic art that creates a dialogue among people and one-way communication that, so James Elkins "speaks to a silent viewer."

japanese office building on and off while sending back a webcam image of the result. Communication Art uses communication technology such as telephones, tele-facsimile or email to allow the participant to collaborate and communicate with others; while Transformation Art applies a process that changes the form or appearance of a signal, often to another sensorial modality, such as from sound to an animated image. When this process involves an *unnatural* distance between the source of the signal and the location where it is perceived we may speak of telematic characteristics.

Communication art is essentially a social activity, and exchange between people facilitated over a distance by technical means. When we look back at early telepresence art we could say that it consisted mostly of Communication Art and in retrospect was dominated and led by technology and the novel technical advances of the time. It was less about content of the messages exchanged than about technology and the medium itself. One fact that enforces this idea is that if we look at the works today little of the excitement that surrounded the events remains and secondly, this particular discipline has disappeared while its technology has been utilised and adopted by large parts of society in form of mailing lists, web-based social networking tools or mobile technologies and it has lost its overall novel character. The following paragraphs try to present some clues for this assertion of “novelty led artistic practice” and develop some thoughts around them.

Roy Ascott's “The pleating of the text - a planetary fairy tale” (“La plissure du texte”) was one of the first events called telepresence art and consisted of 14 groups (some sources count 11, others 15) of participants based in Paris, Vienna, Hawaii, Pittsburgh, Australia, Amsterdam and other places around the world. Participants collaboratively wrote a story together over a period of three weeks. Each group/city was assigned an archetypal fairytale character and Roy Ascott started the event with the lines “Once upon a time ... ” from the main venue in Paris, the “Electra” exhibition. A group would begin writing a story over a day's course and pass it on to another group via the I.P. Sharp Computer Mail Box system. This group continued the story. Over the course of three weeks the narrative developed. If one looks at this story today it leaves little of the appeal and excitement it conveyed during the period it was created. Ascott says about this: *“The result was a huge Joycean collage, entirely unreadable of course, but the process of telematic collaboration was the real content of the piece.”* (Ascott in Popper)²² We realise that the work of art was not the story as such, but the context and the communication that led to its creation. The whole was more of a performance than telepresence.

As these technologies are commonplace now we may even say that this piece could not be repeated with the same effects upon the participants and audience today.

Art historian Frank Popper writes *“in this type of event, it is not the exchanged content that matters, but rather the network that is activated and the functional conditions of the exchange. The aesthetic object is replaced by the immateriality of the field tensions and by vital and organic energy. [...] Finally, the event activates a new phenomenology of virtual, deferred, or remote presence and evokes a feeling of the Kantian ‘sublime’, a sense of truly inexpressible awe.”* (Popper, 1997, 126)

This “inexpressible awe” seems to be created by the *new* technology that allows the remote parties to communicate in real-time from time zone to time zone. Robert Adrian, himself a Telematic Art pioneer, also commented about it: *“the content is the contact”* (Popper, 1997, 134). Ascott used this new global networking technology with the hope that providing the participating artists with a platform to easily connect and exchange ideas which would facilitate collaboration on a local as well as a global scale and would provide a “tangible immersive experience.”²³ Frank Popper comments on this: *“For Ascott, the art of our time is one of system, process, participation and interaction. As our values are relativistic, our cultures pluralistic, our images and forms evanescent, it is the processes of interaction between human beings which create meaning and consequently cultures.”* (Popper, 1993, 125)

Today this type of artistic event has almost disappeared and other telepresent properties are explored that make less use of communication than transmission of real time data of different sources. Technically, this is very similar yet its results are entirely different. Instead of connecting people with people, which is done via the mobile phone network and other technologies, people are connected with places - which leaves space for contemplation, awe and excitement. A fact indicated by the persistent popularity of webcams. Other telepresence pieces of that time included live audio-visual connections (“Hole in Space,” by Rabinowitz/Galloway among many others (Wilson, 2003, 487)). Again we see an example that when a channel is enhanced by a synchronous visible or audible channel that allows people to see and hear each other, its utilitarian communication qualities dominate. The imaginative or *contemplative* telepresence aspects are lost to the *dialogical* properties of the communication medium.

The telephone has a low transportation, physically we stay *here* while being immersed in the conversation.* A Videophone draws us out of this psychologically immersive acoustic inner space - and more into the telematic visual space of the screen. Depending on real-time characteristics, bandwidth and quality of display technologies the realism and thus probably immersion increases as well. As a result transportation might increase as well, in the sense that one loses the awareness for the immediate physical place to a certain degree, but as said earlier, communication channels between people will always dominate the geographical telematic characteristics. The space folds and becomes *Now*, while telematics as such do leave opportunities for reflection and contemplation, especially when they are non-dialogical or when no agency is involved requiring real-time responses. Ben Shneiderman says in a different context "*it's hard to speak and think at the same time.*" (Shneiderman in Thackara, 2005, 172-173)

Creating a dialogue was of course the intention of these early telepresence art projects. Communication, collaboration, exchange and talk, linked to the spirit of Happenings seemed perfectly suited for these new and expensive high-tech media usually controlled by corporations and now at the hands of subversive artistic activists.

It appears that when a technology is adopted by a discipline it reinvents its use and the early stages are explorations of the medium without a deeper understanding of its public impact or consequences. These explorations that are intermediate stages, develop the vocabulary of the medium over time. The harbingers of the technologies appears to make the experiments while the second generation is able to learn from these explorations and investigations and built upon it. It is difficult though to explore a clearly defined technical device that has constraints that are clearly outlined by its proposed use as a usable device. A fax machine is very specific and not as versatile and open as a brush, a tool with less clear constraints upon which skills and experience are built. A wooden stick can become a fire, a hobby horse, a part of a chair, but a fax machine will always only stay a fax machine. The constraints and affordances of a fax machine are very clear boundaries that limits its imaginative and creative use.

*. Experiencing the telephone is still an external event and only relatively internal. The difference between using a regular telephone and a binaural headset is fundamental. The telephone is a voice reaching one ear from the outside while a headset creates the hallucination right between the two ears as an inner voice, speaking from the inside.

The more specific the use of a machine is, the less flexibility it provides for creative misuse. The specific functions create the affordances and constraints.

“The pleating of the text” was a very successful piece with much media coverage and recognition of peers. Other pieces of the times were not, and Robert Adrian, also a telepresence pioneer describes his frustration: “*Adrian has adopted an extremely negative attitude towards the development of interactive and interpersonal communication between artists and non-professionals during the 1980s. He is disappointed that the revolution in this area, which was hoped for at the beginning of the decade, did not take place, partly because of the high cost of acquiring or hiring hardware, but also because of the attitudes of passive consumerism inculcated by late capitalist society.*” (Popper, 1993, 134) Now these technologies are available and ubiquitous - yet people use them in other ways. The Internet is used by programmers collaborating on open-source projects, social-networking, recommending books, people and products, mailing-list etc., all held together by strong bonds of mutual interests (Rheingold, 1993; Turkle, 1995). These have superseded the artificial romantic notion of communicating for communications sake and are held together by real interests. This shared interest in pets, parenting or open source software provides the necessary fundamental base for further bonds, resulting sometimes in personal meetings.

This is what takes place in Paul Sermon's “Telematic Vision.” It is not about geographies, here or there, but is drawing people into the screen, the virtual communication space, connecting people with people. In this work place does not matter. In the moment a telematic technology allows people directly to communicate with one another some hardwired critical mechanism in our psyche or perception breaks down. The awe inspiring unnaturalness of the connection that may be realised as such in a *contemplative* state stays behind the “*vital and organic energy*” (Popper, 1997, 126) of the *dialogical* exchange. The communication facilitating properties of the channel supersede the artificiality of the situation. People will use the channel to interact and communicate and the artificiality of the medium disappears behind its facilitating characteristics. The more *natural* this connection appears the more invisible it becomes.

An entirely different area of Telematic Art is the embedding of several sources of live one-way data which the Radiomap project does. One-way implying that there is no backlink or channel of response involved. The data is only passively received. It is mapped upon a large image and the interaction is unencumbered. In this case it is a geo-

graphical map involving multiple remote locations. This geographical mapping is not restricted to one specific region but encompasses the whole world. The live radio broadcasts are a communication medium, and the experience vacillates between the two states of that of a reflective observer and the “hot” cultural properties of radio which involve. Together with the live-effect they create a vivid experience of interconnectedness and immediacy. This is supported by the interactivity giving a feeling of control and transparency. Compared to the dialogical Communication Art it is passive and less involving, but its experiential elements include contemplation, reflection and may foster a state of emphatic awareness and interconnectedness with these places and cultures. Theoretically it is also possible to embed and transform other live data to the interactive map. This could consist of weather data, seismograph data, webcam images or international statistics which, for example, would allow comparisons of health, wealth among many others among countries. In these applications participants are not completely drawn into the virtual space as there is no agency at the remote place involved, there is no two-way connection allowing them to respond, and also no captivating, animated visual, a role James Elkins would describe as the “silent viewer.” (Kac, 2003, vii) Though it can create a lasting, deep and enhanced state of awareness of holistic overview of the world, global awareness and interconnectedness with the remote places.

2.8: Art, Design, HCI critique

“At no period of human culture have men understood the psychic mechanism involved in invention and technology.” (McLuhan, 1964, 300)

In Radiomap knowledge of art, design and HCI come together forming a coherent whole, each of them having informed theoretical, conceptual and practical aspects of the research project.

The artistic concept was about creating an enhanced immersive experience that allowed for a cultural exploration of an interactive map with radio broadcasts. This interaction should allow visitors an enhanced experience of global awareness and holistic overview of the world. Being technology dependent and computer mediated this task incorporated design as well as HCI aspects. It is located within the constraints of tools and resources that the technologies provide.

The design side of the project was practical as well as theoretical. It was mainly concerned about describing, sketching and outlining the look and feel of the interface, the structure and functions of the different parts of the software, and about the different

stages of the narrative of the interactive experience and the communication of these properties in an easy-to-use interface.

Additionally, it was concerned about a better understanding of the relationship between the effect of transportation (e.g. going there), the transformation of data and its spatial dimension. For this purpose, diagrams were developed that would help to grasp, display and thus comprehend how the technical layers of installations affected spatial and sensorial modalities and participants experience with them. From a certain aspect the usability of the map was an important aspect of its artistic expressiveness and explorativeness. The desired *experience* has to be dominant, and less the interaction with the interface. The interface should be intuitive to use and accessible as opposed to confounding and ambiguous. This can also be a meaningful experience but it was not a desired effect in this case. What can be experienced with the map is constrained by what the required technologies afford. For example, the scenario of having multiple stations playing at any given time while amplifying the selected station was not pursued for two reasons. It would have required an intensive workaround with the existing technology which does not support multiple audio streams, but was also rejected for artistic reasons as this would disturb the listening experience of an individual station. Assuming that this would have been perceived by visitors as too ambiguous.

HCI informed practice, theory, methodology and methods of the project. Practice-based HCI software development tools and workflows aided the building of the different modules of the application and communication with the programmer who was located in Hamburg while I was in Sheffield. HCI also provided theoretical frameworks of user-experience, concepts for interaction and collaboration which helped to outline them in the design process. They also informed the methodological side and methods. Qualitative methods such as conducting interviews, note taking and observation sheets were directly adapted from HCI and the Social Sciences.

Design and HCI have aspects that complement well and are closely related. Both are involved in finding answers to complex and intractable problems; the rich scientific knowledge informing design practice without turning it into a science (Bonsiepe, 1994, 125). The artistic objective in Radiomap requires a design solution which is specifying the overall factors of appearance and behaviour which include the softer and poetic sides of the artistic concept. These requirements are rooted in practice and making. HCI with its rich research history is providing the appropriate tools and theoretical frame-

works to organise, understand and bring together in an orderly structure the different aspects of designerly making and theory in this complex project.

Together they form an unusual construct, as an artistic undertaking usually* does not attempt to systematically *measure* the effectivity of a work or improve its performance, whereas in industrial design, interaction design or HCI this is about to become common practice.

In media art the situation is slightly different. For the artist the technology is the medium to express an idea. We can speculate that the environment, society, own experience and observations create the initial interest for engaging an idea with a particular technology. In some cases perhaps the selection of the technical medium for expression comes before the conceptual idea of what to convey. This can often be seen in *explorations* of novel technologies shown at venues. Unfortunately these are often not labelled as such when presented to the public and regarded as completed works of art. Perhaps this reflects upon the function of art in society, making aware of undercurrents, notions and change. The individual artist does not necessarily have to be consciously aware of his or her role as a catalyst or seismograph of society, simply living in this society and resonating to the circumstances. Creating out of this environment may result in intuitive responses and reactions that influence the work. These works are received by individuals of this society and each person creates his or her personal experience out of the encounter with it.

In some cases knowledge is necessary to appreciate the work. "One sees only what one knows" the saying goes. This knowledge may be the process of making or the context it is presented in or refers to. This specialist knowledge can also be seen as the greatest divide between the arts and the public. While in classical academic art the craftsmanship and style was an important criteria, contemporary art has a conceptual and contextual content where the idea may sometimes be more important than the medium or the technique.

*. Among the exceptions is Vera Molnar a pioneer in computer arts. She suggested in the 1970's to track physiological reactions of the audience including eye tracking to have a better understanding of how it is perceived and acquire control of the works effects aiming to improve them. (Popper, 1994)

In technological art we can see the two different views of craftsmanship and conceptual idea moving closer again. A specialist knowledge of making and electronics is required - and once the discipline matures - it is also the idea that counts. So how important is it for the spectator or participant to know how an interactive piece works? How transparent does it have to be?

While some artists build their own technologies from components or develop software applications themselves, others explore off the shelf technologies. While the latter still require good knowledge and hands-on experience even when emerging technologies become products. Both come from a legacy of exploring technologies and these explorations may initially be based upon curiosity and interest. Perhaps the same interest that society as a whole pays these technologies in form of products. Three among the many examples are art projects using the Quake 3D render engine such as Langlands and Bell's "House of Osama bin Laden" (Langlands, 2005), various projects that utilise multicoloured LED technologies since these have become affordable, or Levin's (et.al.) "Dialtones: A Telesymphony"²⁴ a concert arranged with the audiences mobile phones' ringtones. These projects explore the boundaries, are looking-under-the-hood or use technologies in unintended ways. We can relate that to an emerging discipline that is developing an aesthetic and a vocabulary that becomes more sophisticated and refined over time. In the beginning of such a new discipline public recognition is easily gained as there is no tradition or no apparent predecessors. Once such a discipline becomes more solidified and mature, its vocabulary developed, a tradition emerges which practice and theory build upon. At that point the technical novelty becomes less convincing as the audience numbs to this factor and the emphasis is upon ideas and conceptual content. McLuhan recognised this effect of numbing in 1964 *"It goes without saying that the universal ignoring of the psychic action of technology bespeaks some inherent functions, some essential **numbing** of consciousness such as occurs under stress and shock conditions."* (McLuhan, 1964, 265) (emphasis by the author) Oliver Grau compared this effect of numbing to an arms race of media technologies that need enforced stimulation in their successive iteration. Grau writes about cinema technologies: *"When a new medium of illusion is introduced, it opens a gap between the power of the image's effect and conscious/reflected distancing in the observer. This gap narrows again with increasing exposure and there is a revision to conscious appraisal. Habituation chips away at the illusion, and soon it no longer has the power to captivate. It becomes stale, and the audience are hardened to its attempts at illusion. **At this stage, the observers***

are receptive to content and artistic media competence, until finally a new medium with even greater appeal to the senses and greater suggestive power comes along and casts a spell of illusion over the audience again." (Grau, 2003, 152) (Emphasis by the author). An artist who intimately knows and understands the technology and is able to program and solder is in the privileged situation of being in control of the idea he or she tries to convey. The knowledge of the technology shapes his ideas, provides the vocabulary while its constraints provide the limitations he can challenge. These technical challenges remain unseen for the public but create the reputation among peers. In HCI and Design quantitative and qualitative measures try to steer towards successful completion of the project. Frameworks, guidelines and methods are published, shared and presented at conferences with the aim of feedback and transparency, reproducibility.

For some artistic undertakings an important aspect is the openness and accessibility of a technology or product, the possibility of taking it apart, "hacking it" - a way of understanding how it functions. Today this is becoming more difficult as technologies have become more complex and require special knowledge to understand them. Additionally not all companies that produce the technology agree with this tampering and regard their products as sealed black-boxes, not only advising against taking them apart but even stress and influence the legislator to prohibit this "misuse." We can see this in that some companies deliberately seal the electronic components of their products so that attempts to open them destroys them. As technologies become more proprietary taking them apart to understand them becomes difficult. Still, this tampering results in a skill and tacit knowledge of how things work, and as technologies hardly ever work as they should this provides also insights into their limitations. This knowledge results in more systematic explorations and more advanced concepts of art moving onto a different stage. Recently, perhaps due to the complexity of technologies, artists and computer scientists have begun collaborating, for example merging locative media with RFID or GPS and mobile technologies, thus creating platforms that push the boundaries with open technologies.

In Radiomap I am making use of several existing software modules. The map is created by an open-source application, as is the database, the Director platform itself is a developing environment, a plug-in plays the radio programs and the video tracking software is also a ready-to-use application. Using these saved time and effort, but also came with certain constraints. These constraints create the boundaries of what is thinkable, of what is possible. On the other hand ideas have always been under constraints - and even need

them - as they provide the necessary structure. The constraints essentially form the horizon of what is possible and create the limits for the work. It is within these often helpful boundaries that the freedom of expression is found.

Artists engaging in interactive arts also have to take account of media literacy upon the audience. Meanwhile certain conventions of interaction have established expectations that breaking is risky. Exposure to media art, personal computers at home, everyday use of public service systems and mobile phones has resulted in a tacit knowledge and expectations towards the behaviours and responses of an interactive work. Breaking these expectations that have become ingrained, requires knowledge about the *rules* behind these expectations as well as experience. Otherwise the results may be perceived as too ambiguous and confounding by the audience. The knowledge about these conventions and standards of interaction has to be learned and can be seen as knowledge on one hand, and as a craft or skill on another. Interactive art is drawing from this legacy as well. To a certain extent this is a paradox. If the artist is too adapted this knowledge of conventions and rules may restrict what he or she is able to conceive and prevent the development of radically new approaches. The other extreme would be ignorance of historical predecessors and the field and recreating something that had been there before. An intimate knowledge of hardware, software and interaction principles as well as an overview of emerging technologies is necessary for successful practice in the area.

Artistic approaches can also benefit HCI. Many artworks play with ambiguity, a trait usually considered anathema in design or HCI. Both, design and HCI, fulfil a *need* and try to communicate their message or function clear and unambiguous. William Gaver describes three different types of ambiguity found in the arts that can be of interest in designing interactive systems. He writes: "*Ambiguity of information finds its source in the artefact itself, ambiguity of context in the sociocultural discourses that are used to interpret it, and ambiguity of relationship in the interpretative and evaluative stance of the individual.*" (Gaver, 2003) Again, it is helpful to know about these concepts to explore them and these investigations are where the arts are strong. The results help to gain a better understanding of the relationship between users and interactive systems.

Over the past years I have visited a number of conferences that were truly multi-disciplinary and invited designers, artists as well as computer scientists giving the impression that there is an area gradually coming into existence where these disciplines move closer together. Possibly this is a result of the increasing complexity of projects which require larger teams.

2.9: My position

“[T]he artist should not speak to his or her audience about the natural world, but should instead use art to heighten the audience member's sensitivity to experiences of all kinds.” (emphasis by the author) John Cage quoted by Fred Turner (Turner, 2006)

The following is a discussion of the artistic aspects of Radiomap and its application as a work of art.

The designerly side of Radiomap dominates the artistic side on first glance. Its user interface and interaction is unambiguous, clear and straightforward. The design process makes use of practice-based workflows, concept-papers, rapid-prototyping techniques while the theory and conceptual analysis is aided by concepts from HCI. The result resembles a functional application and the question is where is the art in it? And what is the role of design?

Design is about giving information such a form that its meaning can be grasped as clearly as possible. In art the form is such, that the meaning becomes revealed during a process of engagement with the different layers of the work. I would say that the work of art is intentionally ambiguous to contain these layers of meaning, whereas ambiguous design would in most cases be regarded as detrimental. Decoding a bus schedule or vending machine instruction would be perceived as counterproductive or a game. Both disciplines may rely on comparable skills, methods and materials but have almost oppositional goals. Design usually performs the work of revealing for the consumer, the art encodes meaning - leaving the work of revealing to the consumer. Design gives answers, whereas art raises questions. While the designerly side of Radiomap facilitates the interaction, the main goal of the application is artistic; it is an application of design methods in the task of creating an aesthetic and awareness producing cultural exploration. To make visitors engage, contemplate and reflect about their experience. Radiomap enriches their curiosity and sensations by opening a cultural door to the world.

From this perspective it has a subversive potential that reveals itself through the engagement of a critical and reflective participant.

An important aspect that both, design and HCI provide us with, is that they are adding more and more *things*, products, to our lives. These things cost us time and awareness we could spend on something else. This is contradicting the original idea of technology of labour saving devices allowing to save time that could be invested in something more meaningful. Traditionally they do not have the interest to question our relationship with the technologies they make. The resulting artefacts that permeate our lives deeper and deeper, have the uncanny effect that they change our expectations towards things and the world; they form our expectations towards these products and the people that use them. While we think we do something with technology it is more that technology does something with us; a fact David Rokeby has written about profoundly in his 1995 essay “Transforming Mirrors: Subjectivity and Control in Interactive Media.” (Rokeby in Penny, ed., 1995); and we are not consciously aware of these changes as they happen gradually over time and we easily become accustomed to these changes. Art seems to be the discipline whose role it is to engage into an enquiry of these relationships. Who else would? Not the companies that produce the products, not the designers that develop them and neither the consumers that believe they need them. It is only the arts that can help us to become aware, and critically explore and question our relationship with technology!

Martin Heidegger wrote about how technology makes us perceive the world with new eyes in the sense that we begin to see *reality* from a perspective of quantities, value and use. That natural resources, seen through the eyes of technology are perceived as a *standing reserve*, a stock ready to be *consumed*. From forest and rivers to animals and fellow human beings. A term such as “Human resources” is just one example of this materialistic stance. Erich Fromm’s book title “To have or to be?” comes to mind ... (Fromm, 1976). This influence of technology fundamentally changes the way we exist in the world. As this process is taking place slowly over time it is barely noticeable and we are not consciously aware of it, while it clandestinely imbues our being. As a result it fundamentally changes *us*, who we are and how we exist. It is hard to imagine today in 2006, that only ten years ago, 1996, only a minority of people used the Internet and how most people spent their time different then.

We use mobile phones, order products over the Internet and chat with friends via Instant Messaging which are mostly useful and utilitarian activities. They have made solving tasks and communication easier and faster, both of which have become and end in themselves. But instead of saving us time that we can use to spend on more pleasant activities they seem to occupy more and more of our time then ever before.

Many thinkers have written critically about these changes that occurred during modernity, especially in the early nineteenth century. These critical voices were being raised for example, when the railways were first introduced. While generally comments of those days appear to show an ardour for progress, a refinement of culture and the tethering of natural forces, there were some conservative voices that criticised the speed of travelling resulting in a perceived acceleration of life. While the “Letter of invitation and prospectus” for the opening of the first German railway line between Nürnberg and Fürth in 1835 read *“Distances shrink with these means of transport and connectivity striving for the flight of birds, states and nations move closer together ... man takes more and more possession of space and time;”* (Borscheid, 2004, 119) (translation by the author) at the same time writer Theophile Gautier commented: *“By god, it must be permissible to proceed with small steps to follow ones reveries.”* (Borscheid, 2004, 120) (translation by the author)

Art historian and book collector Aby Warburg who equipped his library, the Kulturwissenschaftliche Bibliothek Warburg, now part of the Warburg Institute of the University of London, with the very latest technology available in the 1920s such as book elevators, telephones and a pneumatic in-house letter-shoot system (Stockhausen, 1991, 90), lamented that these technologies destroyed the space and thus the time to think and reflect, as a result destroying what he called *Denkraum*²⁵ (Warburg, 1923, 1988, 59), the space of thinking man had just wrestled from the mythical space of belief and superstition of earlier times.

While society of the mid to late 19th century was gradually imbued by these modern technologies, the telegraph between 1809-1865, public gas lighting* in between

*. These technical innovations were introduced at the same time that the movement of romanticism was most popular. Its stories of dark forests (ETA Hoffmann), its misty-eyed music and paintings of primordial inner landscapes appear like gestures of evanescence of a disappearing world. Art such as this could not have been created before such a perspective resulting from the revolutionary changes of technology and modernity.

1823-1900, and the train connecting towns, the arts reacted with the movements of romanticism and impressionism as a reaction to this change. Both capturing the moment of evanescence.

An early example of art critically depicting the relationship between technology and man was the sculpture "The Rock Drill" created in 1913 by artist Jacob Epstein in New York. The piece consisted of a masked man, resembling "*No humanity, only the terrible Frankenstein's monster that we have made ourselves into*" (Epstein in Hultén, 1968, 65) mounted upon and merged with a large, three legged rock drill in a way that makes it impossible to distinguish if the rock drill is controlled by the human figure or vice versa, forming one body.

Other critics of the modern changes were writers such as H.G. Wells ("The sleeper awakes" 1899, 1910) or E.M. Forster, author of the novel "Howard's End" in his dystopian science-fiction novel called "The Machine Stops" in 1909. Both appearing far ahead of their times. In this novel humanity is living underground, each person in an individual cell communicating with others only via telecommunication technologies. The "system" as a whole is run by a revered omnipotent machine that is taking care of all human needs. Mankind having become an extension of this machine.

In the last examples the artists criticised and warned of the negative influence of technology, Epstein depicting man as an extension of the machine, Forster as a happy prisoner of the machine. Both works depicting a loss induced by technology, a loss of what essentially is making us human.

In recent years computers have also resulted in increased advances in a wide variety of research areas such as genetics, nano-technology, chemistry and medicine. Every week there are findings that would have made headline news only a few years ago, but through the sheer quantity and complexity these spectacular developments are now buried deeper in the back of newspapers or published in magazines specialised in Geek news such as Wired Magazine. The role of the arts has been that of a seismograph, a reflective mirror of society's condition, the human condition. Some of these advances in technology are contentious and it should be the role of the arts to create work that questions and investigates these developments.

Suzie Gablik has a more radical perspective: "*Modernism above all exalted the complete autonomy of art, and the gesture of severing bonds with society. This sovereign specialness and apartness was symbolised by the romantic exile of the artist, and was*

lived out in modes of rebellion, withdrawal and antagonism. Talk of harmony, or fitting in, was anathema to the alienation of the artist. [...] Today, remaining aloof has dangerous implications. We are all together in the same global amphitheatre. The psychic and social structures in which we live have become too profoundly anti-ecological, unhealthy, and destructive. There is a need for new forms emphasising our essential interconnectedness rather than our separations, forms evoking the feeling of belonging to a large whole rather than expressing the isolated, alienated self." (Gablik, 1992, 5-6)

A completely different approach is taken by some designers looking for a new assignment. Their aim is neither reconciliation nor staying aloof but making us rethink our relationship to technology and things. After much research has gone into products over the last decades some products can simply be not made better, except that they save energy or resources as technology becomes more effective. This fact has led to many unnecessary changes or features in some products aimed at creating new demand in a saturated market. In 1996 designer Marco Susani called these products that are cluttered with features that no one seriously wanted *post-optimal* thus coining an appropriate new term (Dunne, 1999). Some designers have begun creating artefacts that do not solve problems - but ask questions, provoke and disconcert. The most prominent of these designers being Anthony Dunne, Fiona Raby and William Gaver. They have begun rethinking design and given it new challenges by creating ambiguous, critical and provocative artefacts. Examples are devices that visualise the Hertzian Space, the invisible radiation surrounding us in our everyday lives. Other works engage in topics such as anxiety, placebos and bacteria. Their works do not solve problems but question our relationship with technology. As designers they are accustomed with systematic enquiries, working with new materials, intractable problems, symbolic shapes and practice-based methods to test their theories. These investigations are rooted in the centre of our consumption society and touch upon various areas such as sociology, art, research, the sciences, among others, all employed in a critical engagement with what moves us, our relationship to things and technology in society today.

Until now these enquiries had been located within the domain of the arts. It should be here where society is made aware of technology's dangers, beauty and saving power. Does it have to become technological art to engage in these topics? Martin Heidegger wrote that the *saving power* of technology also lay within technology (Heidegger, 1977, 314). Art is an important reflective medium for society and culture and it is here where the saving power of technology may become visible. Not in the sense of warning about

the successive changes induced by technology resulting in snowballing advances in genetics, telematics, surveillance technologies and such, but by critically engaging with them. Allowing the audience to become aware, contemplate, reflect and engage and make their own conclusions. Recently, for example, we see a proliferation of artistic projects that use mobile technologies in combination with Global Positioning System (GPS). Most of these projects are technology-led and employ these technologies without a critical stance. Art is about this critical perception, a discerning view, evaluating, and involving; something Michael Heim describes as *virtual realism* (Heim, 1998, 44), a critically balanced view, located between a technological optimism, which was unrealistic, and technological pessimism which led nowhere as there was no way back out of the technological society. For Heim it is this position of virtual realism working on a critical balance between these two unsustainable perspectives.

Marshall McLuhan stated in 1964 that “*Technologies begin to perform the function of art in making us aware of the psychic and social consequences of technology*” (McLuhan, 1964, ix preface); but this awareness of the consequences of technology only occur to the conscious observer which is a difficult state to retain as we naturally tend to become blind to what we have become used to, it is not the result of an artistic expression. We only recognise change *after* it has happened. So McLuhan’s statement is very optimistic - and says little about the arts. Technology itself does not automatically make us aware of its consequences, but a work of art may do so. McLuhan later added an unusually critical remark: “*There is absolutely no inevitability as long there is a willingness to contemplate what is happening.*” (McLuhan, 1996, 25)

In that sense Radiomap is neutral at first glance. It functions and facilitates the interaction for participants. The artistic idea is to create experiences of interconnectedness and global awareness with an interactive map. Design knowledge and skills are applied to create a software application that intends to facilitate these experiences; While methods from HCI and the social sciences are used to analyse participants actual experience. The desired result is that on a deeper level of reflection and contemplation during the process of engaging in the telematic environment people, become aware of the multitude of cultures, voices, languages and musical styles. They will possibly gain a global perspective, become globally aware. This cultural exploration may lead them to their own culture - in the relativising mirror of a multitude of different and not so different other cultures. This cultural opening allowing for visitors to physically participate in a new dialogue with the world via Radiomap. It is here, to speak with Heidegger, were the

saving power may become an opportunity. The same technology that enframes, obstructs and accelerates our everyday lives, foreclosing becoming aware of what is really important is applied in Radiomap in revealing that we are part of this world and that we have to care (Sorge) for it (Heidegger, 1977, 314). This experience may root participants differently in their everyday world and enable them to perceive it from a larger perspective of an interconnected cosmos, not in an abstract sense, but as something they have become aware of themselves, a realisation in form of an embodied, “hands-on” experience. The artistic aim is to initiate for such a process of contemplation and reflective awareness by using the technology to allow for the process of revealing to take place. In that sense it works well for western visitors that view the world already from a technical and rational perspective.

3: Software development

3.1: Process model workflow: Concept, role, evolution, communication

The initial motivation to produce the *Radiomap* application resulted from experience with a similar application made in 1997 which is described in detail in 3.3. The unexpected reactions it received from the audience could not then be further explored due to lack of time.

The early conceptual phase for this research led to the insight that several iterations of the interactive application would be necessary to understand how participants perceived the experience. A pilot study that would provide a general understanding of the application, its functions and how it was experienced by participants, and a modified and refined main study that would provide rich data which could be related to each other. Live data from remote places, or telematic data, would be mapped onto a geographical representation, a map/image of the world. This data should be sensual and give a vivid impression of the location. Under consideration were weather data, webcam images, seismographic data and also statistical data, yet these did not provide the intrinsic, vivid cultural characteristics. Finally, repeating the 1997 experience, live radio programs were applied on the map to create the desired experience and to study the results upon participants, yet this time not in a screen-based demonstration but in form of an interactive environment.

In this phase of the research it was still unclear that these experiences related to *telepresence* or *telematics*, as telepresence was regarded as being about the psychological effect of leaving a local space behind and moving to a remote or virtual space while telematics were understood as controlling a remote device.

The artistic aim of the project was to create an experience of an *overview effect of the planet* and *interconnectedness* with remote places for participants. To create a vivid experience of an *awareness* of the planet. These intentions have been explained in more detail in chapter two. The research explored the understanding of the resulting experience for participants, their stages and requirements.

Which properties create the observed effects? From an interaction design view the graphical user interface (GUI) should be very simple to allow participants to focus on

the experience, and less on windows or menus. With such a simplistic and reduced interface the appearance of the map itself was of primary importance and should be very realistic and not display country borders or other graphic additions. It should also be of high realism and provide an additional live-character by displaying the current view of the day and night hemispheres. A colour coded political map would have provided a different experience. Clouds were undesirable as they would prevent participants from orienting themselves upon the geography of the continents and the lights of the populated places. The conventional Mercator projection did not appear too compelling as it does not accurately display the size of the continents and has a political-historical legacy of positioning Europe in the centre. The initially preferred “Dymaxion Worldmap” (Figures 34, 76) by Buckminster Fuller displays the continents in their true size but would have added an additional layer of complexity as a result of its unfamiliar geography and orientation. This effect, combined with the essential day and night view would have resulted for the audience in the necessity for constant re-orientation upon the interface.

3.1.1: Documentation of affordances and constraints

The requirements for the application were outlined in a concept paper included in the Appendix I. This method has proved very useful in my professional practice handling large projects in teams. It allows team members as well as clients to develop the same ideas and language about an application. During the process the idea is usually refined in different iterations as a result of meetings and conversations. The concept paper goes through an evolution from “rough concept” to “fine concept” that becomes more detailed and specific as result of discussions and meetings.

During my MA in “media design” this proved a reliable framework for outlining, specifying and articulating an application before the actual making began. Once the process of making had started this again would influence the conceptual side with changes and amendments being required either due to technical limitations which required work-arounds or insights won through engaging with the material. Still extensive hands-on knowledge and experience is requisite to formulate these concepts.

As a result of my own background of designing applications, experience and tacit knowledge I am familiar of the workflows of programming and behaviours and limitations of applications on different platforms.

My own skills lie in creatively developing interactions and communicating them in the form of sketches, written concept papers as well as visualising their behaviours with

flowcharts or 3D applications and schematic screen designs. A course in Java Networking was attended, yet, once the scale of the expertise necessary became clear, it became evident that experienced external programmers would be needed to accomplish the complex and diverse programming tasks.

First a competent colleague willing to collaborate in the research project had to be found. He was Stephan Huber, based in Hamburg, Germany, and one of the creators of “Sinnzeug” a semantic link browser. Stephan had graduated from the same MA course as me, sharing similar vocabulary and design background and had a significant history of projects done as a freelance programmer and designer for different companies, thus being very experienced in Perl, MySQL, Php, Macromedia Director’s Lingo, C++ and Java.

After initial conversations, official communication began with a “rough concept” paper outlining the functionalities of the application and a simple, non-functional visual of the application for demonstration purposes, expecting to result in a more refined version after feedback from the programmer. This *fine concept paper* was not necessary as the information the *rough concept* provided was sufficient to begin the implementation.

3.2: Documentation of affordances and constraints, detail

Main objective from the artistic side of this research project was to see if it was possible to create experiences of *holistic overview*, *global awareness* and *interconnectedness* for interactors. This included a straightforward setting with a geographical map and radio stations positioned on it. Visitors should report about their experience in semi-structured interviews in their own language. Asking the right questions and analysing their use of language would enable us to understand if and how effects of global awareness, global consciousness were created and how participants perceived the interaction, collaboration and the constraints provided by the interface.

One of the important requirements was that Radiomap should be easy and intuitive to use with very low complexity. Its purpose was less that of a step-by-step application but that of a seamless, continuous experience. The only “task” being to explore the map, discovering the stations and listening to the radio programs. It was assumed that the feedback provided by the interface was unambiguous enough to provide necessary affirmation and curiosity to continue the exploration until its function becomes clear.

Technical constraints vs. artistic requirements:

The following constraints are the result of my own knowledge and experience with the technologies involved, such as the hardware and software to be used, and my experience as a designer. They were taken into account while conceiving the artistic aims. For example, an artistic ideal is to have a station playing as soon as it is selected by a participant. In practice the process of connecting and buffering internet radio usually requires a certain period of time. This waiting period is taken into account during the design process as it is perceived as a frustrating experience by some people. The process of contacting and buffering is therefore made transparent to inform participants that the application is active.

- single and multiple user function to investigate experiential difference
 - only one radio station can play at a given time
 - more than three people sharing control will have difficulties controlling the interface
 - the direction of movement of a person determines the direction the interface points
- a station should stop playing when a person leaves
 - can result in interruptions when a person does not stand still
 - the stations “magnetism” attracting the interface has to be balanced with the “force” necessary to leave
 - the projection area has to be of a minimum size to accurately “connect” to locations
- easy maintenance of database regarding adding radio stations and properties
 - system has to be restarted for this update
- little interference with the map, unobtrusive interface
 - Environment: The colour, size, inertia, stickiness and “magnetism” of the navigational ring-element, its connecting lines and the attracting radio stations should be easily adaptable to different conditions of the space (size of projection, ambient lighting)
 - Behaviours of the navigational ring-element in relation to the tracking data have to be adaptable. This pertains to “keep alive time” for a lost person. “Agility” of the ring, how fast it updates to a persons position and how sensitive it reacts (jitteriness)

- it should be transparent when a connection has been made and when a stream is buffering, when the radio will start playing
 - four states of radio streams can be indicated: contacting, buffering, playing and error
 - an ongoing buffering process does not clearly indicate the time span when a station will begin playing
 - network traffic may interfere with listening experience and can lead to unintended interruptions

3.3: Making

This research is rooted within making and inspired by practice. Practice informed the theory, and the theory again informed practice. Together they are linked by technical limitations and feasibility. An iterative process of reflection and description. The idea for this research began with a browser-based version of the application made in 1997. This version was presented in public and visitors were not able to interact themselves. Their overall reaction to the piece was unexpected, enthusiastic and emotional and this observation triggered the interest which properties of the application were responsible for these effects.

First idea collection

The initial observations that led to the idea for this undertaking predated this Ph.D. program and were made in 1997. Then I created a screen-based application that used a map as an interface for radio live streams. This application consisted of a shockwave movie created with Macromedia Director 6.5 that ran embedded in an Internet browser. The map used was photorealistic (1800x900 pixels) and was a day-only map. To provide rich detail the map was only displayed partially and full screen. The map moved inverse to the mouse movement allowing for vivid interaction with the map. The cursor was replaced by two cross-hairs resembling latitude and longitude. Radio stations were positioned manually after using a script that translated Latitude and Longitude to the corresponding pixel positions on the map. Once a station was selected it opened in the Netscape browser in the background. Once a real-audio plugin became available the sound could be played and controlled from within the shockwave application. Conceptually this approach was mainly an exercise in mapping, an alternative to verbose and hierarchical organisation of radio stations. Other systems, for example, organised their directory of radio stations with written links. These forced the visitors to navigate from

page to sub-page beginning with their continental affiliation and moving down the hierarchy to an alphabetical list of countries on this continent and then another alphabetical list of cities. Often this included more than five clicks and required unnecessary efforts regarding orientation and navigation. It provided no element of surprise or exploration and was both unintuitive and unsensuous.

Mapping these stations onto a map was a clear and simple solution. It allowed room for navigation and at the same time gave a synchroptic overview of all the content available. Moreover it also provided a sense of geography; where cities are located. The radio stations have affiliations to cities which themselves have a geographical location and a distinct local culture.

A photorealistic map was chosen as an alternative to a political map of the world that portrays country borders and colours as it is not natural. This state of organisation is not visible on photographs taken from space and man made. Photorealism together with the night and day accentuate the live-character of the artistic experience and only available as a Mercator Projection from the external application X-Planet programmed by Hari Nair. The photorealism of the map also evokes an impression of a realistic view upon the world instead of a graphical map. The regular update enables a vigilant observer to literally see the lights of cities go on as the night hemisphere proceeds. They may recognise consciously, for the first time, that there always is a sunrise and a sunset taking place somewhere in the world in this very moment. This allows one to make connections between radio announcers references to the time of day and what is visible on the map. This synchronised loop of audible perception and visual affirmation contributes to the live experience of *Radiomap*.

Why radio?

In this research live radio was chosen to gain a better understanding of the effects observed in the 1997 browser-based version. Only local stations were selected as their mix of talk, news, traffic reports and local events provide a sense of locality. Pure music stations or national stations were only added to the database if there was no other option. The objective was to gain understanding of the enhanced experiential qualities in this phase while transformation of data would be considered at a later stage. Other data may be included once these experiential characteristics will be understood.

Web-based documentation tool

From the beginning of the research a website was considered an important online documentation tool, a means to disseminate proceedings, and report on the research process. Its structure should be flexible to a certain degree and be able adapt to the growing and changing interests and orientation that the course of the research would take. It is located at <http://hohlwelt.com/en> and is currently based upon the content-management system X-Siter on a PHP/MySQL database.

Process model for workflow

After the first, initial idea the first steps included sketches with annotations, suggesting size, functions and behaviours for the screen-based version. At this stage possible technical approaches were already considered. Once the idea became more concrete rapid prototypes were created in Photoshop with the map of the world as background and different versions of context-sensitive menus and their logic were visualised. In the next phase of rapid prototyping 3D walkthroughs were visualised in Cinema 4D a 3D modelling and animation application.

The application was described in a concept paper, a detailed outline of the functions, behaviours and general look & feel of the application with visuals, diagrams and functional descriptions. Outlining the skills necessary it became evident that programming courses in Java had to be taken. Attending a course in networking Java led to the insight that the scale and complexity of the project required more broader skills, expertise and experience then can possibly be acquired within the framework of the research. The project required experience with video tracking soft and hardware, database management and Java. Assessing the amount of time necessary to acquire some basic skills in Java and setting it in comparison with the research timeline led to the insight that a professional media programmer familiar with these technologies had to be involved. Discussing the situation with him he suggested to move from Java to Macromedia's "Director MX." This platform was not as potent and flexible as Java or C++ but avoided starting "from scratch" and such spending an unreasonable amount of time. Using "Director MX" allowed to make use of rich built-in components as basic TCP/IP capability, playing streaming audio of different formats, peer-to-peer connectivity, XML. External plug-ins provided video tracking functionalities. This realistic approach was considered less risky then starting a complex project "from scratch" with all unknown variables.

This media programmer implemented the main application and the database over the course of several months in his spare time according to the specifications described in the concept paper, sketches and rapid prototyping techniques (3D, 2D visualisations). The *internal structure* of the software and database were his decisions. The final days of the implementation included decisions of subtle and hard to communicate behaviours of the graphical user interface which required on the spot decisions and thus physical presence. This can be seen as an “agile computing” (Cockburn, 2001) approach where decisions can be made and tested on-the-fly and immediately be implemented - and reversed if necessary.

The process model for this workflow was standard professional practice. It consisted of traditional software engineering techniques as sketching, concept papers, exposés and included rapid prototyping techniques in 2D and 3D. All this information was exchanged over the internet via email attachments or Instant Messaging. A version control systems “Subversion,” and a bug-tracking systems were set-up as well. Subversion allowed to work on a daily basis with the “latest built” although being physically at different locations. Together with the - rarely used - bug-tracking and change request system it created a fluent workflow. The bug-tracking system was set-up once the application worked satisfactorily well. Due to the simple functionality of the main Radiomap application it was hardly used.

One the other hand the process model included also radical methods of software engineering as extreme programming and agile methods loosely following a spiral method. This method consisted of defining requirements in the written concept, sketching and rapid prototyping, defining software requirements, among determining objectives, alternatives and constraints. The difference to cowboy style programming was the window of opportunity (the programmer’s spare time between other professional projects) and a list of features and behaviours, organised in priority from essential to nice-to-have, that had to be implemented during this period. All other features and behaviours of the application have before been outlined in detail in the concept paper.

These detailed description included the indication of states of progress in the screen-based version (status bar) and the environment version (changes of opacity and colour of the ring element) as interference with the map should be minimised these states are indicated by sound (the default voice of the operating system) or indicated by changes of the colour, opacity and behaviour of the ring element and the lines that connect it to

the interacting person, respectively the cross-hairs used in the screen-based version.

The application is a lean client application and downloads all data from different sources on the net during start-up via TCP/IP. These communications are displayed in Figure 65. They consist of two main categories: those that can be edited and those that are passive and cannot be edited such as the streaming radio stations. Editable communication-types are the database with the details of the radio stations such as URL and geographical location, the URL of the map which is polled in regular intervals; and the passive video tracking application sending coordinates of persons that walk upon the map.

The first and only physical meeting during this project consisted of the integration of the existing modules with the video-tracking system. This integration overlapped during this process with fine tuning the more subtle behaviours of the environment's visual interface. This included among others, sensitivity, size of visual city indicators as well as the range and strength of their attraction-force, opacity and style of the ring element, its inertia and agility. These again had to be adjusted with the proximity sensitivity and range of the attraction of the radio stations. All these settings have to be adjustable. In iterative steps this had to be calibrated with the range of sensitivity of the video-tracking system. The video-tracking system used is a plug-in for Macromedia Director called "Track them colors Pro," TTC-Pro. It makes use of Director's own functions such as peer-to-peer connectivity via TCP/IP, uses the same coding-syntax and is otherwise also seamlessly integrated. Several systems such as BigEye, Cyclops and a video-plugin for the processing platform were briefly tested but none provided near seamless integration and usability of TTC-Pro. Due to expected performance problems it should run on a separate computer. Both systems, the video-tracking module and the responsiveness of the environments graphical user interface, are adjusted to each other to a certain degree. All necessary behaviours and functions can be set manually in an external preferences file. This implementation session consisted of setting the boundaries and frame of operation for the system as a whole.

3.4: Statement of ownership of work

I declare that this thesis comprises only my original work, except where due acknowledgement has been made in the text to all other materials. Although the application was implemented by an external programmer, it was programmed and implemented as conceived and described in detail in the concept paper found in the Appendix I.

4: Pilot Study: Screen-based application

The screen-based version of Radiomap was an opportunity to verify whether it was possible to create the enhanced experiential qualities, to gather data to understand which properties constituted these effects*, to refine the interview questions to be used in the main study and to acquire experience in conducting interviews. The observations made in 1997 with the similar but much simpler version of the application were mere observations made at this time and their relevance realised only later. No interviews were conducted and there is no record of the events. The Pilot Study with the screen-based application would allow to repeat these observations and gather data in a controlled setting. Should the results regarding the desired experiences be encouraging the direction would be pursued.

4.0.1: Review of pilot study conditions

The Pilot Study was conducted at Columbia University's Teachers College's (TC) Macy Gallery in New York City, between September 29th and October 15th 2004. The Macy gallery is located on the fourth floor of the Teacher's College which consists of several interconnected buildings. The gallery space is "T" shaped and consists of two connected spaces; A large main gallery with another room branching off. Both spaces are frequented by staff as well as students and visitors that have to cross the exhibition space to attend workshops, classes or tutorials. Tutors offices are adjacent to this main gallery. The exhibition was accessible from 10AM to 6PM. During the exhibition several hundred visitors, many domestic but also from abroad, had the opportunity to experience the screen-based version of the proposed interactive environment.

The application ran on a standard PC and visitors interacted with a mouse. Individuals could focus their attention on a 20" LCD display while surrounding spectators could follow their actions via a projection upon the wall (Figure 35).

As a result of disruptive noise from other interactive pieces nearby, headphones had to be provided to allow a more focused experience. Visitors tended to engaged with the application for about five minutes, sometimes longer if not pressured by the presence of

*. The pilot study was intended to be an immersive telematic environment, yet for site-specific reasons it was impossible to achieve the required size of the projection area. Therefore the screen-based mode was used instead.

waiting visitors. After providing a chair these times increased to 15 minutes with some individual visitors staying for up to one hour or coming back a second time. The responses made by people that engaged longer with the application could be described as emotional as well as grounded and thoughtful.

Being located on the fourth floor was very different than being located in a gallery like setting on the ground floor. Visitors were either based at Teachers College or very persistent participants of the conference that found their way to the gallery. Visitors had to show their ID and sign in at the main reception followed by the quest of locating the Macy Gallery on the fourth floor of a side wing of Teachers College, which consists of several interconnected buildings.



Figure 35: Macy Gallery, Teachers College, Columbia University, New York City

As a result of word of mouth during the last two afternoons of the exhibition it occasionally happened that there was a queue of visitors waiting to use Radiomap. This resulted in a change in the behaviour of people using the application. It shortened times of use as individuals felt pressured by the presence of queuing visitors. Where before people used it between 10 to 15 Minutes it dropped to less than 5 under these circumstances.

Only a very small label fixed upon a nearby wall mentioned the name of the application. To the best of the researchers knowledge most visitor's were uninitiated and used the application without any preconceptions. No instructions were available and no advice of use was given to any visitor. The exhibition setting with a monitor, headphones and computer mouse was invitation enough. This was intentional as the intuitive use, and exploration were thought of as conditions of its *experiential quality*. It was anticipated that part of the experienced quality was actually understanding and learning what the experience was all about. Three of the visitors clearly knew beforehand that Radiomap was about listening to radio programs but had not received any other information than that. The flyer repeated this information adding that it was an easy-to-use application. One hundred of these flyers were printed and about 50% of them were given to visitors after the experience. Several visitors mention how important the process of discovery was and we have a visible track of the importance of the aha!-moment in the interviews.

The screen-based version had a status bar indicating current processes of the application. These were contacting *server*, *buffering*, *error* and *now-playing [Radio X, Country Y]*. This was designed to provide sufficient transparency of background processes to forgive what would otherwise might be perceived as unresponsiveness of the application.

The interviews were conducted immediately after visitors used the Radiomap application, only a few steps away from the installation set-up so they had the possibility to point or gesture referring to the experience. A small hand-held Canon DV camera with a wide-angle lens was used to record the interviews. This camera was held in a comfortable, unobtrusive and relaxed position. No additional microphone was required.

4.0.2: Study focus

The pilot study had several foci. Firstly it should help the researcher to get experience in conducting interviews, to refine the question-strategy and to develop the ability to quickly recognise interesting leads and ask relevant follow-up questions. Secondly it was about gathering data, to understand if and how the application created the enhanced experiences. This included gathering data, giving evidence of *which* characteristics of the application created these effects. These results could also be used to improve functions and behaviours of the application as necessary. As there was no instruction given to visitors, their experience relied on exploration. One of the questions was if the subtle visual cues the interface provided functioned as intended in giving enough feedback and

transparency about the applications function.* This not from the view of their technicality but from an intuitive-use perspective. Is the application self-explanatory? Is the balance of constraints and degrees of freedom appropriate? Is the behaviour and feedback of the interface perceived as sufficiently clear? These were important questions as the radio stations were triggered by proximity of the cursor as the interactive environment also would have no possibility for any mouse-click events. How long does it take visitors to understand the interaction with the application? When do they discover the radio programs? Do they experience “going there” or is there “coming here”? Is the live character essential for the experience? Gaining experience in interviewing Radiomap users and developing a first impression of its effects upon visitors was the main focus of the pilot study.

The data from interviews and observations was used to create a theory of the experience with the application, especially its telematic characteristics expected to create the enhanced experiential qualities: global awareness, holistic overview experience and interconnectedness.

4.1: Methods

Investigating participants experience with Radiomap required a strategy that incorporated an adapted Grounded Theory approach. Grounded Theory is a type of qualitative research that often includes interviews and observations. It uses a prescribed set of procedures for analysing data and constructing a theory from them. This theory emerges out of the material itself, while the questions, and even more so the data analysis is informed by the *phenomena under investigation*. The phenomena under investigation being the enhanced experiential quality of the Radiomap application, and how people perceive its use. Among the enhanced experiences we are interested in are those of *global awareness, holistic overview of the world and feelings of interconnectedness* and which properties of the application constitute them. HCI concepts of immersion, spatiality and transportation provide helpful dimension for labelling initial data analysis.

*. These visual cues of the screen-based version consisted of very small blinking, red “dots” measuring 4x4 pixels indicating radio stations and the verbose status of the connection printed in the status bar at the bottom of the screen. This information was verbose, 10 pt Geneva, printing “connecting,” “buffering,” “playing” or “error.” While connecting it would become visible and invisible in a slow rhythm, when playing it would remain visible.

Just as the interview questions were informed by the phenomena under investigation so was the latter analysis of them. Although the interview data may appear constricted, as it seems informed by a constrained perspective, it is very rich and could potentially be analysed with completely different phenomena under investigation. In the *open coding* process visitors replies are *coded* into general themes which give evidence of the investigated phenomena. As the process is open and the data rich the context and circumstances in which themes appear often allows for other significant themes to emerge as well. Often it is this neighbourhood that provides crucial and interesting contradictory evidence.

At the end of the interview visitors were encouraged to leave a written record in a visitors book. Overall, methods consisted of the visitors book, the interviews, observation and computer-based tracking of the stations played.

Most visitors clearly expressed their excitement about their experience with the application, which could also be told by their body language. A vast majority were interested in the possibility of downloading it over the Internet and using it at home.

4.1.1: Radiomap flyer-postcard

To attract more visitors from the main conference site a flyer in the size and shape of a postcard was designed and printed. This flyer consisted of a screen-shot of the screen-based application and simply stated the name of the application, its use and the venue where it was shown. These postcards were distributed via the conference centre and placed among other material for distribution. In all 100 of these flyers were distributed and several of the visitors appeared in the gallery with them. It included the URL of the project web-page with background information.

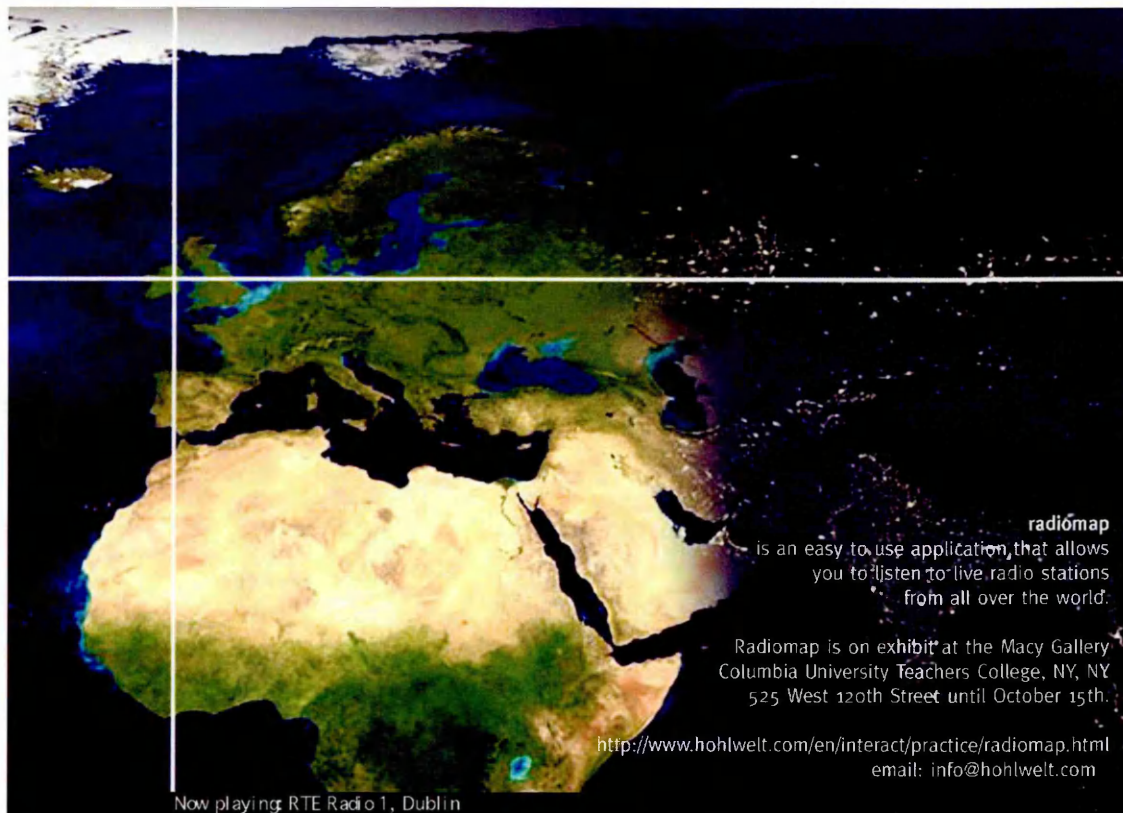


Figure 36: Post card sized flyer created for Pilot Study taking place at Columbia University's Teachers College during the ACM SIG MM conference. The status-bar at the bottom of the screen indicating the station playing.

4.1.2: Observation

Observation during the pilot study was unsystematic and difficult as a result of the space layout and also due to interview activity and presence of staff, visitors and other artists. The plinth holding the screen and monitor was positioned close to a doorway and only allowed visitors to be placed in front of the screen. (Figure 35) The researcher sat behind the screen taking notes and recording duration of use only. No observation sheet was used but notes were made in a note book.

4.1.3: Developing a grounded theory from interview data

An adapted Grounded Theory approach was chosen with an emphasis on the theory emerging out of the collected data only. A valid Grounded Theory approach is usually a field study that gathers data about an environment from the people that live in that environment. In this case this environment was an artefact, a software application that I created and I conducted semi-structured interviews to gather data about *specific phenomena*, about how it was perceived and also to gather data concerning *general phenomena* about the overall experience. Prepared questions were very direct such as “How

long do you think you have used it?” or “covert” in the sense that I did not address the topic of investigation directly to avoid the effect of reactivity, the influence of the interviewer to make interviewees say what he or she wants to hear. Such a covert question would be: “Who do you think would sponsor this piece?” to make interviewees talk about prospective audiences and locations they associated with the perceived artistic message of the work. Mostly questions were improvised, to keep the conversation flowing.

The *prepared* questions were informed by *concepts* from *Presence* research and *Virtual Reality* research which are closely linked with research into *telematics*. These concepts specify terms such as “*transportation*,” the experience of leaving the local space behind and give also clues to *immersion* and *presence*, how engrossing the experience was. These concepts were relevant during the data analysis. Other questions included enquiries about the moment they recognised it was live radio, about prospective audiences that could benefit from it and how they would describe the experience to others. During this process I learned to react to their comments and started to further inquire on statements they provided. To a large extend it consisted of keeping the conversation flowing as most visitors were eager to share their experience. (Questions in Appendix III)

As visitors ended their session they were approached and asked which stations they had listened to or how long they thought they had listened (“ice breaker questions”). While the conversation began they would be asked if they minded if the conversation was recorded. None of the visitors had any objections. A handheld Canon DV camera was used for the interviews due to its unobtrusiveness.

4.1.4: Visitors book

A visitors book was placed close to the screen upon the plinth as an encouragement for visitors to leave comments and suggestions about the application and their experience. An incentive to do so was the prospective opportunity to receive a link to download the screen-based version of Radiomap to be used on their personal computer. While *all* interviewees left their email address in this book, thirteen anonymous visitors left additional comments in chronological order:

“Project it on the inside of a planetarium.”

“Very innovative! Interesting!”

“Imagine it in an airplane, in the back of every seat.”

"Create a website where people can leave comments & suggestions, opinions about stations."

"Very Nice! Short wave radio and gnu radio would be interesting."

"Very intuitive and easy to use. More intuitive than a list."

"Everything is home, radio world connections, does the Internet mean every one is connected? You loose the sense of interconnectedness, don't zoom. Leave it as it is."

"It gives you a sense of the world and cultures."

"This is a truly beautiful idea ... and manifestation."

"It is extremely interesting how you build a cross cultural audio landscape - how you preserve in a beautiful way the uniqueness among the worlds differences."

"Its like travelling"

4.1.5: Analysis of data

The results of the interviews, two sixty minute DV tapes, were digitised and transcribed. Twenty individuals were interviewed in seventeen unique conversations. Eight of them female and twelve male. Interviews lasted between three and twenty minutes resulting altogether in approximately 9500 words. This text was printed out in a narrow column to leave sufficient space for codes, notes, memos and annotations. A selection of which is found in the Appendix III.

The open-coding process attempted to reduce the vast amount of data to a smaller set of general themes. Firstly these were themes relating to the phenomena under investigation, such as

- feelings of interconnectedness with the remote places
- global awareness, holistic overview of the world
- immersion, changes in perception of time,
- telepresence experience, changes of perception of the immediate physical space
- emotion like joy or excitement and the context in which they occurred
- perception of self (memories)
- application domain: ease-of-use, transparency

These themes were refined in the axial coding process creating categories from the themes identified in the open coding process.

At the same time it was important to stay open for unexpected findings during the open coding process and become aware of reoccurring themes in interviewees comments.

These unexpected discoveries included references to

- the importance of the sense of hearing in combination with seeing
- a relationship between hearing and memory, triggering events from personal history
- aha!-effect as a property of exploration and discovery
- the importance of the aesthetic appeal of the map image

These distinct properties allowed during the axial coding process to create a narrative of the phases of experiential qualities as they were experienced by many of the interviewees. The axial coding process was followed by selective coding, determining core categories and their conditions.

Distinct themes appearing in the initial coding sessions

The following diagram depicts the cluster of experiential themes as succinct categories. They form *initial* categories which lead to higher and more sophisticated concepts. Among the experiential categories are *inner experience* (such as triggering vivid memories from the past) and *live experience* (realising the live character of the broadcasts), which were concrete comments made by visitors; And an experiential theme I labelled as *external experiences*. These were not addressed literally but often referred to by remarks such as “a small world,” “a sense of travelling” and comments about culture in local - global comparisons. Another distinct experiential category appearing from the data was the importance of the *sense of hearing* and its quality of triggering memories in visitors. “Hearing” for example occurs two times in the diagram, once as a deducted quality that intrinsically triggers memories, and secondly as a visitors reflection on the *importance* of the sense of hearing itself. Perhaps this reflection can be regarded as a direct *effect* or *insight* stimulated by the application?

Responses were grouped into distinct themes which included references indirectly addressing perception and those directly addressing how interviewee’s perception changed. Comments about space and time were among the more frequent.

They would refer to how they “lost track of time” or referred to a special quality of the perception of space, for example that “*this is not here, this is not New York any more.*” These were indicators for an enhanced immersive state or flow-experience.

Many visitors also commented on the application itself and how they experienced it. They distinctly addressed its intuitiveness and that it was very easy to use. These application-domain comments could be separated into two main categories. One addressing the *graphical-user interface* (GUI) and its functions, and the other suggesting potential uses the application could be employed for, which was among the prepared questions asked. Among the latter learning languages, teaching geography, learning about other cultures dominated. This frame of replies is largely determined by the audience which consists mostly of young teachers who study at the Teachers College.



Figure 37: Distinct themes determined during the open coding process. They refer to the perception, insights, reflections and different types of experiences.

Exploration and discovery

The analysis of the interview data suggests that exploration and discovery are key experiences in the use of Radiomap. The relevance was anticipated but has exceeded expectations as it is a process consisting of different stages. The analysis of the interviews has given evidence of two distinct phases.

The first phase is simply a *serendipitous exploration* to find out what the application is about. As participants discover and begin to listen to the first radio stations they create a mental model of what these sounds could be. How fast they come to the insight that the sound is provided by live radio stations seems to depend on the individuals exposure to Internet radio. The interface provides two subtle guides: a status bar indicating the name and location of the station that is playing and the state of the downloading stream.

After a phase of exploration and discovery interviewees experience a moment of enlightenment and *realise* the application for what it is—an interactive map that streams live radio programs. This moment of realisation results in what I call the *aha!-effect* as it occurred in this context regularly in the interviews. All uninitiated visitors experienced this *aha!-effect* in one way or another. At times this was an instantaneous realisation ... at others it was a gradual realisation.

Having become aware of the applications purpose and function interviewees begin to systematically explore it. This can be seen as another phase I describe as *systematic exploration*. A recurring pattern of behaviour is that this exploration leads them to places that they or their friends have been to. Later they tend to search for places they want to visit or have heard of.

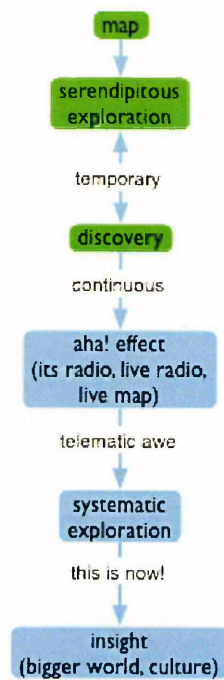


Figure 38: Stage 1: Initial, serendipitous exploration, discovery, aha!-effect and systematic exploration which may result in an insight such as internal or external awareness

This second phase, after realising the applications purpose and its live character, is accompanied by an enhanced state of awareness and immersion, what Frank Popper has called the “telematic awe” (Popper, 1997, 126) This *focused, immersive* and *contemplative* state can result in feelings of interconnectedness to the remote places initiated by the live character of the application. Interviewees reported telematic experiences such as being located above the map image and looking down upon earth. It is assumed that the photorealistic character of the map image will have sustained this effect.

Once visitors have systematically explored the map over an extended period of time some experience what could be described as a phase of deep and moving insight, a feeling of interconnectedness with the world and a change of *Weltanschauung*, a change of world view. This deeper phase is often accompanied by very distinct insights associated with *experiencing the world, cultural understanding* and general comments about “global experience” or an awareness of a “bigger world out there”:

“I really like the principle behind it. How it can bring people together...cultural understanding.” Interviewee 13

“It almost makes you feel you are really experiencing the world as it is now.”
Interviewee 17

"... I think the sense of the global experience is so important" Interviewee 13

"Really understanding there is a bigger world out there." Interviewee 02

"Its like [...] travelling in a different zone." Interviewee 16

Aha!-effect

A crucial climax in the experience of exploration of the map and discovery of radio stations appears to be the *aha!-effect*, it is this moment that visitors realise and make the mental connection that they are actually hearing live radio broadcasts. The interview data supports the importance of this experience. They range from *"that really got me interested"* to *"actually disappearing into that world."*

"I had a live experience!" Interviewee 01.1 referring to the moment the interviewee realised that the radio was live.

"I did not realise that I was listening to channels of radio, [when] I realised that I connected to (?) that opened a whole vision of reality and actual disappearing into that world. Which is not part of a daily-world, but definitely in another sense of time and space somehow. I felt like I was floating above the whole map (...) And it is very revolutionary, you get a sense of being there." Interviewee 01.2

"The first time I didn't I was listening to the music entirely. I didn't get that I was in Thailand yet. When I finally got the concept of moving around, I said "Is this live?" It just occurred to me that I was really, actually listening to something like a Tuner. [...] The dimension of that. So it kind of struck me that it was live." Interviewee 02

"Coming to [...] connections on your own" ... "you need no computer literacy, [...] it is very accessible and also the fact that you have to figure it out is a good thing. [...] That you don't have any directions. You just have to figure it out and make the connections." Interviewee 02

"I was listening to NY .. it wasn't until I went to London that I was sure. The way the time zone changes ... once I saw we're almost in the evening here, that's what the map shows, Wow, that really got me interested." Interviewee 11

(During coding the *aha!-effect* also appeared in context with the pattern *emotion* and the category *visuality of the map image*. Both associated with strong excitement among the visitors.)

The World, self and memory; external awareness and internal awareness

Stage two of the experience consists of two salient experiential properties. Firstly a cluster of categories that relate to a variety of *global experiences* shown in the data. These experiences are an *external awareness*, directed towards the outside world. It consists of becoming aware of a “bigger picture” of the world, feeling of interconnectedness to remote places and a general global awareness that includes reflections upon the application’s ability of making other people aware of the world and cultures. One of these realisations is becoming aware of other cultural traits as languages and dialects. Two interviewees also referred to it literally as an “*inner experience*” and “*contemplative*,” the latter being of special importance for further deductions regarding the experiential quality.

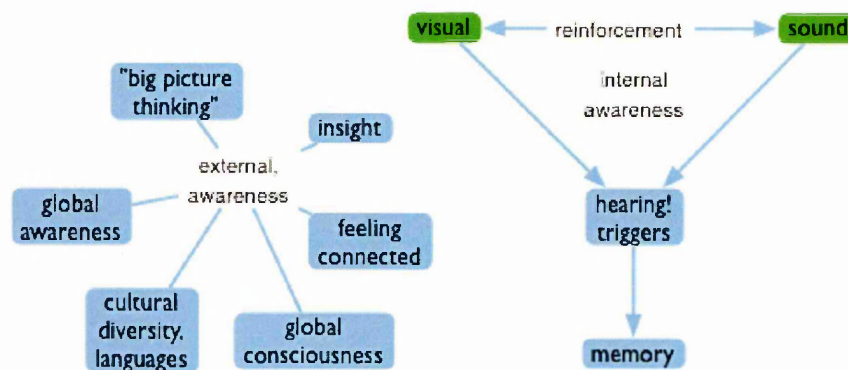


Figure 39: Stage 2: Continuous. External or internal awareness experiences

The other salient property is the relationship between image and sound which seemed to reinforce and emphasise each other. Four visitors reported that hearing a radio program, from a place they had been to in the past, evoked strong memories. Three of these four explicitly emphasised the process of hearing and its importance. These memories were triggered by language or music they had heard there. Visitors would also refer to how the live map image and the live radio stream would create a vivid impression that was “more” than just the radio by itself, thus emphasising the importance of the process of *hearing*.

Interesting is the evidence of the apparent exclusiveness of both experiences. Many participants experience external awareness, but only few the memory-event or internal awareness. Only two individuals experienced both. A vast majority of participants (19) experienced external awareness, a minority of four individuals, all female, referred to the internal awareness experiences or memory event. Only two of these also experi-

enced the external or global awareness. Of 19 interviewees at least 12 experienced external awareness, 2 of these shared as well internal awareness, and the remaining 2 *only* internal awareness. There is no evidence suggesting that prior external awareness is a requirement for internal awareness, neither that individuals vacillate between the two stages. It appears that once the stage of internal awareness or memory event has been triggered the experience is perceived as so intense and captivating that it prevents other states. We can assume that it depends upon the duration of use and at what stage this happens. From the data analysis there is evidence that many people *first* go to places they have been to, and only second to places they want to go.

This suggests that memory events take place at the beginning of the exploration when participants go to places they know. This could be an explanation that the internal awareness / memory group hardly overlaps with the external awareness group, but this assumption is very speculative as there is not enough evidence.

"[I listened to] some traditional music ... and it brought me back to my childhood ... what we were reading at school" Interviewee 17

"[The radio] reminds me of it [...] it puts me back there." Interviewee 12

"I instinctively went to the places I have been, because its a good feeling to go back." Interviewee 12

"The local flavour and [...] colours come into play. Language doesn't matter. A kind of imagery can crop up, create images out of memory, create pictures out of that." Interviewee 01

"You listen to music and you're right away somewhere else." Interviewee 16

"I think it would be an interesting way to give young people a sense of connectedness and relationality. There is something about the auditory senses, that don't get usually drawn into education in a way that the visual senses do." Interviewee 08

Theory of successive stage of experience deduced from the interviews

Through analysing the interview data similarities in visitors experience soon became apparent. Categories of experience followed distinct patterns which began with the visual appeal of the map which raised curiosity to a *serendipitous exploration* of the map leading to the discovery that the sounds heard consisted of live radio stations. This resulted in an *aha!-effect* of heightened engagement and excitement with the application. From this moment visitors became engrossed, deeply engaged and immersed in the interac-

tion. The stage of serendipitous exploration changed to *conscious* or *systematic exploration*. Depending on the individuals susceptibility this would trigger intense experiences of external and/or internal awareness. External awareness would consist of different experiences of global awareness and interconnectedness which are difficult to separate. They could consist of a telematic experience of perceiving the globe from above, feeling connected to the place they would listen to or to an enhanced *awareness* of cultural diversity actually realising and internalising the multiple languages, seasons and sunrises.

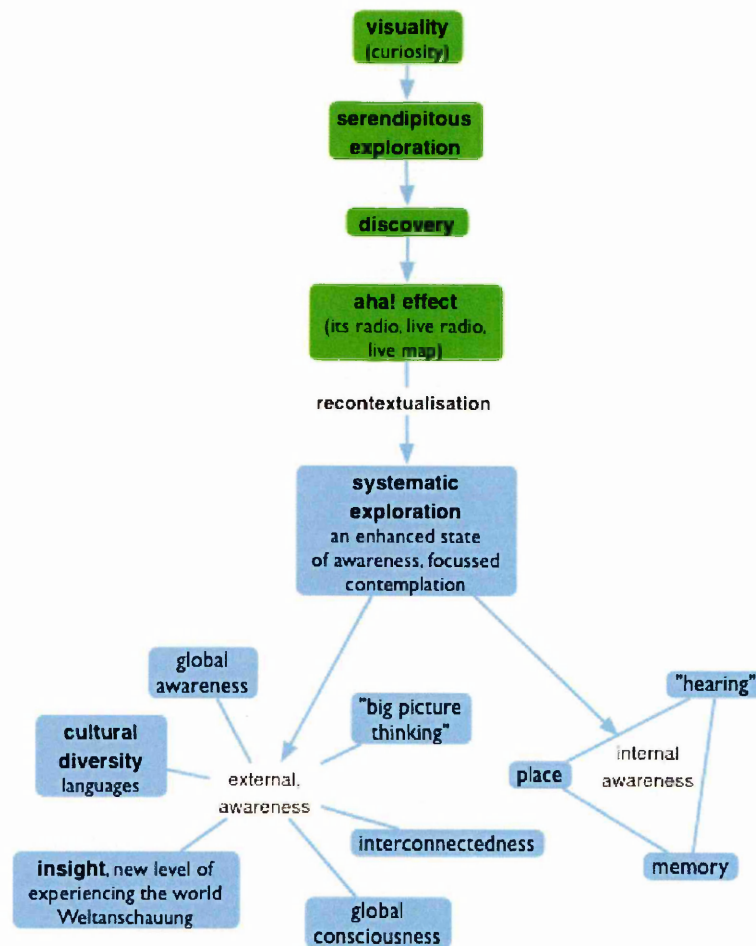


Figure 40: Process model for experience with the screen-based version of the Radiomap application.

Another experience interviewees referred to was the intense and sometimes harrowing experience of radio programs evoking personal memories of their past. Music is known to trigger vivid memories, similar to those described by Marcel Proust in “À la recherche du temps perdu” where the taste of a pastry evokes sensual and intense memories. Experiencing a memory can either occur as a well known song is being recognised or it is place-dependant and triggered by language. This can be seen as an experience of in-

ternal awareness, a reflective state of becoming aware of ones own past - as opposed to the experience of global awareness.

Experiences of global awareness, holistic overview, interconnectedness

Exploring the conditions for these experiences was part of the focus of this research, determining if it was possible to create them and which properties of the application would facilitate them.

After realising the applications live character and recontextualising their impression of it some visitors experience a phase of being more engrossed, engaged and immersed in the use of the application. This greater engagement manifested itself in an overall excitement during the following interview and it was visible in the body language, facial expressions of visitors and speech gestures/comments during use. Other visitors did not show this excited behaviour and simply continued exploring the map and listening to the radio programs. For them the experience did not appear to be as intense. A personal inclination, enhanced susceptibility or deeper immersion may be the cause for this deeper experience.

There is a wide range of comments about different experiential qualities visible in the data. Some visitors refer to it as a *“beautiful way of navigating Internet radio”* while others feel elated and experience a live overview of the whole world, two very different ways of making sense of the experience. While one is reflective and analytical the other is more emotional and intuitive.

“It is extremely interesting how you build a cross cultural audio landscape - how you preserve in a beautiful way the uniqueness among the worlds differences.” anonymous comment from visitors book

“There is something about the viscosity of the image that really, really attracts you and makes you go there.” Interviewee 17

“The complexity is very nice. It almost makes you feel you are really experiencing the world as it is now. And I think that’s a very important part of it. “It almost makes you feel you are really experiencing the world as it is now. [...] Also your position that you are above in space.” Interviewee 19

“You have this wonderful image of the world and you can land [in] an area you are interested in and have a one sided communication with this area.” Interviewee 01

"It is a great way to connect in another sense. Into another time/space and another geographical space. And it is all available. As an artist you feel this is opening another dimension of reality." Interviewee 01

"Really understanding there is a bigger world out there." Interviewee 02

"In a way its almost like being in space looking down." Interviewee 03

"Then I went to places I was curious about, where people close to me have been and love. It is a way to kind of visit ... in a sense." Interviewee 13

"The feeling of interconnectedness, what's being transmitted throughout the world. Where some things on the one hand seem very localised while other things are universal and all at the same time. I suppose that if you kept on going round and round you would find both the (differences?) and the similarities intertwining and interconnecting."
Interviewee 02

"My point is anything that is really global connects you with different cultures and images." Interviewee 14

"I think it gets [children] to think." Interviewee 14

"I think another time I might use it as when I get homesick to some place, like I am homesick right now to (Maui?). Things you might be hearing there and feeling kind of connected somehow." Interviewee 08

Immersion

The degree of immersion is difficult to evaluate, especially as observation of visitors was inconsistent and obstructed due to local conditions. Yet the difference between the perceived time visitors used the application compared to the actual time they used the application allows us assumptions over the degree of immersion the experience achieved. Visitors perception of how much time they spent with Radiomap could be very different to the actual duration. As part of a revised strategy the conversation often began with the question of how long they thought they had used the application. People guessed they had been using it 5 minutes when in fact they had for more then 10, or they guessed 15 minutes when it was in fact more than 20. As part of *presence research* (Yellowlees, 2000) this can be seen as relating to a *flow experience*, an activity that is immersive and enjoyed to such a degree that participants loose the feeling for time.

Providing headphones allowed for a more immersive experience which was also mentioned by one interviewee (*"You put on the headphones ... and it could be very exciting,*

interesting.” 01). This allows for a conjecture about the cognitive immersion that interviewees experienced. The setting as such with a chair and headphones provides a certain degree of immersiveness which was deepened once the visitor went through exploration and discovery and got more engrossed with the application after discovering its live character.

“You put on the headphones ... and it could be very exciting, interesting.”

Interviewee 01

“I lost track of time while I was looking at the little red flashing lights.” Interviewee 04

Cues to immersion are hard to determine from the interview data. It appears that visitors that experienced the aha!-effect and systematically explored the map and conclusively made remarks about global awareness or experiencing “looking down on earth” must have been deeply immersed and engaged with the application for these effects to take place.

Accessibility, ease of use

Accessibility and ease-of-use of the application was noted by a majority of the interviewees in one way or another. As there are no menus involved, no mouse clicks or other discreet, disruptive steps the interaction is perceived as a fluent and continuous experience. Many associate it with being playful and fun.

“ ... I am experiencing it as a child. I don't know the software and the technical background.” Interviewee 01

“[It is] lovely to do” Interviewee 06

“There are no menu's, you just move the mouse ... That is definitely very important.”

Interviewee 11

“It seems a little subtle ... the red dots ... you have to get the cursor quite close to those, make them more sticky.” Interviewee 05

“... just the effect that you scroll, that it is in your hand to go around the world is very nice.” Interviewee 16

"It is so easy and so quick in response." Interviewee 02

"First of all, the live-ness of it makes it something really real And that fact that they can switch it, and that they don't have to stay at one place, that they [children] have the opportunity to maybe go back, makes it very interactive." Interviewee 02

"You need no computer literacy. Yes, it is very accessible, and also the fact that you have to figure it out is a good thing for children. That you don't have any directions. You just have to figure it out and make the connections. That is a type of learning opportunity." Interviewee 02

"I didn't know what the lights were that were flashing, and so I just played around with it." Interviewee 03

"I assumed because of I have listened to radio stations on the internet before, and since I saw the connections being made in the upper left hand corner, the download speed etc. - that made me believe it was live." Interviewee 04

"No, I didn't recognise that the map was live as well, because I couldn't see the whole thing at once." Interviewee 05

"When I came up I recognised the little red blinking lights - and when I went over the blinking red dot I could see that it was buffering ... So it took me one time and then I just knew that I have to look for the blinking red dots and I would find a station there. So it was immediate." Interviewee 08

"I must say I didn't pick on [the live map]. But I can see now that you have the shadow of the timeline, daylight." Interviewee 08

"It was so nice and playful" Interviewee 16

"This is a great way to find this information." Interviewee 18

"The only thing I didn't like was that as you move by that you can't decide if you want to go to the station, it just goes automatically. It would really be nice to click."
Interviewee 19

"Very intuitive and easy to use. More intuitive than a list." comment in visitors book

Aesthetics of map image

The visuality of the photorealistic map image is emphasised in many comments made by visitors. It constitutes the main part of the graphical-user interface. As there are no menus or mouse-down events the interface is perceived as a very fluent and continuous experience. Instead of a cursor navigation of the image and selection of stations are executed with a pair of crosshairs. Their proximity to a station initiates the streaming process of the radio station. Only little less than half of the image map is displayed on the screen and moving the mouse pans the background map image towards the cursor. The motion is very fluent and provides a sense of inertia giving the interface a sense of gravity.

The photorealism of the image map displays an intricate level of detail and a very realistic view of mountainous and arid areas. Visitors are not only able to distinguish between day and night regions but may, over the course of only fifteen minutes, become aware of lights appearing in cities where the sun has just set. This gives the image map a great sense of immediacy. Not all visitors realised that the map was live, in the sense that the day and night hemispheres updated during their interaction. The visual appeal of the map superseded this live character.

In the interviews references to the visuality of the map image tend to appear in context with the *aha!-effect* and *overview experience*, both emotional patterns.

"I would say that it is great to see the map." Interviewee 07

"I think you are so distracted with the beauty of the map. It takes all your attention."
Interviewee 16

"There is something about the visuality of the image that really, really attracts you and makes you go there." Interviewee 19

"... with another map, a political map, not that one with the mountains and rivers ... that is really a hunch on the visuality ...and on the project. And I think that makes a huge difference to the aesthetics. The most important I think is the idea, ... but I think its both." Interviewee 17

"The complexity [of the map] is very nice. It almost makes you feel you are really experiencing the world as it is now. And I think that's a very important part of it."
Interviewee 18

"You have this wonderful image of the world and you can land [in] an area you are interested in and have a one sided communication with this area." Interviewee 01

"I like the fact that it is just plain beautiful, the image is nicely done ..." Interviewee 12

"There are lots of ways to listen to radio on the internet. Just not as nice as this."
Interviewee 14

"I am becoming a child when I look at it" Interviewee 01

"In a way its almost like being in space. Looking down." Interviewee 03

"Looking at the earth without the boundaries." Interviewee 04

"I was thinking that the boundaries are washed away in this view ... so is the music in that kind of sense." Interviewee 04

"It is its visual appeal!" Interviewee 04

"It reminds me of it ... it puts me back there. And I can pretend I am in my studio in France, instead when I am in my studio in the US. In my mind I visualise that. So this is a nice graphical interface." Interviewee 12

"I just like the graphical interface" Interviewee 12

"This is a truly beautiful idea ... and manifestation." anonymous, visitors book

Live character

There is evidence in the interview data that another intrinsic characteristic crucial to the Radiomap's experiential quality appears to be its live character. This live character, which could also be described as the telematic awe (Popper, 1997, 126) creates a sense of urgency or immediacy of a unique moment for the participants that fundamentally changes the experience with the application. It makes the experience appear "more real" or actual. The live character most evidently shows up in the Aha!-moment, when participants realise the function of the application, the live radio broadcasts. The live character of the map contributed less to this effect and perhaps was perceived unconsciously.

"First of all, the liveness of it makes it something really real [...]." Interviewee 02

"to experience something that is alive, what is actually happening makes it much more real ..." Interviewee 03

Transportation and spatiality in Radiomap, screen-based

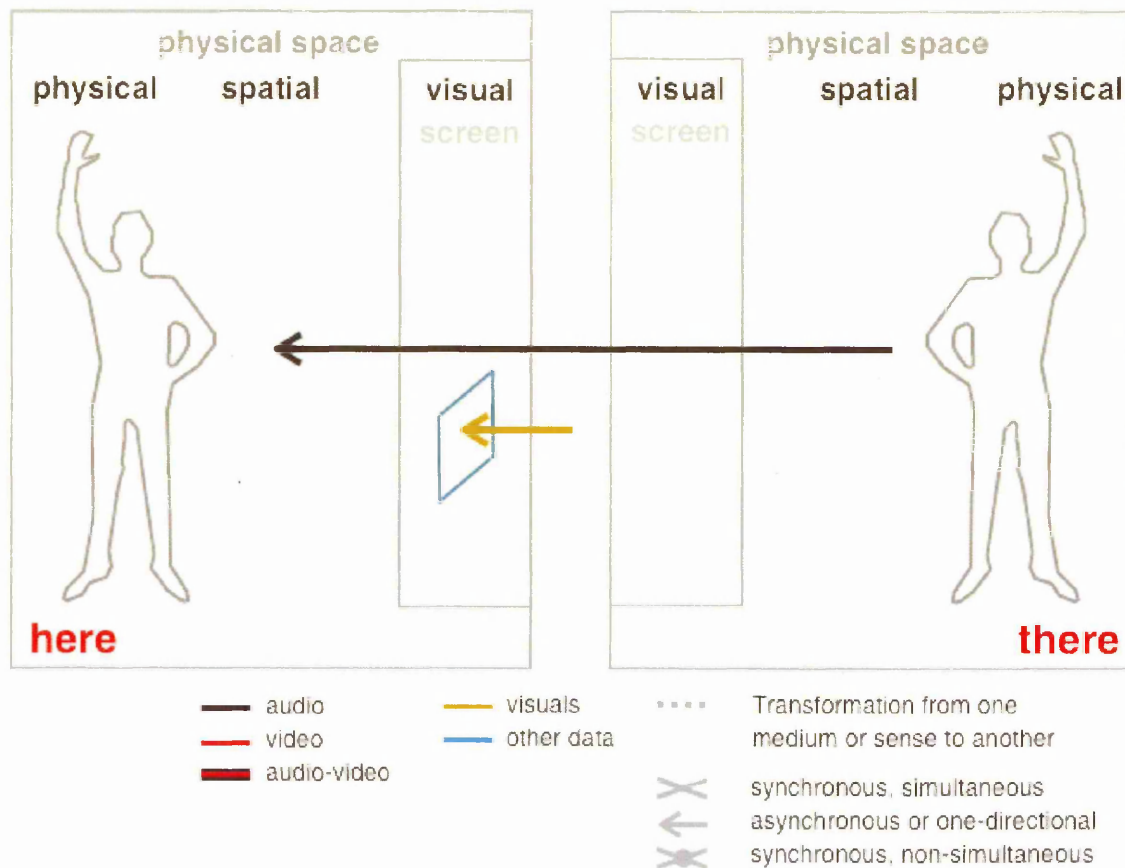


Figure 41: The screen-based version of radiomap: The live radio stream together with the photorealistic map showing current day and night regions together create a live-experience. The map visual is updated every five minutes, while one radio station is streaming its audio signal. (Environment Version Figure 55)

4.1.6: Conclusions of the pilot study

The screen-based version of Radiomap was an opportunity to verify whether it was possible to create the proposed enhanced experiential qualities, to gather data to understand which properties constituted these effects, to test and refine the interview questions to be used in the main study and to acquire experience in conducting interviews.

Developing a grounded theory from the interview data has given evidence that there are mainly four properties of the application that seem to create the experiential quality:

1. the aesthetics of the map
2. the process of exploration and discovery, an Aha!-effect
3. its simple interactivity and perceived freedom, ease-of-use
4. the overall LIVE character of the radio broadcasts

Some visitors reported a strong sense of place for the remote locations and compared exploring the map to travelling. Some younger people argued that they would obtain a “sense of place” through music, whereas older participants would report that it was more the voices of people that created a “sense of place” for them, even if they were not able to understand the language.

Participants also had the possibility of leaving comments or suggestions in a visitors’ book which several made use of. The improvisation of supplying a chair and headphones was crucial for the quality of the interviews as it permitted a more focused experience. This became necessary as a result of different disruptive installations in close proximity. This effect was serendipitous, although it initially was perceived as rather detrimental. While disruptive noise indeed was an obstacle in interviewing visitors afterwards, providing headphones and a chair increased visitors duration of stay. Staying longer led to a deeper engagement with the application and a deeper cognitive immersion. Together these properties allowed for a higher experiential quality of interviewees which is evident in the richness of the interview data. The unintended use of headphones was a serendipitous decision resulting in a richer experience for visitors.

As my experience in interview techniques developed I realised that the quality of my questions was less important than their function of keeping visitors talking about their experience. A more flexible and alert ability was necessary to adapt to the mindset they were in. Recognising this I tried to listen more attentively and improvise follow-up questions to remarks made, basically to keep the conversation flowing. Often this simply was “What do you mean by ... ?” This type of question resulted in replies of deeper relevance in visitor’s own voices. For me as interviewer this state was difficult to maintain; I guess it requires experience in very attentive listening for the right keywords to follow-up upon and to adapt to the visitors current mood, while at the same time being “natural” and relaxed in keeping the conversation flowing. My inexperience regularly led to asking a new question in the very same moment an interviewee attempted to continue a thought after a short pause of contemplation. I thereby interrupted his or her stream of thought. I believe this is a matter of confidence and experience in conducting interviews, and an important advice would be to admit longer pauses of about five seconds.

A surprising insight gained during the coding session was that the answers provided often did not relate very much to the questions asked. This was not perceived that strongly while the interviews were conducted but showed up during analysing the interviews. Occasionally it appears as if interviewees had something to say and did not care much about the actual question asked. Very interesting was also one experience of how one's own perception can distort real events. An interview that was perceived as exceptionally profound and interesting while it was conducted, was, during its analysis recognised as not any different at all, besides that the interviewer simply agreed with most of what the interviewee said.

The four-stage experience the application provides appears crucial for its success. Firstly its appearance is visually appealing and evokes curiosity in visitors. They *want* to engage with it although they do not know what the experience is about. The *serendipitous exploration* phase leading to an *aha!-effect* and to the discovery of what the map is all about is another important moment in the interactive experience. Realising that the broadcasts are live appears to create a sustained vividness during the use of the application. In this way visitors make it their own and enjoy building a mental model of the interaction. The following stage, *systematic exploration*, builds upon this mental model of what the application actually is and visitors purposefully use it to find and listen to international radio stations. The stages following are *external* or *global awareness experience* and the *internal awareness* experience. The connection between these is unclear as there is not enough data. Is the global awareness perhaps a condition for the internal experience?

The exhibition as such has satisfyingly validated the initial hypotheses: That creating experiences of global awareness, interconnectedness and holistic overview is possible and there is evidence of the properties that constituted these effects. We gained an understanding that the experience is structured into four distinct phases and that visitors perceive the experience as exciting, rewarding and enjoyable. Last not least that the application is functioning robust and reliable. The principles informing the interview questions and their analysis functioned very well for the phenomena under investigation and led to rich data leading to several unexpected insights during the analysis of the data.

This shows that using remote live data mapped upon a geographical representation, a simple constellation, can result in surprisingly strong experiences. This could be employed in a whole range of interactive screen-based works that allow users to connect

and engage on an entirely new level of experience. The sophistication of the artistic concept would determine the poetic and subtle intricacies, the meaning and content and the overall message the engagement creates. This does not have to be technology dominated as it can often be seen in projects where a novel technical solution is foisted upon the content.

5: Main Study: Interactive Environment

The main study carried out at Sheffield Hallam University had the purpose to develop a theory of the *enhanced experiential qualities* of Radiomap as a collaborative immersive telematic environment. It aimed at understanding participants' experiences of the unencumbered yet bodily engagement and telematic properties within the spatial dimensions of a large room. The study's focus is participants' experiences of the environment's telematic characteristics. Mainly if they do experience global awareness, an holistic overview of the world and interconnectedness with remote places. Further the study is interested in participants interaction with the interface and the process of collaborating with other, local participants. A theory of the crucial elements of the experience is developed in a grounded theory approach by observing participants and conducting and analysing interviews through the study.

5.1: Review of main study conditions

The main study, an unencumbered, immersive telematic environment, was conducted between October 31st 2005 and December 9th 2005 at Sheffield Hallam University's Psalter Lane Campus. The research space is a spacious research studio located on the third floor. Interviewees are gathered by invitation and word of mouth. They consisted mostly of friends and relatives of fellow researchers and colleagues of these friends and relatives. All were domestic residents and included a number of members of other European countries. The age approximately ranged from twenty to forty years of age. This group was less diverse than the group of the Pilot Study.

In this main study the *Radiomap* application is set up as an unencumbered, immersive, interactive environment. It consists of a *complete* photorealistic map image of the earth. It displays day- and night areas and is projected onto the floor. The projection measures 2.5 x 5 meters which is the largest size that could be achieved under the given conditions. As participants walk on this map they can listen to a selection of live radio programs located at the corresponding locations all over the world. Visitors select these stations with an unencumbered, augmented ring element which is projected onto the map. This ring element is controlled via the position and movement of the visitor's body.

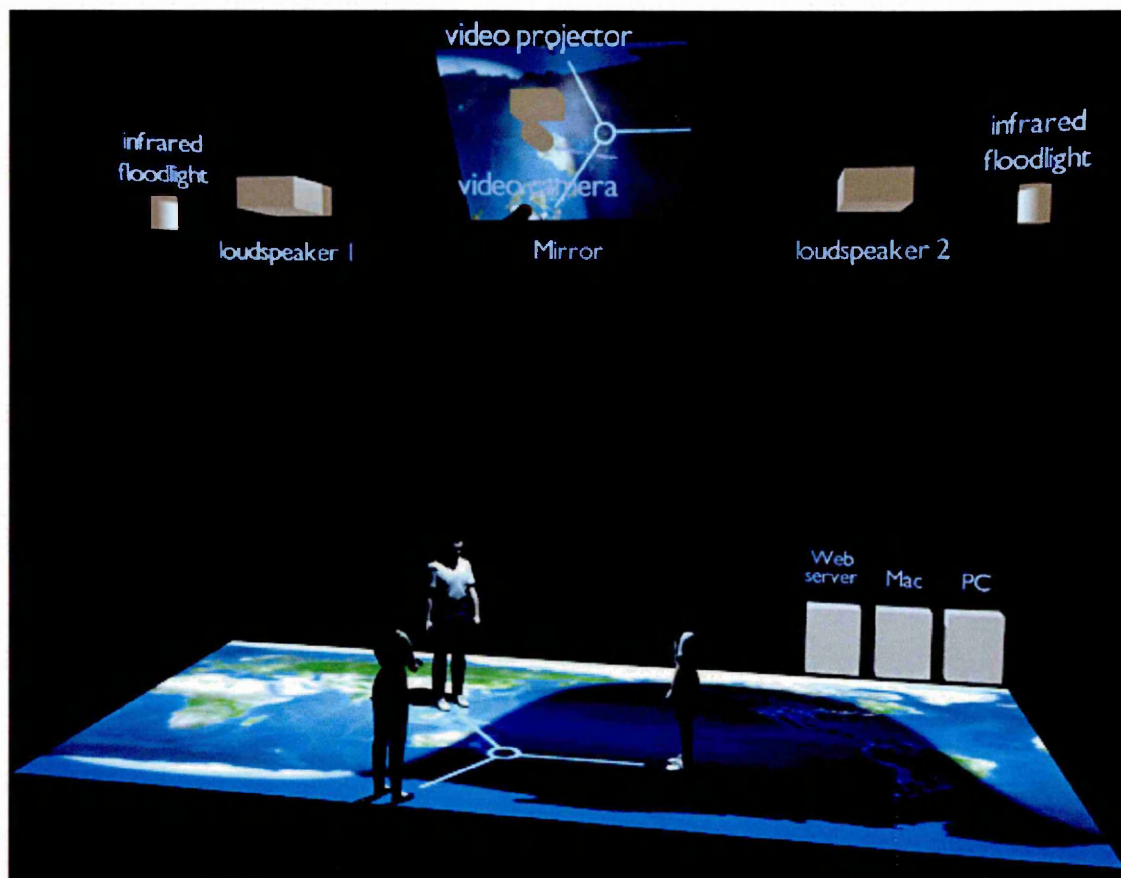


Figure 42: A rapid prototyping visual created in Cinema 4D. Its purpose was to determine the size required.

The technical set-up includes three computers connected via the network. One computer containing the PHP/MySQL database with the data of the radio stations consisting of, among others, the URL of the audio stream, the station name and the cities geographical Latitude and Longitude. A video camera films the scenery from above and a second computer analyses the image for moving people. Their position is sent to a third computer which updates the map image according to the present time, renders the POI in real-time depending on peoples positions and initiates and plays the radio stream. As the space is dark, strong infrared light sources, invisible to the human eye but not to the camera's video chip, are needed to track people's positions upon the map. Occasionally this could lead to inaccuracies in tracking people if the colour of their clothes was too bright. As a result the system would temporarily loose a position or "jitter," vacillating between two positions, A second infrared light would have improved this situation but was not available in time.



Figure 43: Three participants collaborating in the unencumbered telematic environment. Their individual lines are connected with the point of interest in the centre.

Once a person walks about the map image, the unobtrusive graphic ring element is placed into the direction of movement. The augmented ring element is connected to the individual by an augmented line thus indicating its dependency to the person. This ring-line combination is the “Point of Interest” (“PoI”) and is used to select radio stations. These radio stations are indicated by unobtrusive, red and blinking dots that measure 2x2 pixels in size. Should more participants enter the space, their positions also connect to the ring element by other augmented lines, creating shared agency of the PoI. All participants have an equal degree of control over the PoI which is continuously placed in the calculated middle (mean value) between all participants. Now the individuals have to collaborate to navigate the PoI in a controlled manner. Personal aims have to be agreed with the other participants. This encourages complete strangers to act as a group while exploring the map for radio stations.

As the PoI approaches the location of a radio station this station “attracts” the ring with a slight “magnetic” force to facilitate the logging-on process*. Once the PoI connects, the default voice of the computer’s operating system speaks the name of the station, the

*. This logging-on process begins by the PoI being attracted by the slight “magnetism” of a radio station. During this process its dynamic change of opacity (“blinking”) changes to a stable opacity and is followed by a change in colour. It turns orange once it is in the process of connecting to a station which may require a number of seconds. The colour

city it is located in and the country. e.g. “Radio 123, Adelaide, Australia” At the same moment the ring’s colour changes from white to orange, indicating that it is connecting to a station. The colour blue indicates that the audio stream is buffering, green, that it is playing and red that an error has occurred. Part of the concept is that participants learn to identify these states.

The intention behind this design solution is that the behaviours of the PoI together with the redundant auditive feedback, synchronised with the participants own bodily movement, will provide a satisfying sense of feedback and control, and thus a more transparent and satisfying experience. The voice also bridges the moment that it takes the streaming radio station to begin to play.

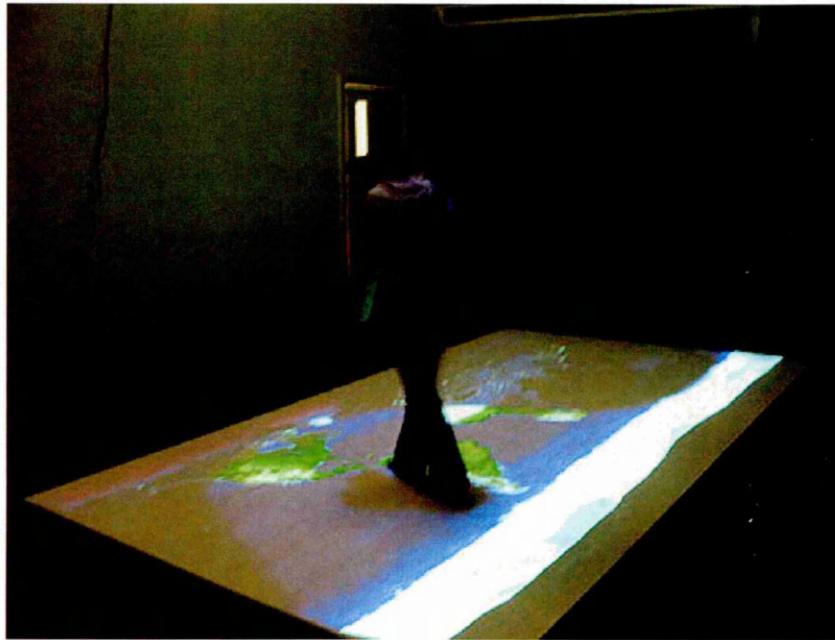


Figure 44: One single participant exploring the interactive environment.

5.2: Study focus

Insights gained during the *pilot study* were mainly used to develop a theoretical model of participants experience and to improve the interview techniques and interview questions. Focus of the *main study* is to gain an understanding of participants’ most salient experiences of the telematic characteristics, immersion and experiential qualities of the unencumbered interactive environment. Another important difference to the Pilot Study

changes to green and then blue once a station starts playing or red if an error occurs.

is the process of collaboration with other participants and how they make use of the shared agency of the unencumbered, augmented ring interface which is controlled by physical motion of the body. How will this virtual interface be perceived? How will people communicate and negotiate their intentions? How will the performative aspect be perceived, that participants are being observed by other visitors? Will it be a more interesting experience to collaborate or to use the environment by oneself?

Another interesting question is, if the subtle visual feedback cues of the augmented ring interface (the dynamic change of opacity and colour indicating the status of connectivity) will be perceived as clear and meaningful enough. As in the pilot study, it would be interesting to discover the importance of the role of exploration and discovery and people's understanding of what the interactive experience was all about. The pilot study had also shown that giving no instructions at all, added crucially to the successful results of exploration and discovery which *motivated* participants to engage deeper.

5.3: Methods

5.3.1: Observation

During the Pilot Study observation was unsystematic as a result of the local architecture and consisted mostly of notes in a notebook. In the Main Study an observation sheet is used which plays a more important role mostly in complementing and supporting the interview data. The observational data will record how long participants actually used the environment compared to how long they said they did. It also records if they collaborated, used it only by themselves or both. It can also provide insight if there are “types” of participants such as patient or impatient.

An observation sheet was created containing six columns for markings. Two additional columns were added later in the process containing the **name** of the visitor and if an **interview** was conducted.

The columns are labelled: *Duration of orientation-phase* (how long did it take them to understand the aim of the interaction), *connoisseur* (slow or patient interaction), *sprinter* (fast or impatient interaction), *single-user* (used alone), *multi-user* (used together with others), *overall duration* (duration of use). The columns cells can be easily ticked-off or numbers entered while visitors are interacting. Times are measured while visitors are observed. The last figure of the total duration of exploring the environment (Figure 45) is entered as people leave as some take a break in between or join others.

5.3.2: Reply postcards

The visitors book of the pilot study was a successful method to get thoughtful feedback from visitors in a written form. As it was anonymous people could be inclined to be more honest than in a personal conversation. As the space of the interactive environment has to be dark a visitors book made little sense. It would have been too dark to read or write. As visitors also came in small groups the desired anonymity would have also possibly been compromised. An alternative to receive thoughtful and anonymous comments was the idea of reply postcards.

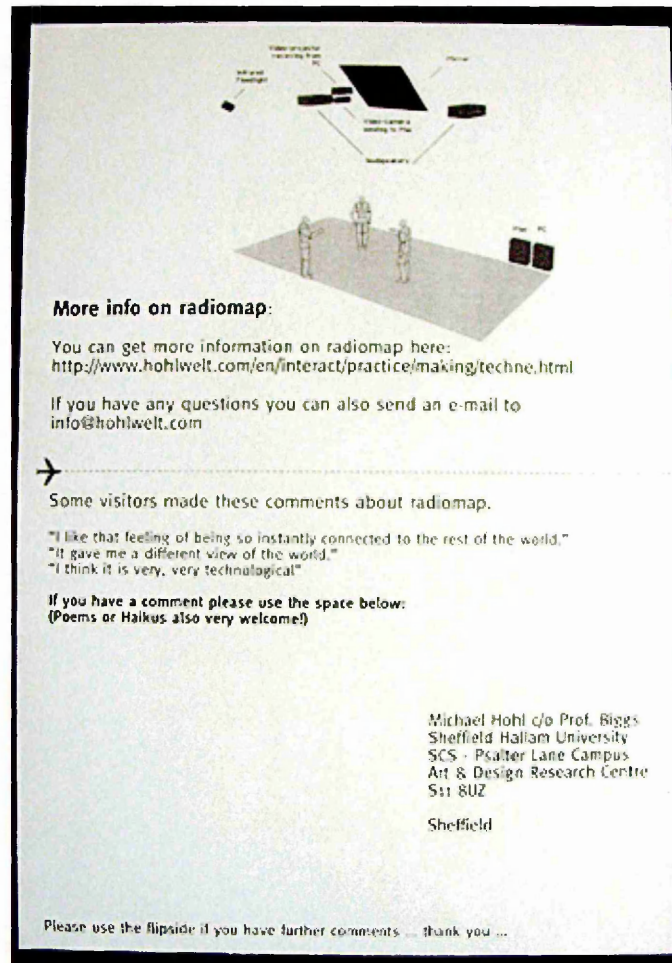


Figure 46: Image of the A5 (2xA6) reply postcard. The upper half containing the technical setup which was enquired upon by most visitors, and the URL of the web-page with detailed technical descriptions as a keepsake. The lower half is the postcard leaving space for visitors comments. In between the separation line.

These would allow visitors an asynchronous opportunity of making more thought through comments. A reply postcard was conceived and designed. The strategy therefore was two-fold. Firstly it should encourage the participant to provide any kind of comment or suggestion about the Radiomap environment. Secondly it should give the

researcher the freedom not having to explain the technical details and background information to every visitor by providing a URL and contact details for further enquiries on this card. The card was sized in an A5 panel format and printed upon solid drawing carton which is relatively thin and provides a matt and smooth surface. The upper half containing a diagram of the technical set-up, the URL and contact details; whilst the lower half containing the address and encouraging comments, could be separated and mailed off. A technical view was chosen to inform visitors of the technical set-up, the video camera, mirror and infrared light sources. Stamps were provided. The reverse side of the A5 format was intentionally left blank. Twenty of these cards were handed out and none was returned.

5.3.3: Developing a grounded theory from interview data

Main research interest for the interactive environment study is to find evidence for experiences of *global awareness*, *interconnectedness* and *overview effect* among the users of the Radiomap environment and also to gain an understanding of which *properties* of the application create these effects. Additionally it attempted to gain an understanding of the use of the unencumbered, augmented interface, the *collaboration process* amongst participants and of the expected difference in perception of *telematic space* and the *body* in this embodied interaction.

As in the Pilot Study it followed an adapted Grounded Theory approach, with *specific phenomena* of interest such as *immersion* and *presence*, the enhanced experiential qualities and concept of *transportation*. *General phenomena* were about the overall experience, collaboration and use of the augmented interface. The resulting interview data would be transcribed, analysed and coded with the theory emerging from the data only.

The resulting interviews were semi-structured and open-ended, beginning questions prepared and linear ("How long have you have used it now?"), others follow-up questions to visitors replies ("Can you tell me more about ... ?"). Main task of this was to keep the conversation flowing. As visitors came upon invitation and the research setting of the installation was evident, influences of the researcher upon interviewees (*reactivity*) cannot be excluded. Most visitors appeared critical, direct and outspoken in their replies and there was no evidence of attempts to provide satisfying or benevolent answers.

As participants ended their exploration of the Radiomap they were approached and usually asked how long they thought they had used the environment. Together with the notes from the observation sheet this would give an insight into the degree of immer-

sion. This was sometimes difficult as many visitors had come with friends or company. Occasionally an interview consisted of the replies of two or even three individuals. While the conversation begins they are asked if they minded if the conversation is recorded. None of the visitors had any objections. A handheld Canon DV camera is used for the interviews due to its easy handling and unobtrusiveness. As the space was very dark the image quality is not always satisfying. The sound quality is fine but occasionally interrupted by the talk of people and the playing of radio stations in the background. Conducting the interviews in the hallway outside the research studio was out of question due to disruptive noise from adjacent video editing suites operating at an increased volume.

The semi-structured interview strategy was followed as planned and proved overall very successful in that it provided rich data, allowing for many unexpected findings and get a broad understanding of visitors experience. General questions that had provided rich data during the pilot study complemented a strategy of improvised follow-up questions specifically targeted at the environment phenomena, the embodied interaction, augmented interface and process of collaboration (*"You say you used it together with X, was it easier to use be yourself or together with X?"*). Of special value was the interviewing experience gained in the Pilot Study, the approach of refining the questions of the Pilot Study together with improvising follow-up questions to keep the conversation flowing.

5.3.4: Analysis of data

The results of the interviews, two sixty minute Digital Video (DV) tapes, were digitised and transcribed. Sixteen individuals were interviewed in thirteen unique interviews. Eight of them male and eight female. The interviews lasted between five and thirty minutes resulting altogether in approximately 9500 words. This text was printed out in a narrow column to leave sufficient space for codes, notes, memos and annotations.

Workflow description: Coding the data was accomplished by hand on a printed version. Once all interviews had been coded identifying categories and patterns, relevant quotes were copy-pasted from the digital copy of the printed version to a second code-collecting document for axial-coding, following Grounded Theory procedures (Yates, 2004, 201-210). Each time focusing on one specific category or pattern only and its context. This procedure was followed for each pattern or category. Occasionally other items previously overlooked or multi-attributed were included. (Examples of the coded pages are included in Appendix III.)

As in the Pilot Study the open-coding process attempted to reduce the vast amount of data to a smaller set of general themes. All themes emerged from the data itself and were either themes that related to the phenomena under investigation or established new themes. The themes consisted of:

- global awareness - holistic overview - interconnectedness
- perception of the visuality of the map
- exploration and discovery, aha!-effect
- program content: music and voice
- telematic experience - immersion - spatiality
- awareness of the body
- geography and culture

Application domain:

- ease of use - transparency
- the circle interface
- using the map
- the voice interface
- collaboration - communication - negotiation

Further including:

- comments referring to the overall experience

At the same time it was important to stay open for unexpected findings during the open coding process and become aware of recurring themes in interviewees comments.

These new directions included references to

- a critical perspective towards globalisation
- expectations and stereotypes of radio programs (as effect of global awareness experience?)
- awareness of physical space, dance
- anti-aha!-effect (slow realisation)

Memo made while coding the interviews:

“The environment study will not provide such a coherent experiential map/trajectory [as the screen-based pilot study]. From the fresh coding perspective the environment study is very different from the pilot study. Audience attitude and response is more critical and reflective, about the functioning of the interface, about the body, movement and space, collaborative features, and especially about globalisation/post-colonialism. Why are the audiences response so very different? Is it the different experiences between screen-based and environment - or the cultural difference of audiences? Maybe both?”

These themes were refined in the axial coding process creating categories from the themes identified in the open coding sessions. These are used to develop a theoretical model of the experience.

Distinct themes appearing in the initial coding sessions

The following diagram depicts the cluster of experiential themes as distinct categories. They form the basis leading to higher and more sophisticated concepts described in the theoretical model of the phases of experiences including enhanced experiential qualities as global awareness and their conditions.

The experiential categories visitors referred to most often are the following: The ring *interface* and its behaviour, the *performative* aspect of being observed and the closely related categories of *collaborating*, *negotiating* and *communicating* with other participants. Several comments referred to the body as an unusual interface and a different perception of space. Very obvious are remarks about globalisation and post-colonialism which is seen as indicators that the environment while in fact successful in creating experiences of global awareness does permit a critical distance as opposed to a state of overwhelming immersion that leaves less faculty for a critical view.

A distinct category is references to perception; occasions were interviewees reported how their direct perception changed. These were mostly comments about the space and the time they spent interacting. They would refer to how they “lost track of time” or refer to a special quality of the perception of space; for example “*you don’t feel you are in a room.*” One visitor mentioned the experiential quality of the hearing experience, “*a sound window into into the world.*”

All visitors voiced their opinion about the augmented interface and the experience of interacting with it. They distinctly addressed individual interface elements, the voice

guide, the ring element and its behaviour and appearance, the connecting lines and overall experience. This comes as no surprise as this principle of interaction is not an everyday experience. Again, application-domain comments are separated into two main categories. One addressing the *graphical-user interface* (GUI) and its functions, the other suggesting potential uses the application could be employed for. Among the latter dominated the learning of languages, teaching geography, learning about other cultures.

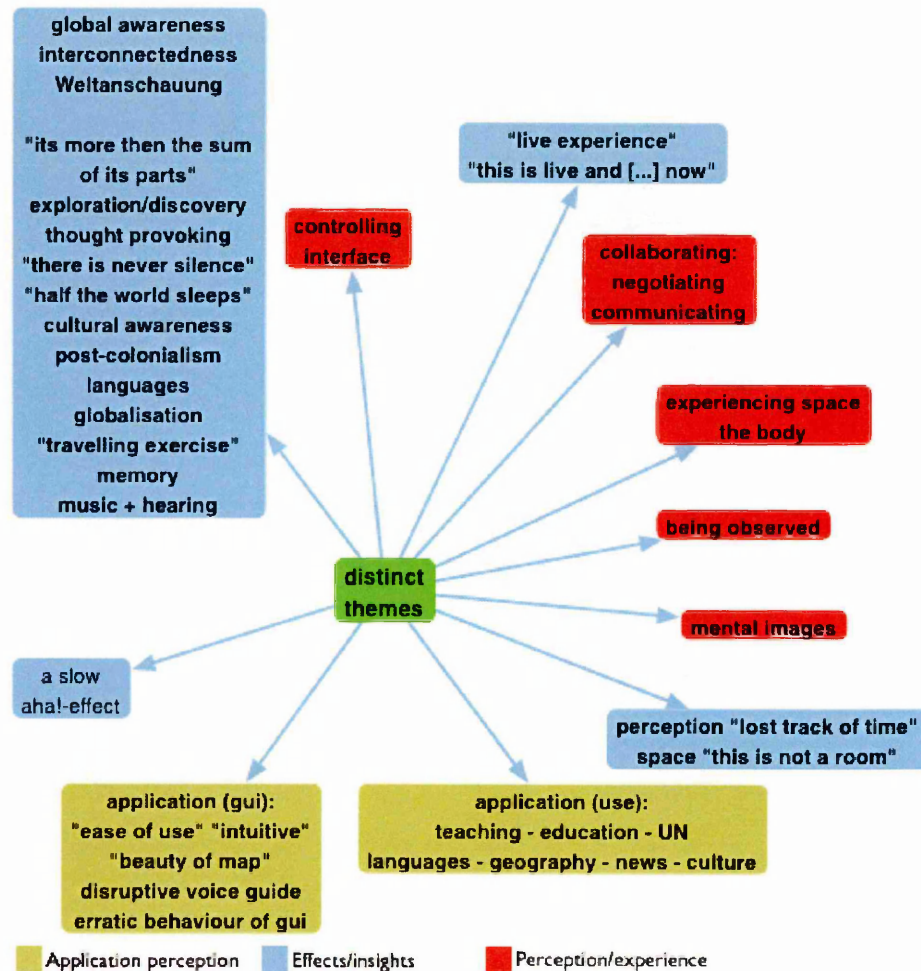


Figure 47: Distinct themes determined during the open coding process. They refer to the perception, insights and different types of experiences relating to the phenomena under investigation but also unexpected findings.

Axial coding allows one to determine deeper knowledge about the individual categories that have been determined during the open coding process. It examines the context, how the condition is triggered, strategies that participants develop and the consequences of these strategies. From the axial coding process the following detailed categories were extracted.

Orientation in the interactive environment

The dominating experience in the interactive environment is one of *orientation* and learning how to navigate the map with the novel augmented ring element interface. Only two visitors directly address *exploration* as an intrinsic element of the experience, a slight evidence that they *mastered* the use of the interface. The unusual character of the interface and its behaviours received more attention than its intended purpose as a *function* of the interactive installation, used to access and listen to radio stations. (In one of the very first sessions it took a visitor ten minutes to determine the function of the map, meaning to successfully listen to a radio station. She believed the interaction to simply consist of navigating the POI across the map. This led to the crucial insight that the ISP's routing tables appear to be cleared every 24 hours and required to access all stations once, before a visitor arrived.

As participants rarely have prior experience with this type of interaction they cannot compare it to anything they have experienced before. One visitor had the impression that the experience solely exists of moving the POI across the map. Another visitor describes that for her "*it was more the effect of finding out what is going on instead of the thing itself.*" For some participants the novel style of interaction and building a mental model of it, is an end in itself and more interesting than actually using it to access radio stations.

For other participants the orientation phase extends over the entire experience. One visitor explored the map for 10 entire minutes without listening to a single station. It pertains to learning to push or pull the ring interface by physical bodily movement. An additional effect is the voice guide announcing the connection to a radio station by speaking its name, the city and country it is located in. The perception of this part of the interface is ambivalent. While some visitors experience the voice guide as disturbing their flow of experience others regard this feature of the application as positive.

Additionally the interface provides an unfamiliar perspective of walking upon an unusual map parts of which are very dark. While orientating oneself participants may also have to collaborate with other participants while spectators are watching. The initial experience consists of a variety of unique factors which all depend on recurrent orientation and navigation.

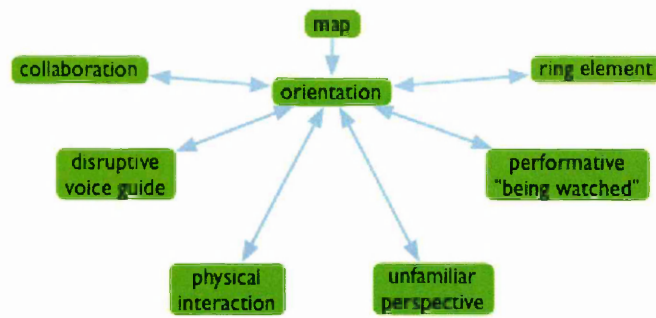


Figure 48: Stage one: The initial experience as perceived by participants is dominated by orientating themselves on the map and adapting to its unfamiliar interface and the interaction it affords.

The attention necessary to engage deeper with the content, and reach a possible flow-experience is continuously diverted by an external engagement shared between controlling the ring element via bodily movement and complex social interaction with other participants. This provides a continuous obstacle of proceeding into a state of deeper, cognitive immersion.

Most visitors would have been familiar with common, screen-based graphical-user interfaces (GUI) operated with a mouse. Through regular exposure and use of a mouse this interface becomes intuitive to use. It is ready-at-hand and requires little or no *conscious* attention. Even for the novice user it “disappears” from conscious attention very fast, allowing the focus less upon the *external interaction* process itself than on internally engaging with the actual content. Engaging with the augmented ring element of the interactive environment is unfamiliar as motion of the body is used to interact with the system. Additionally controlling the ring element requires a phase of adaptation, a period of interacting with it.

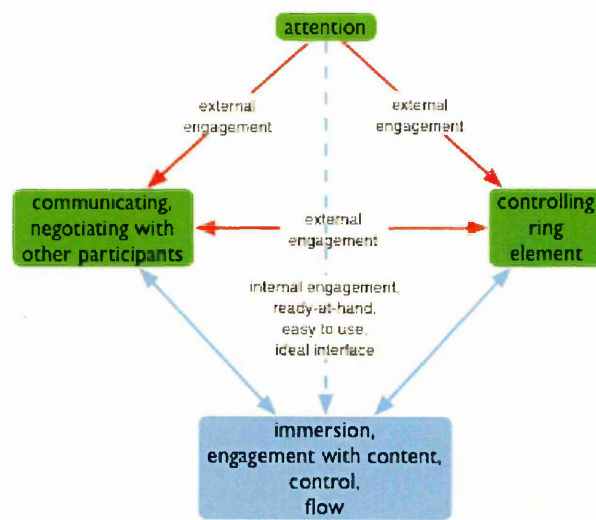


Figure 49: Stage two: Continuous experience: The attention is diverted with external engagement between physically controlling the augmented ring element and communicating with fellow participants. An internal engagement of cognitive immersion with the content is difficult to reach.

The interaction principle of using the body and bodily movement to control the interface is demanding and unfamiliar. Additionally collaborating with other participants to control the interface requires one to *communicate* with them. This implies all the related complex social and convivial characteristics associated with *speaking*, such as making eye contact, speech acts, physical gestures and social status behaviour. This creates another layer of complexity that is distracting attention and prevents immersion into the actual environment. The performative aspect of being observed by other visitors at the same time adds to this overall complexity. Collaborating participants find themselves in a continuous cycle of orientation, negotiation and re-orientation.

Comments about the interface experience:

“When I used it on my own I had a relationship with the circle, [...] when I used it with you I had a relationship to you.” Interviewee 02

“I am still not certain how I was to get the circle to move across. When I was working with S. th[is] ? was a little bit more clear. Because I spent the first two minutes of my (?) I was just focused on where I was going.” Interviewee 01

“When you do it on your own, you immerse yourself more.” Interviewee 02

Theory of experience deduced from the interviews

The experience is complex and structured in different distinct phases which build upon each other. A visitor commented that it was impossible to describe the experience to a third person as the *knowledge* about it can not be adequately conveyed. Visitors step onto the map, attracted by its visuality. They find themselves in a state of curious excitement and an unfamiliar situation. They discover that the augmented ring attaches itself to their feet and they explore the reactions of this interface by moving across the projected map image. Once participants discover the ring's purpose and the concept behind the interaction they enter a phase of consciously exploring the behaviour of the interface. Their attention is focussed upon its novelty and behaviour. Roughly put: exploring the map is a side effect of exploring the interface as it is new and unfamiliar. Additionally it may occur that a participant has to share the agency of the ring with another individual. This results in a further division of attention as it requires communicating and negotiating with the other person. While becoming acquainted with the interface, adapting to its behaviours, visitors encounter the voice guide that announces the radio stations. This default computer voice will speak, for example: "*Radio 123, Melbourne, Australia.*" The sooner the radio program starts playing the clearer the association between *action* and *response* is made. This is a phenomenon called *contiguity*; when two signals that occur in temporal or spatial proximity are associated in a causal relationship. This facilitates creating a mental model of the interaction and the affordances of the interactive environment. If the period between action and response takes too long visitors will have moved on. One visitor even assumed that this was the sole purpose of the interaction. In this phase the interface is still perceived as unclear, so the voice guide event may be perceived as unclear as well. As soon as a radio station begins to play, visitors, while they are still unaware of its live radio character, engage with the map with different expectations. They continue navigating the map for indicated locations and at some moment become aware that it is live radio they are hearing.

This *realisation* enhances the situation into a *live-experience* of increased attention, excitement and immersion. Once they have become aware of this participants *recontextualise* the mental model that they have made of the interactive experience. Their actions become directed and they begin to explore the map image consciously, searching for radio stations in areas they are interested in. They have built a mental model of the reactions of the interactive environment related to their activities.

Depending on a variety of factors, technical and psychological, some participants proceeded into an enhanced state of awareness. They become more deeply cognitively immersed in the interactive environment. The quality of this experience is not only indicated by the duration they explore the map but also by the grade of immersion and presence they experience; this includes the amount of undivided attention to and reflection upon the radio programs and partly, the awareness that the image map is live as well. This deeper state of contemplation results in a number of conscious realisations. Eight visitors had an experience of global awareness, holistic overview of the world, and of interconnectedness with the remote place they listened to. One visitor summed this up in the sentence: *"While I was doing it I learned something about myself, about the world, it made something conscious that wasn't there before."* 02 They became aware of the variety of different times of day or night on other continents, of different seasons, dialects and languages. They gained insights into cultural differences and became culturally aware of different patterns of musical interests, radio jingles, and news reports of the same topics. Some developed a "big picture thinking" of the world, experiencing it in this live-state. This may result in a change of world view, Weltanschauung, that lasts beyond the interaction with the immersive environment. As a result of the environments immersive telematic live-character participants are drawn into this telematic space and their perception of the local space changes as it loses some of its conventional spatial properties.

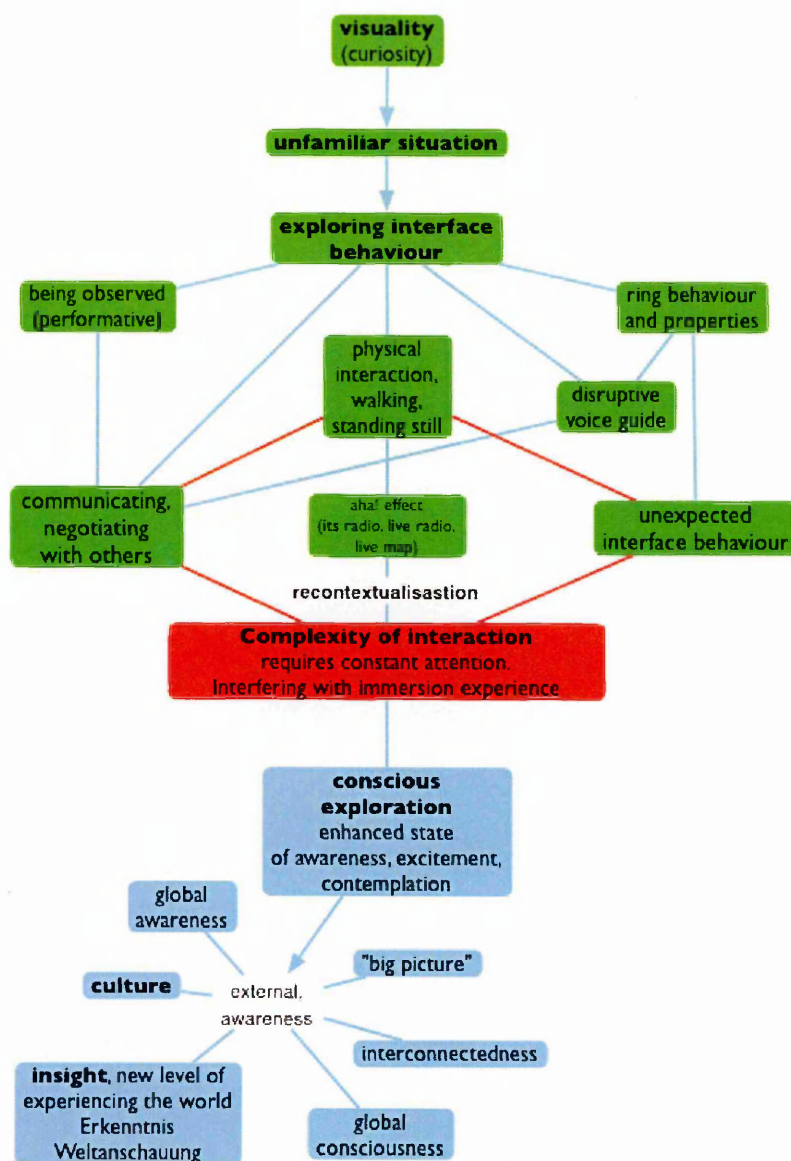


Figure 50: Theory of process model for the interactive environment experience. There is no phase of serendipitous exploration as the interface and its behaviour is unfamiliar and has to be explored first.

Experiences of global awareness, holistic overview, interconnectedness

Once visitors had become acquainted with the interface and discovered its function for listening to live radio broadcasts, they enter into a vivid state of conscious exploration. Overall this vividness is characterised by a *live-experience*, the conscious realisation that the perceived sounds are live broadcasts from remote locations. This live-experience initiates the enhanced experiential quality of the environment, as it emphasises the uniqueness of the experienced moment. This moment reveals itself as *one singular moment in time*, that cannot be repeated. It is a corporeal experience of becoming part of the whole world (made conscious by the recursive interaction with the map). This world

is not merely in view, but the participant is walking upon it, interacting with it that very moment. This fleeting moment may even be emphasised by the mundane character of the traffic news from a far away city.

Depending on the degree of cognitive immersion and their own mental suppositions, which requires a willingness to submit to this illusion to achieve a state of suspension of disbelief, participants might proceed into a contemplative state of mind, an internal state of reflection, about themselves and the world.

They see themselves, in the microcosm, connect to the macrocosm. An almost recursive experience for some visitors, becoming clearer in a visitor saying: "Sort of looking down on yourself." 12. This triggers a process of reflection for some participants where the trivial situation of being in a room, walking upon a map and listening to mundane radio programs, turns into a larger experience of a Gestalt-Effect, where the whole becomes more than just the sum of its parts. This experience is characterised by reflective insights, a global awareness, an holistic overview of the world and feeling of interconnectedness with the remote locations. Some participants have an experience of looking down upon earth from the orbital perspective of a satellite. The perspective of an unattached, distant observer.

"While I was doing it I learned something about myself, about the world, it made something conscious that wasn't there before." Interviewee 02

"It's quiet ... but there are things happening ... its an interesting conundrum ... it is alive ..." Interviewee 14

"What you are dealing with here is about people about territory, about the world itself ... there is so much in there ...you could just talk about it for hours and hours ... people will have very individual things to say ... it makes you conscious ... like an astronaut looking down at the world for the first time." Interviewee 14

"Half of the world is awake and half is asleep and [...] you really see it." Interviewee 02

"It makes me think about conceptions I have of the world." Interviewee 02

"Its like a window into the world" Interviewee 09

"You get instantly tuned in to what's happening outside, to what is happening in the world at the moment." Interviewee 14

"I think it is a wonderful piece of work; it is really interesting and very thought provoking. I mean it has got lots of layers, you can think about many things, whether in terms of culture, politics, geography, you know how the world is structured. But also about communication, radio and accessibility of it." Interviewee 02

"What I also find interesting about that is the fact, yeah, it is a live map and that there is never silence. [...] That there never is any silence ... at all on the face of the planet. There is always some sort of (voice?) noise going on somewhere." Interviewee 07m

"I can see from the light that its night-time ... and that the sun is coming up over there." Interviewee 12

"When I look at this and when I look at cities at night ... because you have this kind of onlooker look ... you have the feeling that this is constantly making sound ..." Interviewee 14

"A mixture of science and space and thoughts. I was like ... interacting." Interviewee 06f1

"You are part of it aren't you? You aren't only observing ... you are part of it." Interviewee 12

"Once you walk on it you actually have a feeling of contact, I don't know how to say it. Its really something related to physical contact. What you are listening to, your mind and your body." Interviewee 03

"I really like the way it's this mass observation, I really like that. [...] ... the idea of almost being a satellite ..." Interviewee 14

"This is very much how we are actually experiencing life outside at the moment. You get instantly tuned in to what's happening outside to what is happening in the world at the moment. [...] As soon as you tune into the idea of yes, this is live and this is happening now, ..." Interviewee 14

critical distance: globalisation and stereotypes

Among the effects considered during the conceptual phase was that the experience should allow or stimulate a position of critical distance while still being immersive and enjoyable. This distance is seen as an experiential opposite to being completely *overwhelmed* by the display technologies, their resolution, magnitude, sound quality and volume. Loud stereoscopic sound and an overly large, high resolution and brilliant image quality implicitly dim the ability of an individual to keep a critical distance by being

too sensorially captivating and engrossing that the *outer form* of the experience makes a state of critical and reflective distance impossible. Oliver Grau points to this option in his book “Virtual Art” (Grau, 2003). He considers this critical distance an important property which makes the difference between a piece that has a lasting content and a piece that is technology led and to which people numb over time.

In that respect the many responses pertaining to globalisation and post-colonialism are seen as the ability of keeping a critical distance while being immersed in, and engaging with, the interactive experience. This is vividly realised when some local radio programs switch to the BBC World Service during the early morning hours. The sense of locality becomes lost!

“it is quite an interesting experience about globalisation, that people are listening to things all over the world that sound very Euro.” Interviewee 11f

“It makes me think about conceptions I have of the world. About globalisation, about the fact, yes, that Starbucks comes from America” Interviewee 02

“I was surprised that [the radio stations] all sounded so similar.” Interviewee 05

“I would say that, that is not typical for the country, that is just radio like everywhere else.” Interviewee 04f,m

“When you go to England and Scotland, again it seems so stereotypical, this inundation of telephone call-ins, and they are always talking about football as well. Yesterday we had suicide bombings and lots of killings and so forth but the most important thing is Manchester United being knocked out of Europe.” Interviewee 14

“You can just go there and do it and see what it talks to me of my own history, of my own experiences, you know, with the thoughts I have had before about the world and about globalisation.” Interviewee 02

“you obviously got also a lot of French radio stations appearing in areas traditionally colonised by the French. mmhh and the same with British of voices. It is a global experience but in an odd kind of way I suppose.” Interviewee 07m

“This computerised voice always makes me think of that, it is linked up, it instantly has this appeal of great wealth, globalisation, big companies. The empty areas are more interesting ... then the areas that are full. It makes you wonder what is there. “ Interviewee 07m

“... the fact that radio stations might be playing western music from different continents I think that is quite interesting when you think about globalisation.” Interviewee 09

“ms: ... Yeah, mmhh, it depends I suppose whether if you tune into BBC worldwide newscasts and that sort of thing ... fs: Being British it automatically makes you think of colonisation.” Interviewee 07fs1

“It is a map of wealth and of sub-colonial enterprising in a way” Interviewee 07

Bringing the there here: Telematic characteristics, spatiality and the body

Live radio streams, together with the photorealistic map image constitute the telematic properties of the interactive environment. They create the vivid experience of being interconnected with a remote place and the world as a whole. It is different from the feeling of interconnectedness in that it does not pertain to a *specific place* as such, but more to the overall perception that the local space undergoes. This change of perception occurs with the degree of presence (a result of immersion) and the activity of walking through the space and looking down upon the interactive map while at the same time *becoming a part of it*.

One of the indicators one might expect to strongly support the telematic character of the application is that interviewees rarely make use of the *name* of a radio station but solely refer to the city or country it is located in, to its *place* and geography. Yet, we can assume that this is less evidence for the telematic characteristics than for the fact that it is easier to remember the name of a city or country than a perhaps cryptic abbreviation of an unknown radio station which may even be pronounced in a unfamiliar way by the operating system's voice. Would people have had the same kind of experience of global presence if they had been sat them down in front of an old short-wave radio set? I do not believe so. We can see people adapting to media over time and adapt to the experience. Short wave radio has had a vivid and connecting quality in its early days but present radio has lost this characteristic. Radiomap brings radio stations into a geographical relationship in an unusual immersive experience on an interactive photorealistic map and thus creates an entirely different experience than the ambient, not embodied and non-visual experience with a short wave radio receiver.

5.3.5: Transformation and spatiality in the “Radiomap” environment

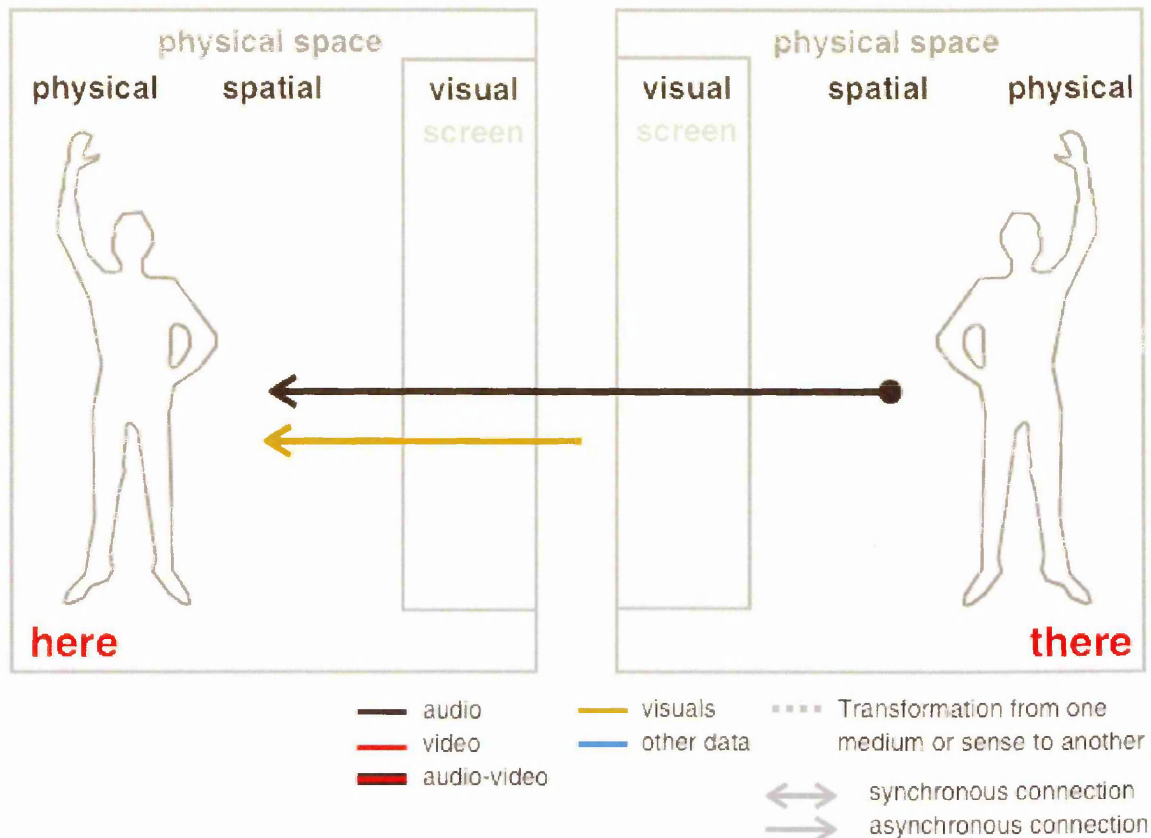


Figure 51: Radiomap environment: The interactive, spatial experience of a live radio broadcast together with the large photorealistic and live map create together a telematic experience of global awareness and interconnectedness.

Transformation has no relevance in Radiomap, as the stations broadcasts are not modified. Spatiality is relevant as participants move about the space, exploring the map with the unencumbered interface. The artificiality is perceived as less significant, as the photorealism of the map makes it appear very “natural.” The experience is a mediation between the real-time mapping of the live radio broadcasts onto the geographical map that participants can engage with in a continuous experience by physical motion. An interviewee describes the importance of context and frame of mind: *“You get an immediate sense of ... well, the thing is, I come here in my car listening to my radio .. that has immediately linked me into what is going on in this country and the music that is happening and things like that. Coming straight out of that environment into this where you sort of switching channels instead of getting BBC radio Two or Three you are getting Italy or Peru or wherever.... so yeah, you do get this immediate sense of having landed in that place.”* Interviewee 10

"... when you are actually walking on it you don't feel you are in a room. You feel like you are on the planet and that is a nice ... I know that it is only in your head, but actually while you are in there, you are thinking, you are only taking two steps ... but you are saying to yourself ... you are moving from Africa to America and that is what you feel that these two steps represent, when you make that step. And I was literally thinking to myself: What part of the world do I want to go to hear what their radio sounds like. Oh, I want to go to China, and I walked to China, and you do feel that as a kind of (?) you are moving across the globe, and you don't have the feeling that this is the floor any more." Interviewee 05

"Its nice to walk around the world and choose where you want to hear the radio. So you walk over from America to Africa and see the differences. It is nice to be physically moving ..." Interviewee 04m

"It is quite strange to think you pick up a sense of the place that you are actually standing over." Interviewee 07m

"It is quite calming to look at, the lights, and knowing that it is live. Sort of looking down on yourself." Interviewee 12

"You are part of it aren't you? You aren't only observing ... you are part of it." Interviewee 12

"I like the idea that you have got a map and you can literally walk across the map and pick the places that you that you want to go and focus on" Interviewee 10

"[...] you do get this immediate sense of having landed in that place." Interviewee 10

"... it makes you conscious ... like an astronaut looking down at the world for the first time." Interviewee 14

"Yes, it was fascinating to be able to tune into these radio stations in a way." Interviewee 07

Memo

"It is difficult to separate telematic experience from overview experience as they are interdependent. Why is this merged with Spatiality? Where does here and there appear in the pilot study? Perhaps a result of embodiment and the change of the local space['s spatiality]?"

Interface experience: the body

Using the whole body and true physical motion to interact in a computer mediated environment is a new experience for most participants. It is generally perceived as interesting and positive but also has its detrimental sides. Overall the involvement of the body provided less rich information than initially expected thus the evidence deduced is speculative.

The general perception of this involvement of the body is perceived as positive by all visitors. They enjoy the unusual situation of walking upon a map and interacting with it via full body interaction in the space. Some also report the feeling of becoming part of the system, probably as a result of the physical immersion. Physically walking upon the map and at the same time focusing the attention on it creates an immersive situation that some visitors experience as leaving the local space behind to a certain extent. They experience not walking upon a floor any more. The interactive live map has transcended these spatial properties. Or better, the local space loses its *presence* behind the augmented immersive qualities of the environment, which appears *more present*.

On the other hand having to stand still for the whole duration of listening to a station, is perceived as detrimental and cumbersome by several participants. Then two minutes of having to stand still are perceived as a long time. Some even referred to the experience as having to become “reverse musical statues” while resisting the temptation to dance. One visitor sat down to enjoy a longer period of listening.

One observation was that the system reacted with different sensitivities to the colours of some visitors clothing. The visitors that complained about having to stand too still had difficulties due to this effect. This problem should be solvable with more infrared lights and possible visible light filters for the camera.

“The way it makes you stand, the way it makes you behave is quite interesting.”

Interviewee 7

“One thing is, (On) the internet (one is) to do one thing and then stand back (...) this really, really involves you. People watch you, people look at you.” Interviewee 7

“Because you have to stand still in one place in order to listen ... and our bodies are not really used to standing still in one place ... then two minutes felt like quite a long time”

Interviewee 13

“Once you walk on it you actually have a feeling of contact, I don't know how to say it. Its really something related to physical contact. What you are listening to, your mind and your body.” Interviewee 03

“It is nice to be able to walk around the world and choose where you want to hear the radio. So you can walk over from America to Africa and see the differences. It is nice that you are physically moving instead of just clicking on a button.” Interviewee 05

“When you are actually walking on it you don't feel you are in a room.” Interviewee 05

“Oh, I want to go to China, and I walked to China, and you do feel that as a kind of ... you are moving across the globe, and you don't have the feeling that this is the floor any more.” Interviewee 05

“For children they learn by walking around ... and when they hear the name they know that's that place.” Interviewee 11

“Now we are going to Europe and its a travelling exercise” Interviewee 02

“[...] it is quite a bizarre thing when you hear the music the first impulse is to dance to it - but you have to do these kind of reverse musical statues.” Interviewee 07

Perception of the augmented ring and line interface (POI)

The augmented ring interface used to select the radio stations, was added to contribute to an experience of *collaboration* among participants. An alternative would have been a single participant environment without any augmented interface. This would have resulted in frustrated individuals waiting for the participant to finish the session. Sharing the agency and sharing the experience among several people, was thought of as a valuable communal enhancement to an otherwise lonely and performative version and is linked as well to the overall artistic concept of contemplation, reflection and collaboration.

Becoming aware of the agency of the ring element was an intuitive experience for most visitors. Learning to *navigate* it and discovering its *function* of selecting stations required additional time. Overall its use was intuitive, after additional information (meaning of changes of colour and opacity) was provided proved very satisfactory. Once the ring was connected to a station, its colour changed from white to orange, indicating that it was connecting to the server. Buffering was indicated by blue and playing by green. An error was indicated by red.

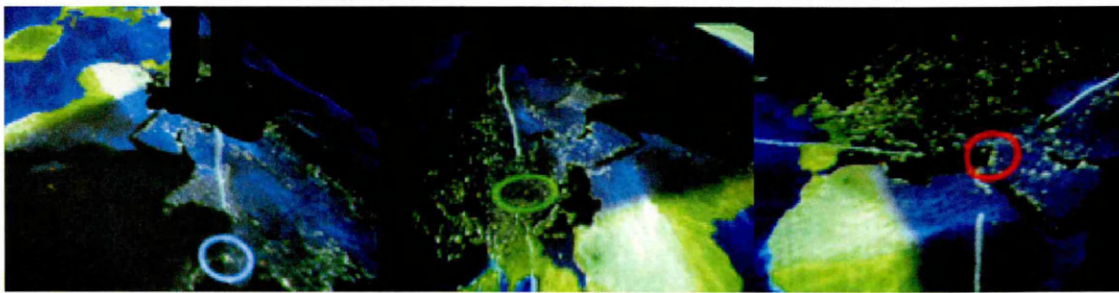


Figure 52: The POI, point-of-interest, ring interface indicated the status of a radio station by a change of its colour. From its default white it changes to orange when contacting a station, blue indicates buffering and green that a station is playing. An error is indicated by red.

A detrimental side effect of the collaboration among participants has only been realised in the process. The process of communication with all its convivial, social and behavioural characteristics effectively prevents a state of deeper, cognitive immersion and thus jeopardises the proceeding into the advanced state of experience, insights and reflections that result in global awareness etc..

"I like that fact that it is not only a circle but a line as well. So it is a guided circle a circle linked to my feet, I think this really works well." Interviewee 02

"I am still not certain how I was to get the circle to move across. When I was working with S. the (?) was a little bit more clear. Because I spent the first two minutes of my (?) I was just focused on where I was going." Interviewee 01

"I found it very difficult to control with one" (by oneself) Interviewee 02

"When I used it on my own I had a relationship with the circle, [...] when I used it with you I had a relationship to you." Interviewee 02

"Because it takes time for the system to work you may lose your patience if you don't know why the circle is moving and changing colour. You do see it changing its colour, but you think it's a visual effect. It's nothing meaningful. [...] I think knowing about the circle and about the colours is enough. To make you know. It's quite simple to figure it out once you know." Interviewee 03

"The station itself took a little bit longer, but it was pretty obvious soon that you could select the blinking points on the map. As soon as I found out that the circle moves, yes. And that the colour changes." Interviewee 04f

"Its quite quick to figure out what the whole aim of moving the circle was, as I say it takes a little bit of practice to move it to the point where it locks into things. it takes a certain amount of time. Its quick to figure out to move the circle around."

Interviewee 07m

"FS: Alone I think is easier. MS: Alone, yeah. [...] MS: Unless you are using it with someone that has the exact purpose in mind. FS: It is good that you can both do it. I see that when you first stepped on to it and there were two (people) it makes people act in quite an interesting way" Interviewee 07m,f

"Once you get used to the idea that you have got to fine tune it and get the circle exactly over the middle of the dot, the middle of the circle ... then it is quite easy. Also it is quite sensitive ... sometimes you have the feeling you are standing still but the circle is still moving. But yeah, it is quite intuitive." Interviewee 10

collaboration and negotiation

The ring and line interface feature corresponds to the process of collaboration and negotiation, as it is the means to engage with the map. Collaboration among participants is also considered a fundamental part of the larger artistic concept, allowing participants to become aware of the necessity of collaboration from a local to a global level.

In the case of Radiomap, to collaborate means to act together in the mutually beneficial activity of navigating the interface upon the projected map to a desired location to listen to a radio station. The conceptual idea was that radio broadcasts would, amongst others, provide an awareness of diverse conflicts all over the world.

Understanding collaborative behaviour together with the afforded means of awareness of global differences can lead the way further towards avoiding or possibly eradicating such recognised conflicts. Recognising the similarities between the microcosm of local collaboration analogous to the macrocosm of the global collaboration is an intended insight in this aspect of the work.

An unexpected result materialised in that the participants interacted more with each other, then becoming immersed in the environment. This deeper state of immersion however is a requirement for reflecting on the radio broadcasts and becoming globally aware.

"[With] two people there is more of an intimacy there, with three it is a crowd already"

Interviewee 02

“Generally it is more polite to talk about it.” Interviewee 02 (collaboratively navigating the map)

“With two is more partnership [...] with three there is got to be a leader because he decides to control the other two.” Interviewee 02

“There is something geopolitical about it ... because the interface is doing something. I think someone would adopt a leader position” Interviewee 02

“...in the end we didn't listen to the sound” Interviewee 03 (as a result of talking with each other)

“I think it is bit of both. Its verbal communication and ... (Gesturing).” Interviewee 04f

“When I used it on my own I had a relationship with the circle, [...] when I used it with you I had a relationship to you.” Interviewee 02

“[Y]ou kind of have to work together to get where you want to go. (Laughing)” Interviewee 04f

Visuality of map image

The visuality of the map defines the unencumbered environment. The map image is photorealistic, detailed and alive in that it shows the gradual changing of time in different localities. Synchronous to the rotation of the earth the map updates its day and night view in five minute intervals. Where the sun sets, the attentive observer can become aware of city lights appearing. The *live-experience* is constituted by the live radio broadcast together with the visuality of the map. Analysing the data gives evidence that the *photorealism*, together with the radio broadcasts, seems to provide sufficient presence to constitute the enhanced experiential quality. Only some visitors *consciously* realised the live character of the map, while the majority did not become aware of this property until later, during the interview. From this point of view the live character of the map does not appear to be too necessary for the experiential quality. On the other hand we can assume that visitors subconsciously realise they engage with a *different* kind of the map as the display of day and night is very unusual.

All participants suggested an increase in the size of the projection area, mostly so to improve the ease of selection of stations that are located so close to each other that the ring element occasionally jumps back and forth between two stations.

Participants use the term “map” because it shows the whole world in a familiar projection, yet it is not a traditional map. It is a live, photorealistic satellite view of the whole

world. Participants recognise it because they see what they expect to see by mixing the projection method of the traditional mercator map with the photorealism of a day and night satellite view. A perspective they have become exposed/used to.

*"I didn't realise that [the map] was live and actually that is another dimension to the fact that half of the world is awake and half is asleep and that you really see it! You always **know** that [here you see it]... I have never seen a map like this before."*

Interviewee 02

"I know that it is dark where I am and that made me think it is a live map. It wasn't done to make it easy for us. If it hadn't been live it would have been made so that we could see where we were more easily. The fact that I couldn't find where I was very easily made me realise that there was something else going on. And it was a live map so it wasn't easy to see the outlines of some countries. [...] Because you can't quite see, it gives it this nice sense of mystery. We tried to work out, is this Vladivostok? And I quite like that. In America, that bit that is light, its obvious where everything is but over here it's like fishing in the dark, it's nice that you can't quite see. I quite like that."

Interviewee 11f

"It is quite calming to look at, the lights, and knowing that it is live. Sort of looking down on yourself." Interviewee 12

"This is it for me, the shimmering cities! Its a very beautiful image ... One thing about the work is that it is very seductive as well." Interviewee 14

"It is actually very interesting, I avoided this area down here, because there is a shadow on it. I thought "Maybe it doesn't work there because ..." Until other people went there." Interviewee 01

"The size needs to be bigger" Interviewee 02

"[...] you are part of it aren't you? You aren't only observing ... you are part of it."

Interviewee 12

"I remember when I stood on the map, Australia was so dark, that I only could see the lights. I thought of it but I didn't realise it." Interviewee 02

"And I also like that you can see where it is day, and where it is night."

Interviewee 04m

"Once you realise, that it is live you start to get an indication of the time of day as well." Interviewee 10

"... when I look at cities at night ..." Interviewee 14

"[But] I can see from the light that its night-time ... and that the sun is coming up over there." Interviewee 12

the voice guide

As the ring element connects to a radio station the stations name, city and the country it is located in are spoken by the generic default voice of the computers operating system via text-to-speech. This is a means to provide necessary feedback for participants and transparency of internal processes of the interactive environment. This voice guide serves a practical purpose bridging the necessary period of time until the live radio stream begins playing. It also induces a moment of significant feedback every time the ring makes this audible connection to a station, thus creating anticipation in participants.

The perception of this part of the interface is ambivalent. While some visitors experience the voice guide as disruptive and disturbing their flow of experience, others regard this feature of the application as positive and fun.

"I think the voice in the background creates a picture of the atmosphere because every time you build a kind of picture in your mind [of] what's going on in that city at the very moment. The next time when you move, the guide comes on again „Radio blabla“ The whole picture breaks down again. And so every time you have to rebuild it. It really doesn't give you much information. Except which city you are on." Interviewee 03

"The other thing I like is the synthesised voice of the map. Because I think it is quite funny that "he" doesn't always pronounce things the right way. [...] he is like a foreigner as well, he is foreign and we are foreign. If you hear him speaking in the accent of the place, and you don't like his voice it can put you off before you have listened to the station. [...] So because it is synthesised it is the same continuously. You have no preconception of what the radio station will be like. Just step on it and take a listen." Interviewee 11

"That's why I wasn't listening to the radios, I was listening to the voice telling me "You're in Venezuela ... you're in Colombia .." Because there are no ... , because the map is not a political map so it hasn't got frontiers on." Interviewee 02

"To me the voice attracts me more than the music. mmhh And that goes also for the computer voice. For me the most interesting thing was the computer voice. To me the most interesting thing was the geography of it. More than the actual radio."

Interviewee 02

"[Because] the voice is very artificial and it doesn't give a feeling about the place itself." Interviewee 04

"FS: I always associate this voice with Microsoft., as well. This computerised voice always makes me think of that, it is linked up, it instantly has this appeal of great wealth, globalisation, big companies." Interviewee 07f

Radio experience

The preconceptions and cultural expectations of visitors had a high influence on how they experienced the radio programs. This analysis relates strongly to "critical distance: globalisation and stereotypes." Only when stations fulfilled a stereotypical expectation would they be perceived as authentic and as positively contributing to the experience. The study was conducted in the evening hours between 6 pm - 9 pm to allow the participants to visit after their working hours. At this time it was early morning in Australia and several Australian stations, as well as some National Public Radio stations in the US where it was early afternoon, broadcasted news from the BBC World Service. This effect of an non-local station playing at the locality contributed to the perception of in-authentic radio as it was not perceived as local any more. A station in Africa, having a particularly poor reception of the audio stream which was heavily obliterated by white noise and hissing was perceived as very atmospheric and authentic. The effect of the bad quality catering to the expectation of Africa being far away with weak reception and badly connected.

"I would say that, that is not typical for the country, that is just radio like everywhere else." Interviewee 04m

"I think it was quite typical. When we went to Africa, the voice, the music was quite typical." Interviewee 03

"it is quite an interesting experience about globalisation, that people are listening to things all over the world that sound very Euro." Interviewee 11f

"I was quite astonished how a lot of places I was expecting to hear local music or what I perceived as local music is - and it sounded very like western poppy music."

Interviewee 11

[About the atmosphere of place] *"Only at stations where they were sending programs that were characteristic for the country. [...] I think stations where they are playing English music, I would say that, that is not typical for the country, that is just radio like everywhere else."* Interviewee 04

"I was surprised that they all sounded so similar. I felt that the differences were to be more sharper." Interviewee 05

"Why is it playing BBC News all over the world!?" Interviewee 06

"Yes, you absolutely get flavours of places you listen to ... then you also get history, by the places that have been colonised, maybe; and have different kinds of histories that feed into the makeup of that radio station ... also the fact that radio stations might be playing western music from different continents. I think that is quite interesting when you think about globalisation. [...] And they can be quite deceptive as well. Because they might be playing something which you wouldn't figure would be coming from that place." Interviewee 09

5.3.6: Conclusions of the main study

The main study conducted with Radiomap had the primary goal to develop a theory of participant's immersive telematic experience. Of special interest were the enhanced experiential qualities, its telematic characteristics for example any changes of perception to the spatiality of the local space, but also to gain a general understanding of the range of experiences it created for participants. Among these general perceptions are the *embodied interaction*, the unencumbered augmented interface and the process of collaboration among participants. Also of interest was how visitors experienced the usually ambient radio programs as the focus of an activity.

Developing a grounded theory from the interview data has given many insights into aspects of the different individual experiential characteristics but has not resulted in a picture as coherent and clear as that of the Pilot Study. The evidence suggests that the experience is more complex, and characterised by a variety of interrelating effects and leaves several questions unanswered such as the long-term effects.

The interview data has given evidence that the main properties of the experiential quality are:

1. its telematic LIVE character
2. engaging with the unfamiliar interface
3. engaging with other visitors
4. enhanced experiential qualities such as global awareness, holistic overview of the world and experience of interconnectedness
5. a state of critical, reflective contemplation
6. the process of exploration and discovery
7. the aesthetics of the map

That said, it also permitted to gain a general understanding of the individual *properties* which together constitute these effects. These can be attributed to five main factors: The aesthetics of the map, the live-character of map and audio, the vivid cultural characteristics of the radio formats in the immersive set-up, and the general interactivity.

In that respect the Main Study was successful in determining and understanding these issues, especially the difficulties of collaboration with the novel interface which works against the necessary deeper immersive experience which seems to be a requirement for

the intensity of the enhanced experiential quality. It also resulted in the various other insights summarised below.

Methods

The grounded theory developed from the analysis of the interviews has provided strong evidence that participants did have experiences of global awareness, holistic overview and feelings of interconnectedness within the immersive, telematic environment.

The notes section of the observation sheet has also been used to list dysfunctional radio stations and exchange them for an active one when necessary. Other notes were that light effects caused by entering visitors were possibly obstructing the video-tracking system. This would require a black curtain over the entrance door to prevent light obstructing the video-tracking system. Another insight gained from the notes was that the Dymaxion map would be more practical; a group of three visitors had difficulties reaching stations at the fringes of the map image in northern Europe as one member repeatedly stepped *off* the map and by leaving the tracking-area and as a result was lost by the tracking system. The Dymaxion map places the continents as one large island surrounded by the oceans which would prevent the necessity of stepping off the map. Future iterations should use a different type of map such as a political one displaying country borders. This would allow, within limits, to compare the experience of the photorealistic map to that of the graphical one.

Other aspects concern the exhibition situation. The research studio where the study was conducted is located on the third floor and does not allow for an audience to simply walk-in by coincidence. A more public setting such as a gallery in the city centre would most likely have resulted in a less homogenous group of participants.

Overall the semi-structured interviews and the analysis of the data has provided satisfyingly rich data that gave valuable insights not only into visitors perceptions but also into many other and more subtle aspects of the applications functions. Among these aspects we find the importance of *local* radio formats for the experiential quality, that participants attitude is forgiving towards delays caused by the network and that the perceived authenticity of stations is enforced by a loss of the audible quality of the streaming radio. The adapted Grounded Theory approach was the adequate method to get an understanding of the phenomena under investigation considering the scope of the research.

Ambient radio and embodied interaction

There is evidence that the aspect of ambient radio as the focus of embodied interaction was an intense experience. The darkness of the exhibition space together with the quiet evening hours created an immersive situation with the Radiomap and its radio programs as the centre of participants attention; there also appears to be evidence that it is easier to control the interface together with another person, which is slightly detrimental to deeper engagement with the content. Still, the immersive situation of a dark space with the interactive map at its centre, together with the embodied experience of physically walking upon this map created an intense listening experience, focusing the attention upon the acoustic experience. This suggests that sharing the control of the augmented interface interferes with the individual listening experience as the attention is shared between listening, controlling the interface and talking to the collaborators. In a future iteration these insights should be considered in the form of enhancing the relationship between embodied experience and listening by avoiding the collaborative aspect.

The **augmented ring interface** was mainly installed for artistic/conceptual reasons to facilitate a collaborative experience. From the the conceptual artistic approach this was considered as more interesting then exploring the map by oneself. From that aspect the ring element functioned very well as a navigation and selection aid - not counting occasional technical difficulties. Most participants discovered its usage of moving it around and selecting stations with ease and intuitively. The analysis of the interview data has also shown that its usefulness has a contentious side. The interaction in the environment is *physically* unencumbered yet participants are in fact *virtually* encumbered with the augmented ring interface. This encumbrance creates a layer of complexity between participant and content which is effectively disturbing the state of psychological immersion which is so essential to the radio experience.

An alternative to the augmented interface would be no interface. A participant could explore the map and each radio station would indicate its state visually, without requiring an additional navigational layer such as the augmented ring element. Effectively, in its current iteration this would turn the Radiomap into a single-user environment. Its visual and acoustic signals are appreciated by regular participants yet first-time visitors perceive them as too subtle. This subtleness of the design would be more appropriate for an application of frequent use. Altogether, the interaction principle of using the body and bodily movement to control an augmented interface is still perceived as unfamiliar and

demanding for most participants. On the other hand an increased exposure to this type of interaction would result in a higher confidence of participants interacting with this type of unencumbered interface. In recent years an increasing number of interactive installations from an artistic background have made use of floor projections with visitors engaging with their bodies or via their shadows. The visitor is becoming more familiar with this type of interaction.²⁶

Another aspect is the **process of collaboration** which consists of *communicating* with other participants with all its social characteristics, creates a complex layer of consistent distraction, conflicting with a state of deeper immersion. The performative aspect of being watched by other visitors was also a distracting experience for some individuals. In another iteration the design would be changed as such that it allows for an individual immersive experience, which the Pilot Study has shown is most successful in creating the contemplative, involved yet critically and reflective state of mind that is so successful in creating the enhanced experiential qualities of Inner Awareness and Global Awareness as described in Figure 40: External or internal awareness experiences.

There is evidence that due to the novelty factor of the immersive environment some participants paid more attention to the interface and its behaviours then to the actual aim of the application: exploration and listening to the radio programs. In that sense the screen-based version was *more effective*, effective in the sense that users of the screen-based version made more references that could be related to effects of transportation, spatiality and global awareness caused by the engagement with the *content* - and less about their experience with the *interface*, the *medium*. This could be a temporary condition which increased exposure will resolve.

Three visitors had difficulties properly navigating the environment due to technical limitations resulting from the colour of their clothes and the video tracking technology. This problem should be solved with a second infrared light source or an extended period of calibration of the system with different samples and different conditions of lighting and projector adjustments.

An insight was that the requirement to stand still while listening to a particular station was perceived as difficult by some. Several participants perceived this as tiring and unpleasant especially after several minutes. Some participants wanted to dance to the music and found the impossibility of this frustrating. Possibly the sensitivity of the system has to be adjusted so that it allows for a more natural bodily movement. As only few

participants reported this observations this could also be a result of individual sensitivities.

Uninitiated participants took between one and three minutes to discover the functionality of the interactive environment, showing an unexpected tolerance to frustration. Obviously the visual indicators of the augmented navigation element (pulsating opacity and changes of colour indicating *proximity* to a station, *loading*, *buffering* and *error*) were perceived as too subtle and not logical and clear enough for a *first time user*. It appears that this depends on the type of application. Subtlety is required for an overly functional application that is used by a limited group of regular users. Lurid, simple usability is necessary for exhibition and kiosk systems that are mostly used for a single time by one-off users. Functional application are repetitively used by a the same group which are well aware of the systems capabilities and would over time be frustrated by too lurid interactions. This led to participants waiting up to ten seconds (in some case up to twenty) for a station to play the streaming audio. Participants obviously were not aware of these processes and repeatedly moved on in the very same moment the visuals were indicating that the sound would start playing any moment. This insight led to two changes in the set-up. To keep the ISP's routing tables up-to-date it required to have every station played once a day, before the first visitors used the application. A second step was to give visitors very brief instructions of the visual feedback of the interface without revealing too much. Both measures were very successful and resulted in a satisfying, clear experience for visitors and in fast responding times of less then two seconds on average before a stations started playing.

An unexpected experience was that the reply postcards were not successful. Also postcards for providing participants with a medium to respond with further written recollections of their experience were provided not a single one was returned (stamps were provided). By word of mouth I learned some months later that one of the participants considered using the immersive environment as a "life changing experience." Obviously this was realised after visiting the Radiomap environment. The post cards as a method were conceived as a possibility to capture exactly these experiences. This has proven that a delayed feedback medium is important and necessary. A future study would require a more reliable method, such as the successful visitors book used during the pilot study.

The process of making

The practice-based part of the research that included the making of the Radiomap application allowed interesting conclusions about collaboration and workflow in an interdisciplinary team. Developing the software application including writing a concept-paper outlining the application and features in detail and communicating with the programmer via Email or instant messaging. This process proceeded as anticipated in a professional manner. All milestones were achieved according to the proposed schedule.

The hardware side of the project included a large mirror that had to be installed in the research studio. For this task an in-house technician was required to install this mirror according to health and safety regulations. From the arrival of this mirror to its final set-up over six months went by. In a professional setting the time scale for such an undertaking would be between one and three weeks.

From its beginning stage the goal was to involve this technician in the project and solve the conceptual issues together with him, benefiting from his knowledge and experience. As he was familiar with health and safety regulations I anticipated to learn from him, from another professional based in a different discipline. I outlined the purpose and goal of the project and thus to get him involved and motivated, frequently asking him for suggestions and advice regarding hardware and tools.

For reasons beyond my knowledge or control, the technician was unable to give this project the appropriate attention. The anticipated collaboration did not occur and there were many instances of negligence in timing and meetings which in effect prolonged the construction process.

While producing the interactive environment required only three individuals, it is without question that as a result of size and increasing sophistication of projects interdisciplinary collaboration will become more common in the future. In professional practice this resulted in the introduction of various managerial methods and tools to assure in time delivery and staying within budget. How can some of these measures be integrated into a smaller size project? Methods to assure staying within the proposed time scale (and budget) could include milestones and fixed dates for the different stages of development. Team-building meetings would make non-local members become familiar with each other. Increased communication of members reporting on the stage they are at to other team members. This communication among team members should be where necessary transparent so everyone is aware of the current proceedings and how it affects

his or her part of the project. From the beginning responsibilities and tasks would have to be clearly defined and outlined during meetings and written form. All this without creating too much overhead and thus loss of time in a smaller team.

Conclusions

1: Introduction

The thesis has developed a detailed enquiry into the area of Telematic Arts and its relation to the discovered the paradigm of Global Awareness Art and Transformation Art, the latter a broader term for Visualisation Art. It used a methodology that combined three areas of knowledge and practice. It looked at other artists work to establish the arena of interest and thus distinguish the practice of Global Awareness Art. It introduced relevant computer science frameworks and methods to depict relationships, and described the ideas and techniques involved in the process of conceiving and making a telematic environment both as a piece of interactive art in its own right and as a research instrument in two applied, practice based studies. Moreover it looked at theory written by practitioners from the arts and how these regarded telematics applied in art. These perspectives, concepts and dimensions formed a unique method which was applied by informing an adapted Grounded Theory approach used in the practical study and data analysis. As one of the outcomes, it developed a diagrammatic style that allows to display the spatial output of telematic set-ups and the transformation of data from one sensorial modality to another, involved in this procedure.

This last chapter will critically discuss the research questions and the practical and theoretical implications of the outcomes. This includes the methodology, overall methods in regard to their interdisciplinarity and the themes of immersion, transformation and enhanced experiential qualities, closing with a promising trajectory for future research.

1.1: Main research questions:

The research began with a contextual review that resulted in answering the initial research questions (Contextual Review, 3.3) - and also in a number of new questions that opened a new vista upon the research.

The contextual review provided the insight that the reactions observed in 1997 were *related* to Telepresence but belonged to the much broader area of Telematics which comprises several sub-categories including Teleoperation, Collaborative Virtual Workspaces, video conferencing amongst others.

These views did still not fully explain the observed reactions. What was it that created the observed reactions?

One clue was art historian Frank Popper's remark of the experience of "telepresence awe" that participants of telepresence art experience.

Main research question were:

1. Which qualities are necessary to create experiences of global awareness, holistic overview and interconnectedness? In which ways can the evidence be recorded and analysed?
2. How does the experience change when participants of the interactive environment version have to collaborate?
3. What is the history of the idea of global awareness? Is there artistic practice interested in this experience?

Additional questions that arose during the research process:

- a. What are the effects when radio, which is under everyday conditions perceived as a rather *ambient* medium, becomes the actual focus of an involving, performative and collaborative experience?
- b. How will participants experience the difference between the screen-based and the environment versions?
- c. Is it necessary to brief participants - or let them discover themselves?

These questions may be answered with the insights gained through the two studies.

1. The two studies with Radiomap have given evidence that a combination of factors create the global awareness experiences. The main properties constituting the experience are the live character of the map and the radio. Effects that support the experience are the aesthetics of the map, the vivid cultural characteristics of the radio formats in the immersive set-up, and the general interactivity providing a feeling of control and containment. The method to record and analyse the evidence was the adapted Grounded Theory approach. It proved very useful in determining the effectiveness of the application. It was possible to get a reasonably good understanding of not only the enhanced experiential qualities but also of how the interface was perceived and where changes were necessary in future iterations. The method of informing a Grounded Theory approach by looking at artistic practice through relevant concepts of HCI and relating

those again to artistic concepts has proven very useful and may apply to a much wider variety of practice than telematics or telepresence. For example, increasingly artistic practice becomes more technology-led and dependent upon the computer sciences standards and norms. As we see in examples of locative art which is merging handhelds and other mobile technologies and connecting them to mash-ups of flickr, Google maps or RFID* technologies. These projects between art and computer sciences have become easier to realise and are encouraged through norms such as verbose tagging (folksonomies), Geo-tags and open API's.** These allow for an easier implementation of works building upon existing software modules that are "open" in the sense that they provide interfaces and encourage creative "abuse" as opposed to "closed" and proprietary systems. The conceptual artistic frameworks here can be informed by the paradigms of HCI developed over the course of the standards and can be used to examine and understand the diverse projects. Together with artistic reflections and speculations this may create potentially interesting frameworks for similar projects.

2. Collaboration among participants was considered a beneficial addition to the overall artistic concept. The interaction principle functioned as planned and participants immediately and intuitively use it to collaborate in an almost natural way. It is a very democratic way of sharing agency as all members share the same degree of control. It was a surprising discovery to learn from the data analysis that the collaboration among participants worked perfectly well, yet competed with individuals' global awareness experience in that it interfered with the necessary psychological immersion. Thereby it interfered with the intended conceptual artistic goal of the experience. From this point of view I regard it as an intriguing example of a theoretically beneficial enhancement which in practice is detrimental for the overall concept. From the VR and Telepresence concepts I reviewed this could not be predicted. When people communicate with others

*. RFID or Radio Frequency Tags are transponders that allow for a remote retrieval of the data they hold. They are often used to identify an object, animal or person.

**.. An API or Application Programming Interface is an interface of computer systems or databases to exchange data such as requests for services with software applications. This is a convenient way to access the database or system with a clear, higher level library of functions, variables and procedures. It enables convenient, easy and creative access to the information held in the databases. "Open" implies that access and use do not require to pay royalties.

this is a process oriented outwards, of status and mirroring the own status. Nevertheless the insights gained through the data analysis give very clear directions for the next iteration of the interactive environment. The collaborative features will have to be excluded and the interface simplified so that participants can immerse themselves in a more personal experience.

3. The history of the idea of global awareness was examined in the contextual review together with the related areas of Transformation Art and Telematic Art. Historically this global perspective began with the rise of telecommunication technologies and modern transportation and received a worldwide recognition with the imagery of our planet earth taken by astronauts from an orbit. It seems no coincidence that James Lovelock* developed his Gaia hypothesis from 1961 on, while working at NASA. As the astronaut Eugene Cernan said *"We went to explore the Moon, and in fact discovered the Earth."* (Krausse, 1998, 270) These images received within a short amount of time an iconic status and led to the environmental movement and a raised consciousness of earth as one connected habitat (Brand, 1999). Buckminster Fuller seemed to have been among the first who had this true understanding of a global awareness which becomes visible in his drawings from 1927-28 (Krausse, 1999, 99). Marshall McLuhan's perspective is more concerned about the disappearance of distances and the loss of geography than in a big picture of global awareness. A selection of artistic practice is included in the contextual review respectively in the case studies. An interesting perception is that the distancelessness created by the modern media technology does not create nearness (Heidegger, 1971, 166). It often stays distant and abstract as we passively consume. It requires more than the mere deployment of telematic technologies to evoke this. The selected examples of the artistic case studies have shown that there are potential areas of global awareness experience beyond visualisation of data for education purposes or space art which have not been fully explored yet. Among these I see more projects engaging with issues of the *indiscernible* in the local space (an example of electromagnetic influence

*. *"It is often difficult to recognise the larger entity of which we are part; as the saying goes, "You can't see the forest for the trees." So it was with the Earth itself before we shared with the astronauts vicariously that stunning and awesome vision; that impeccable sphere that punctuates the division from the past to the present. This gift, this ability to see the Earth from afar, was so revealing that it forced the novel top-down approach to the planetary biology."* (Lovelock, 2000, 29)

we see in Dunne and Raby's exploration of "Hertzian Space" (Dunne, 1999)), or remote natural processes such as wind, planetary motion of different kinds, or earthquakes in sensual and tangible transformation processes. Other promising areas would be biofeedback interfaces using plants and elementary interfaces such as water, light or sand. Examples of this we see in the work of Christa Sommerer and Laurent Mignonneau (Wilson, 2002, 356), Eduardo Kac (Wilson, 2002, 120) or David Small and Tom White (Wilson, 2002, 765). They use physical interfaces in their works, but unusual and ephemeral ones such as plants or water. The engagement with such a volatile, living or delicate thing must be perceived as highly sensual and captivating. It pushes the traditional conception that engaging with a computer is literary dry and non-sensuous into a new realm. All these works involve not merely a sensual aspect, but often a direct, physical hands-on engagement with an enlivened thing, which is not perceived as technology as such. In these interactions it is not just the result that is important and reached within a chain of tasks and menus, but the process of engagement itself becomes meaningful and sensual and is just as important as the result. It is important that the interaction is seamlessly integrated into the conceptual aim and content. An example of this is Sommerer and Mignonneau's piece "E-volve" where virtual creatures evolve in water and participants can directly interact with them by immersing their hands into the water filled pool. Sensuality and the senses, physical motion and hands-on activities are qualities that are essential in our everyday lives and could greatly benefit to artistic expression with technology and to artistic reflections upon the machine.

a. What are the effects when radio, which is perceived as a rather ambient medium today, becomes the actual focus of an involving, performative and collaborative experience? The data analysis has shown that the radio programs succeeded in creating a deep cultural experience for some individuals. As part of a focused immersive exploration it recreates some of the vividness of the historical excitement about radio that has been lost due to its pervasive and ambient entertainment character. As focus of an interactive process it results in a deep listening experience in both versions of Radiomap, as an embodied experience and as one wearing headphones.

b. How different are the participant's experiences of the screen-based application version versus the interactive environment version? The two applications were perceived as very different by participants. While the screen-based version is a very immersive personal experience that may lead to an inner awareness (a moment of personal memory) as well as to a global awareness experience, the interactive environment is dominated

by its novel and unfamiliar interaction. It does provide a vivid cultural exploration and supports a critical reflective state of mind together with a deep listening experience yet these could be reinforced by measures that enhance the immersive state of the installation. Perhaps it would also be beneficial to simplify the interface. Omitting the augmented ring element would disable the multiple-user functionality but would allow people to focus more on the experience than upon the graphical user interface. This would possibly increase the immersive state, but would result in a growing pressure from waiting participants and the performative aspects. The interesting polar relationship between *Immersion* and a state of *critical, reflective distance* provides a field for future research.

c. Is it necessary to brief participants about the application beforehand, or, let them discover themselves? While the screen-based version was completely self explanatory the environment version was less so. Exploring the screen-based version and “finding out what it was all about” was a beneficial, ambiguous experience for visitors of making it their own. The environment also had strong psychological components of exploration and discovery but required a short explanation of the interface. The gained insight is that in future iterations the interface has to be more transparent, less ambiguous. Otherwise exploration and discovery are key elements of the experience’s quality.

To summarise these findings: We have seen that the specific idea of global awareness, this deep experience of realising one’s geographical position in the world in the context of the whole planet is relatively new and a result of modern transport, modern communications and media. That we are able to imagine this at all (without going to space) is probably a sign of our uprootedness by technology, the ability to fathom this experience that is fundamentally contradicting our everyday perception. Modern transport and telecommunications are a result of technological development that fundamentally influences our lives. This includes effects of globalisation, of the complex planetary network that connects all societies today via distribution of information, goods and people. All this is dry and abstract knowledge. Our lives fundamentally change as a result of these technologies while at the same time we become able to attain this global perspective. Environmentalist René Dubos summarises this “*We are becoming planetized probably almost as fast as the planet is becoming humanised.*” (Dubos in Brand, 1999, 144) Implying that as a result of technological advances we cause pollution and other human impact that effect the remotes regions of the world and the atmosphere, while at the same time technology allows us to become aware of the global scale of this human impact through research, advanced analysis of satellite and other data. So the fragility of

the ecosystem and the long term impact of pollution that is crossing national borders on a global scale is portrayed by the media, and therefore people are graphically aware of it. Footage of oil spills in remotest areas are distributed within hours all over the world. Because of this more people become aware of the effects of own actions upon the globe. We can speculate that perhaps the Radiomap experience succeeds because participants bring this tacit knowledge already with them, as maps and radio are culturally ingrained. Radiomap is a different type of approach towards telematic arts emphasising the role of the participant as that of an active observer - and not involving him or her in remote communication. The cultural exploration is vivid and embodied and the spatial properties of the local space change. The telematic set-up creates a space where to an extent *there* is coming *here* while participants stay aware of their bodies, aware of the situation.

1.2: Critical review of the system of methods

The system of methods that developed over the course of this research is based upon an analysis of the relevant context my own practice is located in. This context includes concepts from media theory, art history, HCI, philosophy, media design practice, and a selection of examples of works of other makers. In the research process my own practice has two functions. It is both a work of art in its own right and a research instrument to gain insights into participants perception of this work. Together, the contextual analysis and own making form the system of methods that assisted in informing and creating own theory and practice. Initially the research began examining HCI's understanding of telematic technologies and to use this knowledge to analyse and understand a number of diverse case studies from a mainly artistic background. This resulted in a new method of looking at telematic art from a HCI and a designerly perspective. The mix of these different perspectives resulted in a unique overall method that was crucial for the comprehensive outcomes of the research.

This was an important investigation as the focus of this research was to get a better understanding of peoples strong emotional reactions to the mapping of remote data, observed in 1997. The questions were what had caused these reactions and how did people perceive them? How could participants experience be captured?

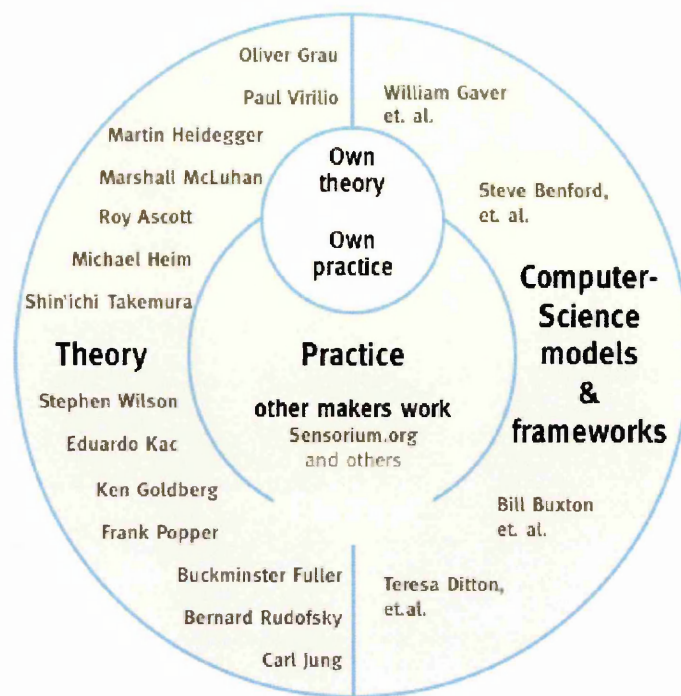


Figure 53: The system of methods includes relevant theoretical models from the arts, philosophy, design theory, media theory, and relevant computer science models and frameworks. At its centre lies practice, own practice and that of other makers. Altogether this system of methods helped refining the research process and its outcomes.

In this research I attempted to repeat the events on a larger scale and under controlled circumstances and thus gain a better understanding of observed reactions. Initially a collection of technological art, reading artistic statements regarding their works and looking at relevant HCI concepts and how they described telematics and the related VR. The first of several important insights, resulting in a new understanding of telematics were dimensions introduced by Steve Benford's (et.al.) text "*Understanding and Constructing Shared Spaces with Mixed-Reality Boundaries*" (Benford, 1998). It provided the dimensions of Transportation, Artificiality and Spatiality, used to describe the characteristics of communication among remote parties. Although these dimensions classify *shared spaces*, this method can be extended to general telepresence constellations. Transportation in Benford's concept is about the perceived degree of leaving the local space behind and *going to* the remote place. It is related to the degree of Artificiality which determines the degree of how computer-mediated the experience is. Spatiality, the third dimension refers to the spatial dimension of the experience, the relevance of attributes defining *place* and *space*. These dimensions inspired me to develop a diagram that could depict the transformation and spatiality of telematic set-ups. The dimension

of spatiality proved somewhat problematic for the development of a diagrammatic visual language to display spatial features of a telematic art experience. This mostly as a result of intractable difficulties in defining the medium to its mediality and the relationship between sensorial modality and the transformation process in respect to spatial dimensions. The sensorial modality is becoming more relevant from this perspective than the spatial dimensions. An interesting trajectory that deserves further research.

Overall the dimensions of Transportation and Artificiality cover a wide range of applications and can not only describe Collaborative Virtual Workspaces but also a simple video-conferencing application which consists of low Artificiality but a certain degree of Transportation of drawing people into the telematic space of the screen, depending to a degree on the quality of display technologies.

Two other ancillary dimensions adopted from HCI were Presence and Immersion, provided by Lombard and Ditton (Lombard, 1997) in their paper "At the Heart of It All: The Concept of Presence." They present an overview of the different properties and interdependencies between Presence and Immersion and the possibilities of distinguishing between them. Two early insights here were the differentiation between cognitive or psychological immersion and physical or perceptual immersion.

Together these dimensions of Here and There, Transportation and Artificiality, Spatiality, Presence and Immersion provided a deeper understanding of immersive telematic environments and the similarities to Virtual Reality. Moreover they informed not only the foundation of some of the interview questions and their analysis, but also the visual diagrams showing the spatial or sensorial output of telematic data exchange between Here and There, a useful instrument in comparing, depicting and better understanding telematic artworks using their technical set-up to display their spatiality and type of transformation. This is somewhat controversial as it emphasises the technical layer of an installation more than its artistic content - but at the same time this objectivity is its strength, allowing for a relatively neutral and impartial way of visualising the main characteristics of a work.

This diagram was developed as there were no diagrams available showing the *transformation of data between remote locations*. Some approaches were found, organised as *media*, *modality* and *content* for hypermedia learning systems in educational proceedings (Straka, 1998) but these did not directly address the transformation process.

McLuhan describes that the content of a medium was always another medium: “*The content of the press is literary statement, as the content of the book is speech, and the content of the movie is the novel. So the effects of radio are quite independent of its programming.*” (McLuhan, 1964, 267) It appears that this is becoming much more complex today through media convergence, with audio-books to listen to, ascii-films and podcasts. Perhaps the medium is becoming fluent and more of a process? Moving from one medium to another, changing its meaning on the way by different contexts.

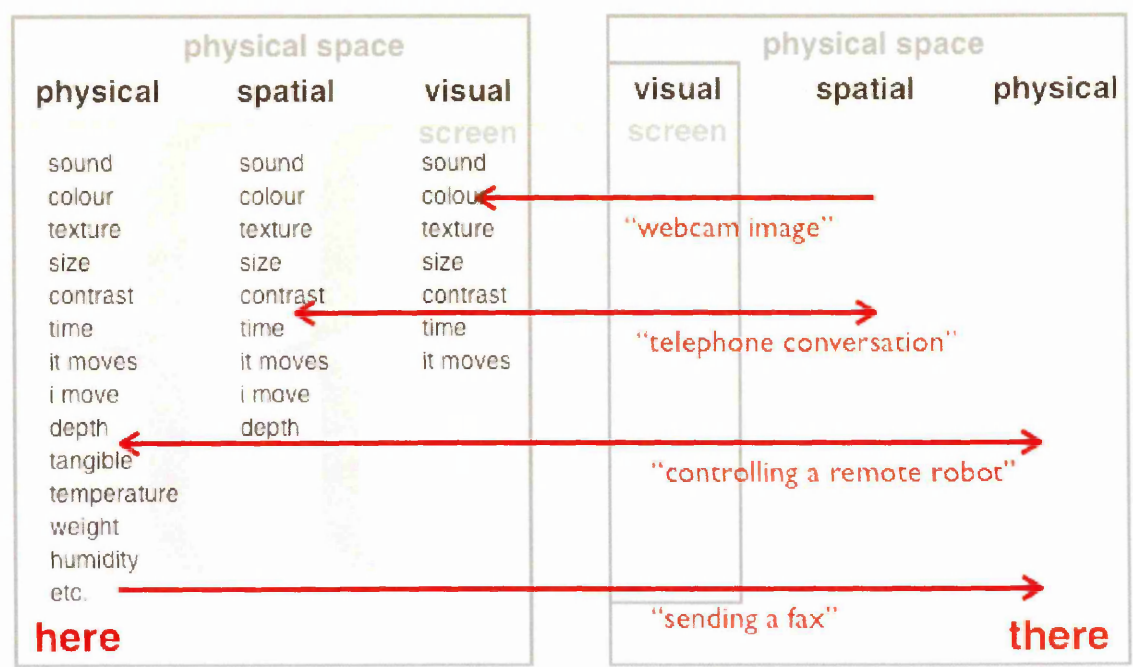


Figure 54: First iteration of Here, There: Telematic Spatiality: The diagram attempts to depict the different properties of a telematic connection between here and there. Most telematic connections are visual only and screen-based, while other connections involve spatial or even physical output and input.

With Transformation and Spatiality in mind I developed the first diagram to depict these setups. This “Here, There: Telematic Spatiality” diagram (Figure 54) was developed and refined in different iterations and in its last stage combined two information layers in one display: The spatial dimension that data was transformed *from*, and the *type* of Transformation it had undergone (Figure 55). This diagram will be further developed to combine Transformation with the sensorial modality or mediality of the data.

1.2.1: Transformation and spatiality in the Radiomap environment

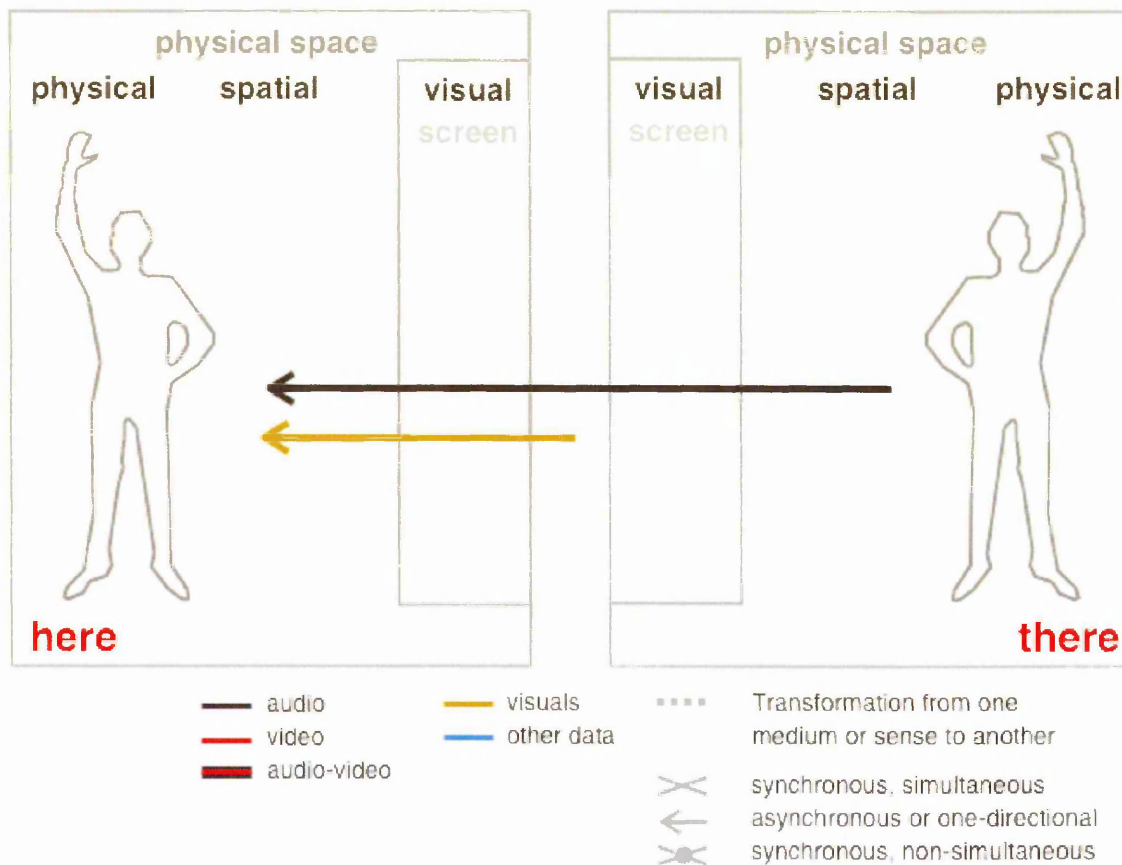


Figure 55: Transformation and Spatiality in the immersive telematic environment Radiomap:

The diagram depicting the spatial dimension and type of medium there, and, additionally, the transformation and spatial dimension taking place here. In this case there is no transformation taking place. The map is updated every five minutes, while one radio station is streaming its audio signal. The screen-based version is depicted in Figure 41.

The second diagram, Classification of Interactive Art (Figure 56) was inspired by Frank Popper's "Classification of kinetic Art" from 1967 (Figure 57). Popper developed a clear hierarchical schema that allowed one to categorise kinetic sculptures deduced from functional attributes such as, for example, real movement or virtual movement. My "Classification of Media Art Installations" also consists of *functions* of installation pieces but they do not create classes or categories. Each level depends on a distinct function in an oppositional pairing that is determined by the level before and it clearly is hierarchical.

As the works it attempts to “classify” are interactive, some functions are interpretative and disputable though. It allows to display existing pieces and discover similarities or differences among them beside their actual appearance and allows one to discover “theoretical” areas that perhaps do not exist yet.

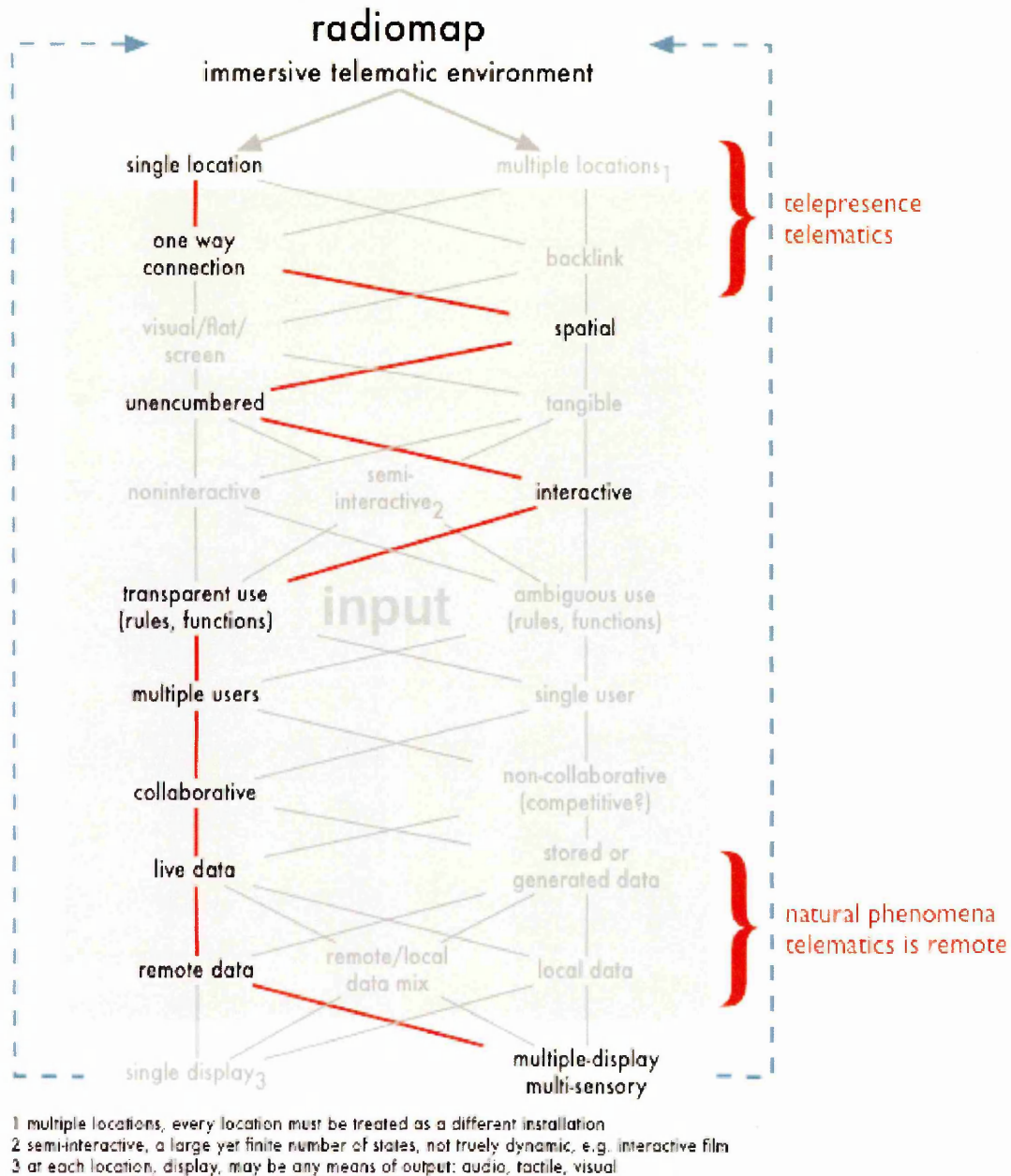


Figure 56: Classification of Radiomap environment in the Classification scheme.

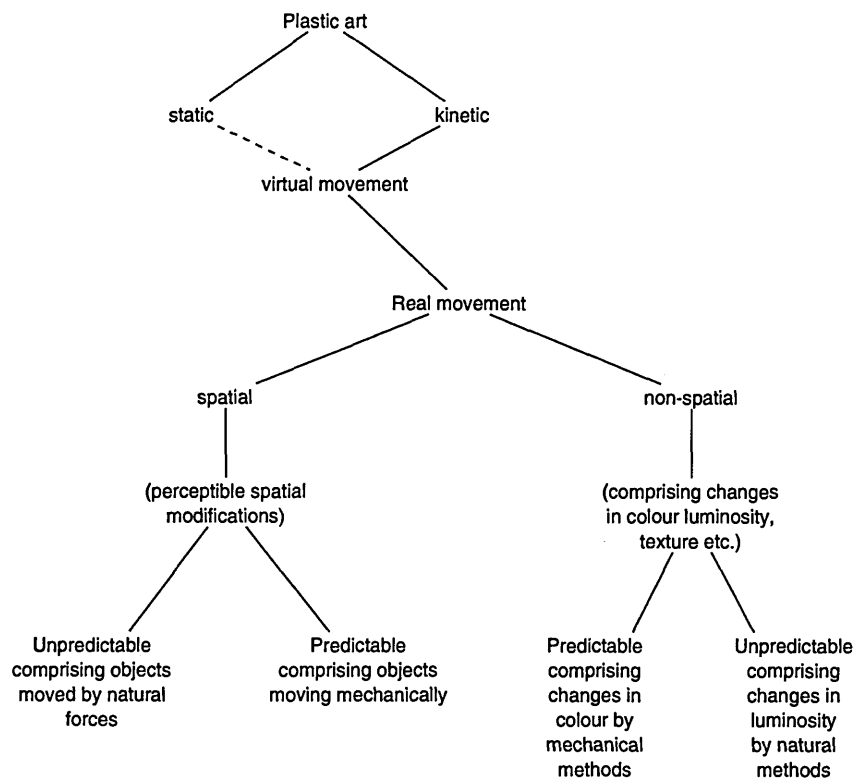


Figure 57: Frank Popper's 1968 "Classification of Kinetic Art," (Popper, 1968, 251)

Frank Popper also wrote about the experience of *telepresence awe* (Popper, 1997, 126) a term he used in connection with communication art, but one that could also be attributed to the participants of Radiomap. It suggested that there was a "telematic experience" that was different to "going there" but pertained to changes in peoples perception of the local space. An experience of "there coming here" or feeling connected which, in the case of Radiomap, creates an *embodiment* of the experience which is the exact opposite of the common understanding of Telepresence which, similar to Virtual Reality, is about *leaving the body behind* (Benford, 1998). Radiomap is a telematic experience that makes us aware of the body!

While these enquiries into art history and HCI frameworks were undertaken the information they provided was applied to the analysis of a selection of artworks. The selected pieces had been gathered in advance without a clear understanding of their similarities, but with the insight that they had certain properties in common, which art history and HCI concepts would possibly be able to identify. This process of analysis allowed me to point out these properties as Transformation Art, Telematic Art and Global Awareness (or Natural Process) art.

The results are displayed in the Venn diagram “area of interest” (Figure 58). The outcomes of this analysis provided a deeper understanding of the limits of the art history concepts and HCI frameworks.

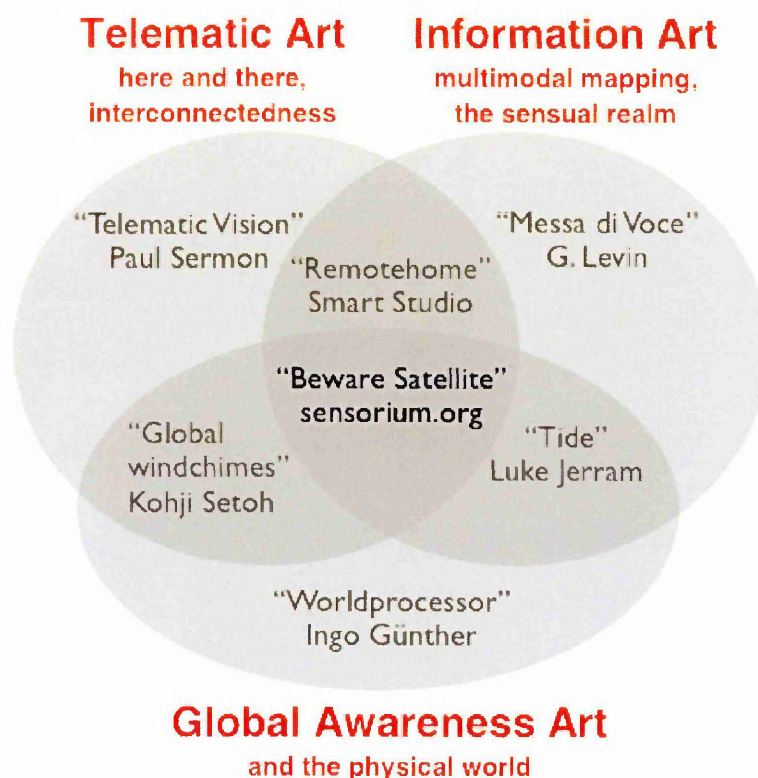


Figure 58: The “area of interest” emerged during the analysis of relevant works by other artists (context). Telematic Art is a recognised discipline while Transformation Art and Global Awareness Art are own concepts.

Together this analysis, the art perspectives and the HCI frameworks led to the discovery that telematic art practice consists largely of two distinct areas. One area being concerned about controlling remote devices such as Ken Goldberg’s “Telegarden” (Wilson, 2002, 528), and involved in *Telepresence*, the other focussing on communication, and allowing individuals to communicate with one another, for example Paul Sermon’s work “Telematic Vision” (Contextual Review, 2.7). The perspective of embedding remote data in a local environment exists as an artistic practice but does not yet receive the significant attention or analysis for the *fruitful directions* (Manovich, 2002) this incorporates.

This insight led to the discovery of the inherent and intrinsic relationship between telematics and what some refer to as *non-visual multi-modal visualisation*, a term that does not give sufficient credit to the process involved and is here referred to as *trans-*

formation, as a changing of form. This relationship becomes clearer if we view Telematics as the transmission of data between remote places, and Transformation as a process determining the appearance of data. One is concerned about data *transmission* the other about data *appearance*, both deal in input and output of data. Together they can be seen as a powerful concept beyond remote control or communication. This combination of telematics and transformation allows to facilitate captivating and *sensual* hands-on experiences with remote places or remote data in ways beyond what we usually see, such as cycling through microscopic landscapes, listening to gravity or solar winds, feeling a remote sunset or interacting with interstellar or ocean data. There are practitioners from both the arts and HCI working with transformation, while others work with telematics, yet there are not many examples where both transformation and telematics have been brought together.

One of the intrinsic properties of art and interactive art is its *ambiguity*, that it may be unclear, contradictory and open to interpretations. We have to decode the work through our engagement and critical reflection. Becoming aware that this property can be used as an advantage was an insight gained from William Gaver, who pointed to the three values of these ambiguities: *Ambiguity of information*, *ambiguity of context*, *ambiguity of relationship* (Gaver, et.al. 2003) and their benefits to design and interactive media. This valuable insight also allowed for a more diverse perspective upon the collection of examples in the case studies.

In retrospect the framework developed from HCI perspectives to inform the qualitative research was the right choice. Spatiality, Transportation, Artificiality, Presence and Immersion were valuable dimensions and concepts that provided the necessary structure for the enquiry. Together with own thoughts and practice, art history concepts and design methods they formed a new system of methods to critically engage with the topics and informed the analysis of the qualitative data.

The great advantage of the adapted Grounded Theory approach used in both studies is the richness of data in peoples own voice. The difference to a general Grounded Theory approach was mainly that the research did not take place in the field, but in an artificial setting that was created by the interviewer. Nevertheless the approach proved useful and valid as the interview strategy was following improvised questions and not a rigid structure and interested in keeping participants sharing their perceptions about the experience.

1.3: Reflections

"Daylight approaches: a father in Japan breakfasts on coffee, Pepsi, and vitamin pills before running for the train,. Twelve thousand miles away in Haiti, a man winces as he shaves with a much-used dry razor blade. Two girls in Iceland run barefoot in the snow around a hot spring; a boy in the United States happily fills in a firearm-safety coloring book; two boys at a village in Mali amuse themselves by marching around in Mickey Mouse sunglasses. Alone in a hot farmhouse, the wife of a rice grower in Thailand takes a short nap on a teak floor, a TV soap opera chattering at her unconscious back." (Menzel, 1994, i)

This excerpt is taken from the introduction of Peter Menzel's 1995 book "Material World." Photographer Menzel visited families in 32 countries and documented their home, their lives and their belongings. Browsing the book creates an awareness of culture and of difference by being able to compare people, their dwellings and belongings to each other from page to page. Viewing indigenous images it makes Gregory Bateson's comment that the environment shapes people's culture very clear. While in Mongolia the possessions consist predominantly of blankets and carpets, in Africa they consist of different types of mugs, jars and other containers.

Radiomap does not allow for such a visual connection through the eyes of a photographer but in its current version allows for other ways of comparing cultures in an acoustic way and by comparing difference and diversity in an acoustic trail in their geographical relations. The selection of this acoustic sources has been selected by me to create local images, or what I perceive as local. It is a technical journey that is heavily computer mediated and this mediation is apparent for every participant. Its goal is to use this technology to create an acoustic image of the world in form of a personal cultural exploration. The acoustic space is perceived as vivid and close and reminds of the excitement of early radio days. The participant is in control, explores at his or her own pace and the missing visual image stimulates the imagination. The technology merges with its content but does not become completely invisible. It blends in and serves its goal. The piece is not technology led but uses technology as a means. The participant becomes a traveller who returns with a different perspective upon his own culture after having been exposed to other cultures. The participation with the world map is spatial and embodied while the experience is intense, immersive, unencumbered and acoustic. A cultural window is created by the experience of listening and imagination, the immers-

ive experience, control and interaction. The sense of belonging is a result of the intrinsic cultural traits of the broadcasting radio stations, creating a new perception of the own culture, an own sense of belonging, in the mirror of the other cultures.

An experience such as this can be seen from Heidegger's perspective of an enframing technology that holds in itself the saving power as well. As technology constrains our view upon what is relevant and important in being, it has also turned our relationship to the world into one of consumption, of value and weight. A world of stock, its resources of rivers, forests and land seen as a repository and a standing-reserve, just as the wind and sea currents are "harvested" to produce electrical energy. A forest, a river and a sunset have a price. *Making aware* of this changing relationship between world and man, this uprooting and gradual alienation that technology has inflicted upon our lives. As mentioned earlier, neither the companies that produce the things, nor the consumers that consume them will critically reflect on these issues - and the arts should. By using telematic technology in artistic pieces, bringing there here by involving processes of transformation we can create technical pieces that are not technological in their appearance but sensual and embodied, connecting us on a physical and a cognitive level. Playing with this awareness of ambiguity and contradiction is the privilege and strength of the arts.

In a globalised world that is dependent and enframed by technology, global awareness experiences such as Radiomap could contribute to a feeling of belonging, not to one culture but being part of the world and its rich diversity. Or, to speak with René Dubos, to *planetise humanity* as fast as the planet is becoming humanised.

1.4: Outcomes and contributions

When this interdisciplinary research undertaking began the proposed outcomes appeared highly speculative. While the disciplines of art and HCI are more clearly defined, this research project had to locate itself between these disciplines and developed its own set of methods and methodologies to pursue this task. Nevertheless it has resulted in a range of insights, outcomes and contributions that appear highly relevant to all disciplines involved.

The achieved outcomes include:

- an understanding of participant's experiences of immersive telematics:
- the paradigm of Global Awareness Art and global awareness experience
- a diagram that depicts spatiality and transformation of telematic installations aiding in their understanding
- a new perspective and understanding of telematic experience, which is not about "going there" but bringing properties of "there" here.
- a new perspective on Telematics emphasising its combination with the transformation of data into another sensorial modality.
- a new perspective upon the artistic application of telematics, besides from connecting people with people and communication, to connecting people with places, emphasising a global awareness experience.
- new interdisciplinary perspectives for the broader media arts and computer science community such as the combination of history of media arts and HCI views
- novel methods to capture and describe the "experiential quality" of immersive, telematic environments.

Additional to these contributions we may consider Radiomap itself for its novel global awareness approach, its interaction paradigm and principles, the interdisciplinary, collaborative practice, the application of a practice-based computing and media design workflow as well as the system of methods developed during the course of this research.

From its structure this system could be applied to other interdisciplinary research frameworks within Art and Design, and Computer Sciences, analysing the context of practice and theory from the disciplines involved and applying relevant models to inform a qualitative research process.

- an understanding of participant's experiences of immersive telematics:

The research has gained a better understanding of the phases and the properties of participant's perceptions of this type of telematic application which is not about going there and not meeting in a virtual space but the until then theoretical concept of bringing the there here. This is revealed in the various comments about the perceived change of the spatial properties. It has also shown that this type of immersion leaves space for critical reflection through a contemplative state, a balance between involving and passive characteristics. A remaining question are the different critical attitudes of the audiences of the two studies. Were they a result of the innate experiential qualities of the screen-based application respectively the interactive environment or a result of visitors cultural background?

- the conditions for a global awareness experience:

There is evidence that the global awareness experience is a result of the combination of live-data, their synchroptic geographical representation and the interactive involvement. The question remains if Live-data really is essential and if perhaps statistical data from a database such as rate of birth and death would not as well create such an experience with a geographical representation. This could be explored in a future iteration.

- diagrams to depict telematic installations that enable researchers from the concerned disciplines to converse about spatiality and transformation in these set-ups and also modify and adapt the diagrams for their own benefit:

The diagrams "Transformation and Spatiality" and "Classification of interactive art" have been created to the best of my knowledge in different iterations and need to be further developed, and scrutinised by the community.

- a new perspective and understanding of telematic experience, which is not about "going there" but bringing properties of "there" here.

The research has provided evidence that there is an experience of *telematic awe* that is neither about going to a remote location out there, nor about meeting in a virtual place, but bringing the there here. It would be interesting to explore how these properties

would change in a setting without geographical representation but with tangible interfaces or other display technologies which are not physically immersive.

- a new perspective on Telematics emphasising its combination with the transformation of data into another sensorial modality.

The combination of Telematics and Transformation is clearly a promising field for future applications and has not been explored with Radiomap. Radiomap could be enhanced with other data from remote places that participants could engage in physically, tangibly and sensually.

- a new perspective upon the artistic application of telematics, besides from connecting people with people and communication, to connecting people with places, emphasising a global awareness experience.

The research has provided evidence that as people communicate they are deeply occupied with the act of communicating. This leaves less faculty for (critical) reflection and contemplation. Telematic installations that position the visitor in the role of an active observer could create immersive experiences by connecting to remote places and engage with the natural process, or in form of a geographical representation. It would be an interesting trajectory to follow if connecting to a single place without a clear geographical reference would still result in a strong experience of global awareness. Perhaps it would only be perceived as interconnectedness?

- new perspectives for the broader media arts and computer science community

New perspectives have been suggested by points made above, such as the sensual involvement together with a cognitive one, transformation together with telematics, the natural process or global awareness experience, mixes of statistical and live data, bringing there here, observant contemplative and reflective use of telematics as an alternative to applications of telematic communication, and the experiences of global awareness and holistic overview.

- novel methods to capture and describe the “experiential quality” of immersive, telematic environments.

The system of methods - the combination of theory and practice from different disciplines developed during this research, could also be used as a model by other interdisciplinary investigations. In this specific case it was beneficial that one discipline (HCI) provided a rich history of concepts of Telematics and the related areas such as Immer-

sion and Presence. The other discipline, Art provided an entirely different view upon the same area. Together they allowed the development of appropriate methods that complemented each other in a unique profile.

I would suggest that whichever technical area art engages in that there would be a systematic record of frameworks available by another discipline to follow. An artists/researcher wanting to engage in technical art will most likely be able to employ a systematic record of frameworks from other disciplines such as Computer Sciences, design or engineering that has produced theory, and practice relating to that theory, to create an interdisciplinary method from.

1.5: Concluding remarks and future research

The preceding section included several promising trajectories for future exploration. In this section I would like to focus upon the main directions this research will pursue. The first is about focussing further on the area of “bringing there to here” by adding components of sensual involvement via transformation to Radiomap. This investigation will include other data from the remote places, beside radio programs, allowing for additional cues about the conditions there. The intent is to transform this data into a sensual experience. An example of this application could consist of weather conditions such as temperature, wind, rain, snow, sunshine or the moon, positions of the planets, day or night, among others and transparently transform these to other sensorial modalities such as touch, smell, sound, air currents or temperature differences. This will possibly include tangible interfaces. It would be part of this prospective investigation to determine which transformations to which sensorial modality are perceived as lucent, vivid and meaningful. The aim is not to create an accurate simulation by a direct transformation but gain new insights by applying a cross-sensorial transformation. A focus will be upon the mapping of properties of tangibility, touch and feel, and which combinations are perceived as most intuitive or comprehensible and transparent. The exploration will be guided by the conceptual idea of expanding the Radiomap environment as a platform for experience not only of the world, but of the individual in the world - from a subjective perspective to a more holistic one. All of this on a combined, sensual as well as a rational basis in an embodied and physical experience creating a balance between thinking and feeling, reflection and emotion. Even if these displays are information poor in comparison to the original, they may create a new environment to connect and become aware of the world, of technology and its effects. From a technical point of view this

will probably be based upon the same MySQL/PHP database but using a different client. It may also make use of new open API's such as geotagged image databases and other standards that allow interfaces for easy access to existing data.

Communication vs. contemplation

The discovery of the intractable and almost mutually exclusive relationship between collaboration/communication vs. a reflective-contemplative state and flow-experience appears to reinforce the importance of the individual experience as opposed to a collaborative one. How do results from research into education and learning theory support this discovery? In some learning environments communication and collaboration are essential properties. My artistic targets though seem to require critical distance, reflection and contemplation to create, among others, the global awareness experience. Is there a way of these states informing or supporting each other? This could be an aspect to investigate in a future iterations of the environment.

Conclusive remarks on technology

I think the relationship between invisibility and knowledge is firstly a corporeal and physical experience. We handle artefacts in our environment and watch people use these. When we use the computer mouse we don't look at the mouse we *become* the cursor. After surprisingly little practice we forget about the mouse and it becomes an almost natural part or extension of our body. Tacit knowledge. Only when there is something stuck in the trackball and it stops working as we expect it we all of a sudden become aware of it again. Paul Dourish is describing this extension-of-the-body use as what Heidegger has meant as ready-at-hand (Dourish, 2001). The use of something has become so ingrained that it has become almost invisible - whereas being aware of it would be present-at-hand. We have to use it consciously and wilful. Otherwise we would be overwhelmed by mundane details of infinite dimensions. Thinking of walking, one only recognises how difficult and complex walking is after having to relearn it after an injury. From a more radical artistic perspective this suggests that obstructing a sense that is taken for granted allows people a heightened awareness on its return. Some researchers are doing this, for example, simulating old-age for designers to artificially applying impaired vision, hearing, gloves and limited dexterity to induce the experience of perception of an older person (Clarkson, 2003). Is it worth exploring this paradigm in telematic art?

Secondly, beside the physical dimension there is the dimension not what we do with technology, but what technology does with us; How it is changing us as human beings, our perception, our behaviour, our expectations towards artefacts and people. How technology effects our lives from a phenomenological and an epistemological point of view. We live different then before. We think and speak about different things. We do not perceive this change as a loss but it limits what we are able to think to what is possible to do with a device. After that, in another step, it changes our view upon the world around us. How can art, or technological art, make us aware of these changes?

Cultural knowledge includes knowledge how to operate a vending machine, read a map, drive a car, go to the bathroom. All these activities are complex but become invisible after a while. We can drive a car while we talk to someone and listen to the radio. So we can say that most of that what we do, we do being on autopilot. Some of these cultural techniques are different in other countries, driving on the “wrong” side of the road for example, and these are fantastic parallel worlds - that seem familiar, yet are different and enable us to see our own world with different eyes as we return. A non-artistic application of the travellers unconstrained view phenomenon.

Our environment determines our culture (Tomatis, 2003; Diamond, 1999; Bateson, 1973). Our culture constitutes our world and our horizon. What we do, how we do it. But also the reasons behind it all, *why* we do it. What we think. When our environment changes - we change as people. Most of our world consist of artefacts, things, products that we use for doing something. But for what? Often, I would say for actions that were not necessary before we owned all these things. That is one observation. My colleague Dr. Thomas Fisher can be quoted in this context saying: *“Show me things and I see people.”*

Now these things, these artefacts are becoming more and more complex and powerful. It is not a single artefact that does this, but the whole multitude of small gadgets like mobiles & handhelds, new operating systems, online shopping, video chat, text messaging, GPS, Craigslist on google maps, using skype on a plane, iPods & podcasts, home delivery, “intelligent houses”, “smart” household devices, games and how we spend our leisure time.

And as we integrate them into our lives they become our environment.

And again: While we think we use them, they shape us. They change our language (we “text” someone), we take a “podcast tour” of a museum, we speak with far away people

while ignoring the people in our immediate physical surrounding. Combined these small effects will have an interesting impact upon our culture in the long term.

And this is what I am curious about or better where it has to do with telematics, distant communication as many of these devices are used for communication with people or contact with remote places.

So, the essence of technology, to speak with Martin Heidegger, is not technology itself but how we change and adapt as human beings to it as we perceive the world through it. The basic question behind this is, do we really *change* - or do our fundamental desires, needs and aspirations stay the same? I guess the latter as we see so many indications that the changes have detrimental effects. Heidegger suggests that reflective art is the answer to question technology and by using technology itself to critically reflect on it.

During the course of this research while I was ruminating about the impact of tele-technologies upon our lives, I experienced a moment of epiphany in the early morning hours taking a train to the airport travelling to a conference. My clock had stopped working some days before and I was concerned I might oversleep and miss my aeroplane. I had mentioned this the evening before during a video-conference with my girlfriend. She offered to leave the video connection open and set her clock to the time I had to get up so that I would hear her clock ringing at her place - and wake up. We did as she suggested and her idea was successful (besides that she kindly agreed to being woken up in the middle of the night). It was only in the train, slowing waking up, that I realised the monstrosity of what had happened this morning: I had woken up to a clock that rang 3374 miles away across the Atlantic in New York City where it was five hours earlier! This was a true utilisation of “bringing there here,” of space collapsing, abolishing the time difference and turning it all into one Now.

In Radiomap we see an attempt of creating an enhanced awareness of the essence of telematic culture in a globalised world.

Appendix I: Concept paper and structure of software

The Concept Paper

Following the facsimile of the initial “rough concept” outlining the application affordances, as it was sent to Stephan Huber, the external programmer. A “fine concept” was not written and the information provided by this text was sufficiently detailed.

concept

Radiomap

state

2004-04-20

content

Overview

Structure & explanation of graphical elements

Dropdown menu & status bar

Kiosk/Terminal Version

Environment Version

Tracker

Admin-Tool

Overview

Radiomap is an easy to use (computer) application to listen to live radio stations worldwide through the Internet. It comes in basically two flavours: As a single-user screen-based version and as a multiuser unencumbered environment.

The user selects the radiostations from a photorealistic map of the world. These stations are selected with the help of crosshairs visualising Latitude & Longitude. A context-sensitive menu allows to change settings as genre and language of broadcasts. This results in powerful filtering abilities for individuals.

On the other hand the person experiences the application as being of very low complexity and intuitive to use.

All necessary data is accessed via a web-based database every time the application is started. This has the advantage that the application only has to be installed once onto the computer.

The multiuser environment works similar, but with different preferences: The crosshairs are replaced by a ring element that enables participants to connect to stations, there are no click-events only proximities - and there are no menus.

This concept-paper describes the basic structure of the application, the different interaction possibilities and sketches the dimension of the server-sided, database backend, the video-tracking application and the Editing-frontend for the database.

important

Graphics are functional sketches!

No layout, no design!

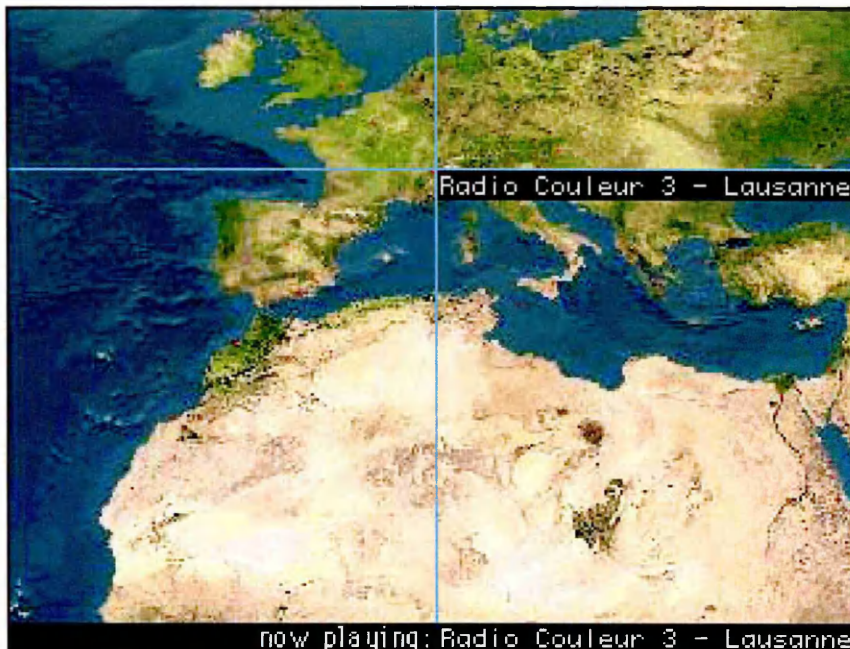


Figure 59: A rapid prototyping visual created in photoshop

Element Lat/Lon

Depicts dynamically Latitude and Longitude of the place the crosshairs intersect. It highlights on mouse-down or if a station is shown the name of the city in the city-display.

! „70 N, 170 E” N eg. S can only reach „90” Degrees, E eg. W reaches 180 Degrees.

Element GMT

Is only visible at mouse-down. Timezones display is not dynamic, not accurate but just blended over as GMT +1 eg. GMT –1 not in dependance to the Zero-Meridian. No DST. One hours steps – not 30 min (Iran, etc.)

! Typface clear and legible, favourably Geneva 9pt.

Element location indicator

Here name, city and country of a station are indicated.

Should the city have more than one station these are shown in a dropdown menu. The „last listened“ should be listed on top. The dropdown following below.

Complete map

The image-map as a whole is bigger then the screen-section. It consists of two images render from the fourmilab.ch website. Each half is 960x960 pixel big. It is desirable to have TWO images beside each other to enable an accurate, undivided view of the Pacific region. This would also allow for visualising trace-routes. The area measures 4 x 960 pixels = 3840 x 960.

e.g.: Current images are created by the application „xPlanet“ in five minute intervals and available at <http://hohlwelt.com/Radiomap/west.jpg> eg. [east.jpg](http://hohlwelt.com/Radiomap/east.jpg).

East and West are oriented along the GMT Zero-Meridian, Greewich, London.

Traceroutes

A traceroute shows the route the IP packets take over the internet – a fundamental difference to the way radio signals are transmitted via the „ether.“ It is interesting to make this hidden property transparent for participants. The IP-addresses are resolved by the local-host and passed on to CAIDA where the Lat/Lon to IP mapping is resolved and sent back.

This function is demonstrated well in the application „WhatRoute“. Yet Splines are preferred to vectors!

Element crosshairs

The only real interaction-element in the interface. With it the stations lists can be accessed (rollover-dropdown), settings or preferences changed eg. the content-filtering adjusted.

The reverse motion of the background image is also attached to its movement (x-screen size). Click into „nothing“ opens a different menu then a click onto a city.

Element „drop-down“ Menu

Rollover at a city (= at least one station) the available stations (genre/language filter!) are displayed followed by the menu items.

Rollover at mousedown(stilldown) into „Nothing“ (e.g. ocean) opens the menu-items without stations.

Element status bar

The status bar is permanently displayed and communicates ongoing processes (e.g.: „loading“, „buffering“). It displays the currently playing station and all external player states as „establishing connection“ e.g.. It provides necessary feedback and transparency for the participant. Indicating: „something is going on and I am not waiting in vain.“ In the case of several, different messages at the same time, the status-bar should blink and toggle between the different messages. (e.g. „loading background image“, „establishing connection.“

City dots

Cities are NOT indicated by a permanent visual „one-pixel“ image. But upon mousedown they should highlight. Cities should be „magnetic“ to the crosshairs.

Dropdown menu & status bar

Interaction- and feedback procedures create the elegance and usability of the application. The opening of menus and selection of stations should happen „fluently“ instead of abruptly. It is elementary that actions in the field station-select and in the status-bar inform about reasons of

performance problems (new bg image). Dropdown in nothing should highlight all possible stations / cities, preferably with a shape that is located at the actual place.

dropdown menu

there is only one kind of dropdown. It happens either upon ROLLOVER at a station/city – or upon MOUSEDOWN in „nothing“ (not a station/city). The difference is in the details important for terminal or environment version.

Matrix for dropdown menu features for the different stages as shockwave, standalone, not environment, kiosk terminal.

context-sensitive dropdown station:

- List of (visible) stations with selected filter: “<news, jazz>” stations in <London, UK>
- bookmark playing (only when playing)
- bookmarks
- Open <sendername> in browser
- Show history Nonsense
- shrink to desktop
- volume OFF/ON
- quit

context-sensitive dropdown Nothing:

- bookmark playing (only when active)
- bookmarks (folder hierarchy)
- language
- genre
- show history
- shrink to desktop
- quit

categories are created with admin-tool or website.

genres

Screen-based Version

- Single user
- One station per city
- Rollover only
- Crosshairs
- No menus, no prefs

the general difference is that there are NO dropdown menus and the only interaction is ROLLOVER – no mousedown. Cursor is indicated by crosshairs. As the crosshairs snap to a city the only (first from list) station begins playing. A station keeps playing until next station starts playing. Status bar, Lat / Lon as before.

Environment Version

- Multiple users
- Floor projection
- Whole map visible
- Shared Ring element – no crosshairs
- Lively, animated „feel“ of interaction elements

The environment version is functioning similar to the kiosk/terminal but has a few fundamental differences: The WHOLE map is visible – not only parts of it. The map is projected onto the FLOOR. MULTIPLE participants that physically move upon the map trigger the radio stations. Still there only can play one radio station at a time. All additional augmented information Lat/ Lon, GMT etc. is missing.

The crosshairs are replaced by a circle element which is shared among several participants. This connection / control is indicated by a line which protrudes from the persons position, connecting her with the circle element (Point of interest or Pol). The „tension“ applied to the Pol via the lines is divided, the Pol placed in the „middle“ – thus encouraging collaboration.

Environment with ONE person



Figure 60: A rapid prototyping visual created in Cinema 4D. The station name and the town it is located in are spoken by the default computer system voice. States of the radio stream as connecting, buffering, playing or error are indicated by the colour and opacity of the POI.



Figure 61: A screenshot of the final application in environment mode. The opacity of the POI is changing due to proximity to a radio station in red, sized 2x2 pixels, animated.

ring element /Point-of-Interest

the POI replaces the crosshairs and is used to select radio stations.

The centre point of the POI is the reference point. It can be used by one or more participants and has certain behaviours:

opacity

Its opacity changes dynamically upon proximity to a station moving dynamically from a low „breathing“ frequency, over a „nervous“ blinking to a final „permanent“ once it „snapped“ to a station.

Colour (status bar)

Once „snapped“ to a station the different states of the connection or download process that are indicated in the screen-based version by the status bar are indicated by colour changes. There are four states to be indicated: connecting (white), buffering (green), playing (blue), error (red)

Size

No changes in size at this time.

Behaviour / „feel“

Much of the experiential quality, e.g. „feeling of control“, „real time feedback“, transparency, charm and usability of the application relies on the behaviours of the ring-element, how it adapts to motion and reacts to people. Intuitive use is of major interest.

It should provide a viscosity in its movement, a certain animistic „aliveness“ in its reaction and inertia communicating weight. E.g. it should „avoid“ direct contact to people where possible. Also forgiveness / robustness concerning unintentional motion input is of interest.

Location indicator

No visible text - spoken by the system voice, preferably „Victoria“ or equivalent.

Radio stations

Only one station can play at any given time. This should be pre-selectable by the web- or admin-tool.

Drop-down menus

None of the functions are relevant here and should be ignored.

Genres

Not relevant in environment version.

Languages

Not relevant in environment version.

Demo-mode

It should allow a demo-mode for testing or debugging purposes that shows positions of people to adjust sensitivity of tracker and incoming participant data.

That allows to interact with the ring element via mouse and participants. Among others.

It should also be possible to exclude stream formats.

Tracker

The Tracker recognises participants on the map and sends their location to the Radiomap application. Because of performance reasons it should run on a different computer. The preferable technology would be video-tracking and the platform Macromedia Director together with the „track-them-colors“ (TTC) xtra.

Also the interface of TTC does not provide a GUI, the technology of identifying „blobs“ is fairly well developed and robust. Other systems should be taken into account as well, such as EyesWeb, softvns, WebCamXtra, BigEye. TTC was chosen as it is especially written for Macromedia Director and scriptable with Lingo. This provided a much easier integration.

In case of one larger environment or collaboration among participants between different environments at other locations it should be possible to use data sent by multiple Trackers.

User-Interface

The tracker should be a standalone application that recognises if a camera is connected to the computer.

The current video image should be seen beside the reference area.

It should be possible to adjust the angle, dimension and location of the reference plane, the „sensitive“ tracking area.

There should be buttons for all necessary functions as: de- & increase sensitivity, create reference frame, etc.

Demo mode

In case no camera is available there should be a demo-mode available for testing purposes generating „realistic“ data. Both for the purpose of adjusting sensitivity of the system as well as for making use of the generated data. This should be transparent and adjustable during runtime. These functions should support up to eight participants.

Administration-Tool

The admin-tool is necessary for fostering and maintenance of the web-based XML data stored in a MySQL database queried by PHP. The Radiomap application is an „empty shell“ loading all the current data every time it starts from the server.

The different values as stations, genres, formats, cities, countries and languages are heavily interdependent. E.g. Bengali News from Chicago, USA. We have streaming audio (formats qt, wmv, ra, mp3) from radio-stations (name, genres, language) > in cities (name, Lat/Lon) > in countries (name) etc.

The Admin-Tool consists of eight different editor-areas (windows):

Stations (main-window) + Station-Genres, media-types, genres, languages, countries, cities, map,

Stations editor

Overview window

Displays all stations and their properties

Stations overview

Shows all stations, sortable by attributes

Name of Station, field

String of characters + figures

URL of Homepage, field

url of homepage for screenbased version, string

URL of stream, field

URL to stream resource, http

Volume default for station, field

Because of volume differences this is important,

comment, field

text, personal comments, why disabled, unreliable etc.

media-type, dropdown

editable in other window, different media-types as qt, wmv, ra

city, dropdown

editable in other window, cities, alphabetically?

language, dropdown

editable in language window,

favourite, check-box

the first station listed in the screen-based version

disabled, check-box

alternative for deleting a station that is temporarily unavailable

environment only, check-box

the station that is available in the environment only, others are ignored.

Genres for station

Check-boxes that allow to select multiple genres for any station

City editor

To add a city

Name

City Name, field

Latitude, field

Latitude Degrees, e.g.: 37n47

Lon , field

Longitude Degrees, e.g. 122w25

Country, dropdown

Edited in country editor

Country editor

To edit countries for the cities

Languages editor

To add the language **stations** broadcast in.

! Not country, not city

media-type

the format of the radio stream, usually Quicktime, WMV, RA (RealAudio), or mp3 (streaming mpeg)

Genres

The „format“ of the radio broadcast: news, jazz, etc.

Map

The possibility to verify positions of cities by crosshairs, displaying, city name + lat/lon. Map in 1:1 scale

Next steps include:

- evaluating software, plugins, video tracking applications
- deciding for a desired platform
- finding, evaluating local radio stations that also broadcasted on the Internet
- path name conventions for database
- a cron job was set up to render the photorealistic, night/day background map¹.
- a web based documentation tool was set up at hohlwelt.com/en

As the project proceeded we:

- developed wording conventions for naming files
- set up “Subversion,” a version control system that allows management and documentation of the different iterations of the core applications and convenient updates from remote local networks.
- set up “Bugbase,” a web based change request and bug reporting (“ticket”) system that allows convenient report of unexpected or undesired behaviours and also making change requests.
- role, evolution and communication

1. “xplanet” by Hari Nair at <http://xplanet.sourceforge.net/>

Appendix II: Structure of software modules

The structure of the individual software modules was implemented as outlined in the concept paper (Appendix I) by the collaborating external programmer Stephan Huber, in the following manner. He converted the descriptions of behaviours and affordances outlined in the concept-paper into function-layers and objects of the software application. Platforms, hardware and procedures were informally discussed beforehand.

Structure of main Radiomap application

The preferences-loader recognises if Radiomap runs as a screen-based application or in environment -mode.

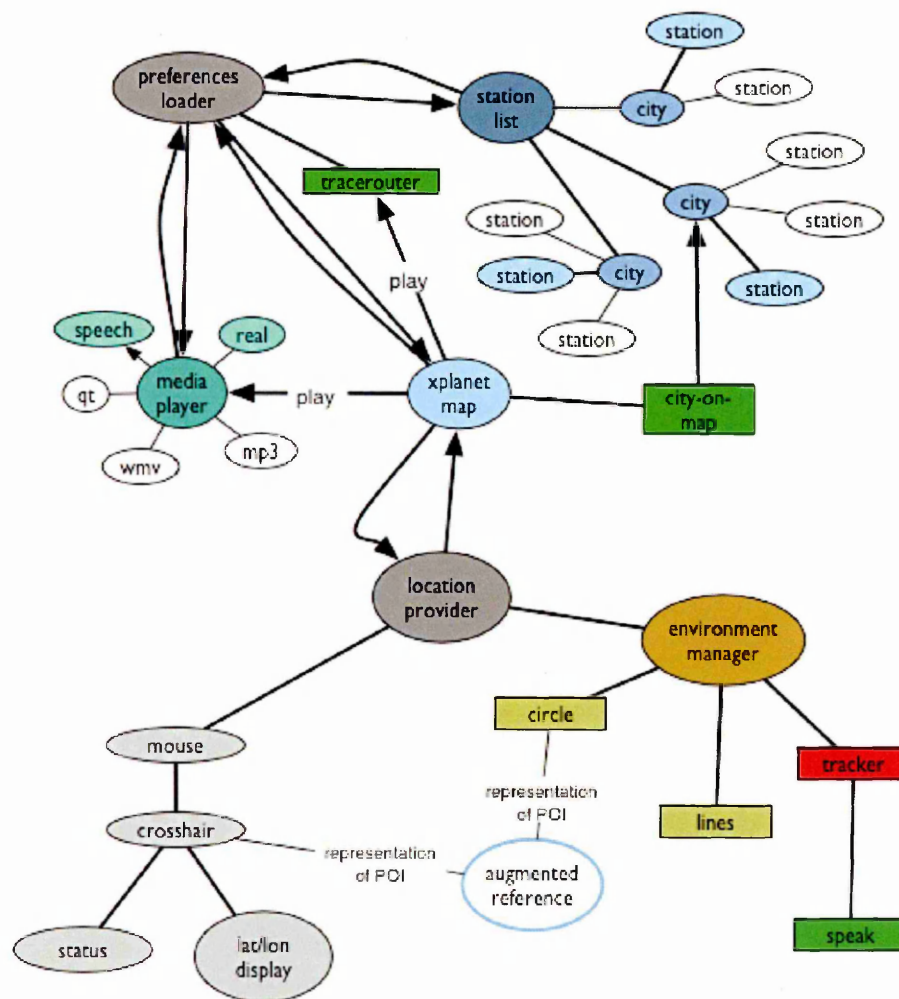


Figure 62: POI, Point Of Interest, the augmented ring element for one or more participants on the map. Cities may have multiple radio stations, yet the environment is only able to play a single one. The remaining serve as alternatives that can be manually updated in case a station is not available. Quicktime (qt), Windows Media Player (wmv), mp3 are disabled as they do not run stable.

Structure of administration-tool

The administration-tool was used to maintain the online mySQL database containing, cities , their Latitude, Longitude, radio stations, country affiliation and streaming URL.

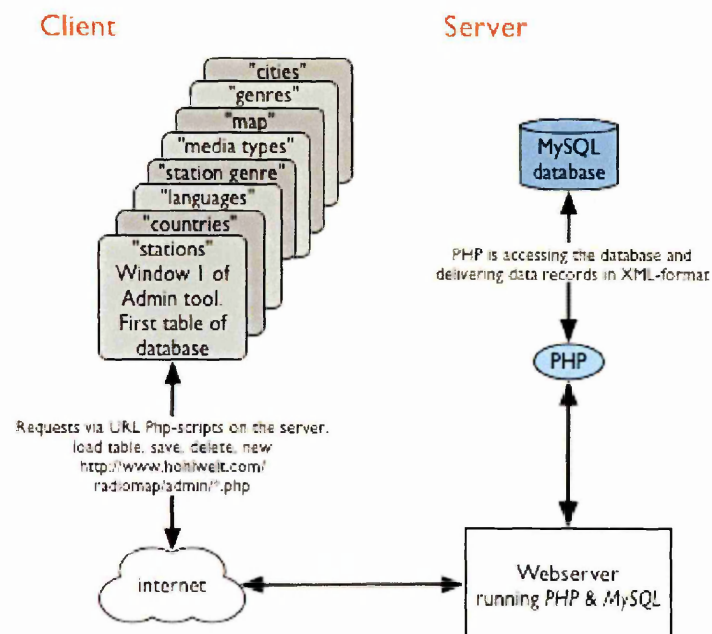


Figure 63: The admin-tool allows to add new content to the MySQL database PHP, Hypertext Preprocessor, a server-side, HTML embedded scripting language to create dynamic Web pages. MySQL, (structured query language) is an interactive programming language for getting information from and updating a database.

Structure of online database

The structure of the online database was developed from own affordances and how they were outlined in the concept paper.

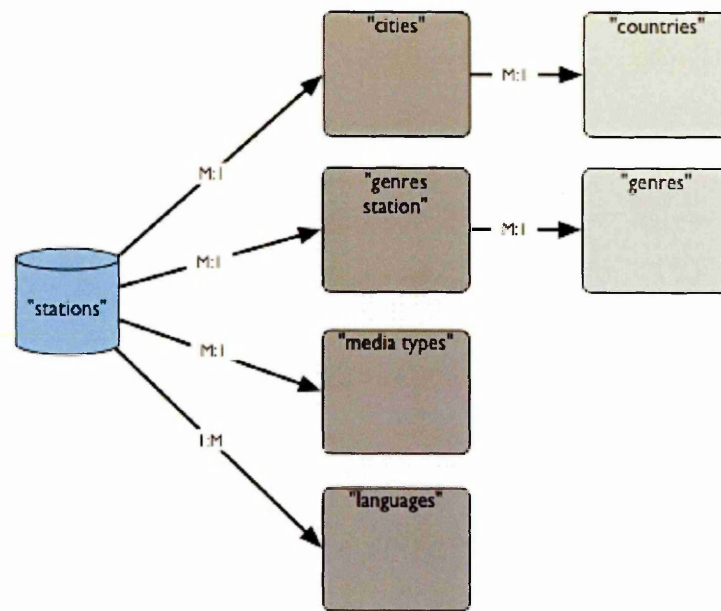


Figure 64: Stations, are the entities of the structure. All other properties as their city, genre, media type and language are set in dependence to it. M:1, many to one 1:M, one to many.

Structure of external data the application requires

The different software applications run on two local computers and two different processes on one remote computer. The topological overview determines between the different processes and modules of the software, not their physical location.

The MySQL database provides all relevant data regarding the radio stations, their location, language, country affiliation, stream format and genre. It is sent upon request to the Radiomap application as the “station-list.” The individual radio stations stream their format to the real audio player. Running in environment-mode the video-tracking software continuously sends floating point coordinates to the application. The server-based application Xplanet is generating a new image every five minutes. The application fetches this image as a background process every five minutes.

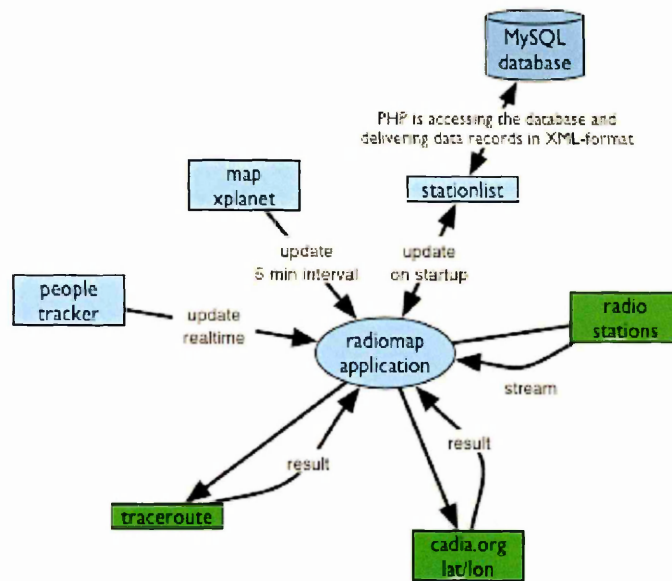


Figure 65: Topology of the different external processes the application requires. Colours differentiate between own processes (blue) and external processes that are beyond influence (green).

Structural flow of the video-tracking process

The video image is sent via firewire to the powerbook. The Tracker uses the TrackthemcolorsPro plugin running in Macromedia Director MX 2004 to create coordinates from the comparison of changes taking place from image to image, determines a centre-point and continuously sends these locations via TCP/IP to the Radiomap application. The receiving application only evaluates the *latest* coordinates and drops the older ones, checks their probability and updates the position of the line and as a result the position of the ring element. If a position is lost the applications “searches” in increasing distance for new points and interpolates the new position if one is found, resulting a smooth transition between the old and the new location.

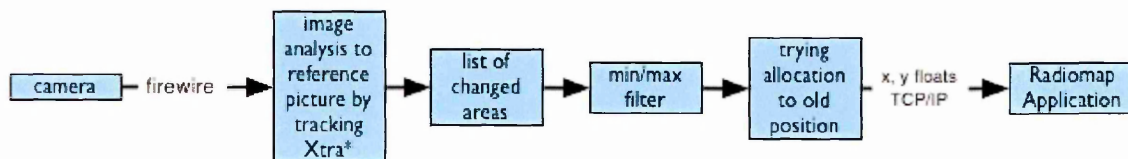


Figure 66: Stream of x,y floats generated with Macromedia Director MX 2004 & trackthemcolors xtra, image analysis to reference picture is inherent to the tracking xtra. Certain properties as brightness, size and detection of colours are available functions of the xtra.

Structural flow of participants movement and search for stations in proximity

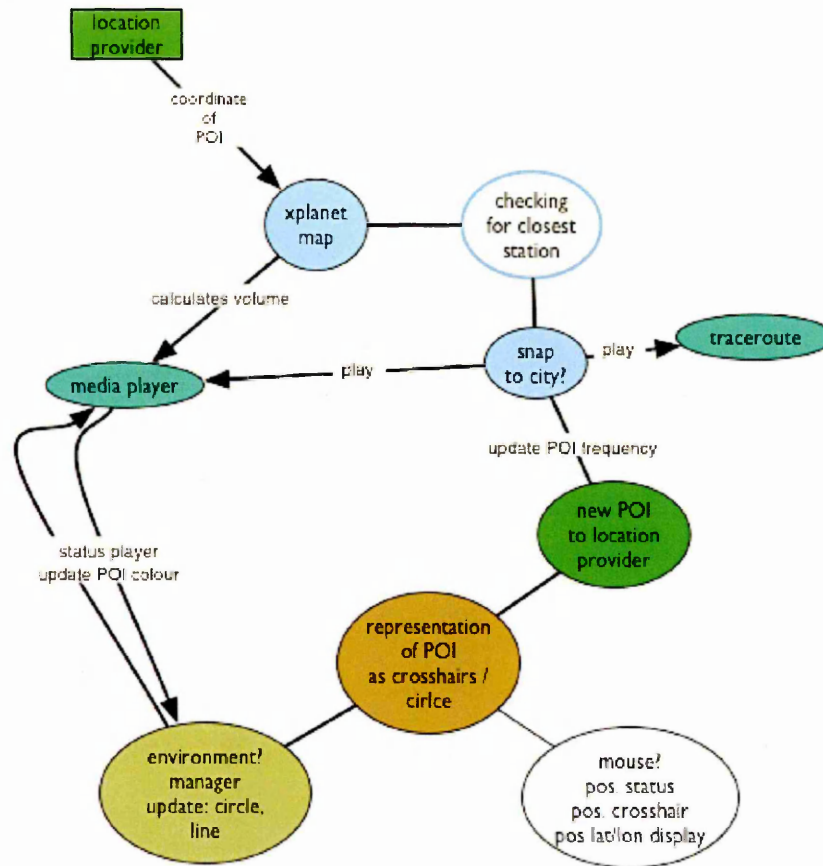


Figure 67: The map compares the position of the augmented ring interface to the closest radio station in the database and sets the locationprovider's loc to the new position of the ring interface as a result of "snapping," the magnetic force of a radio station upon the ring interface.

Interaction scheme of Radiomap environment

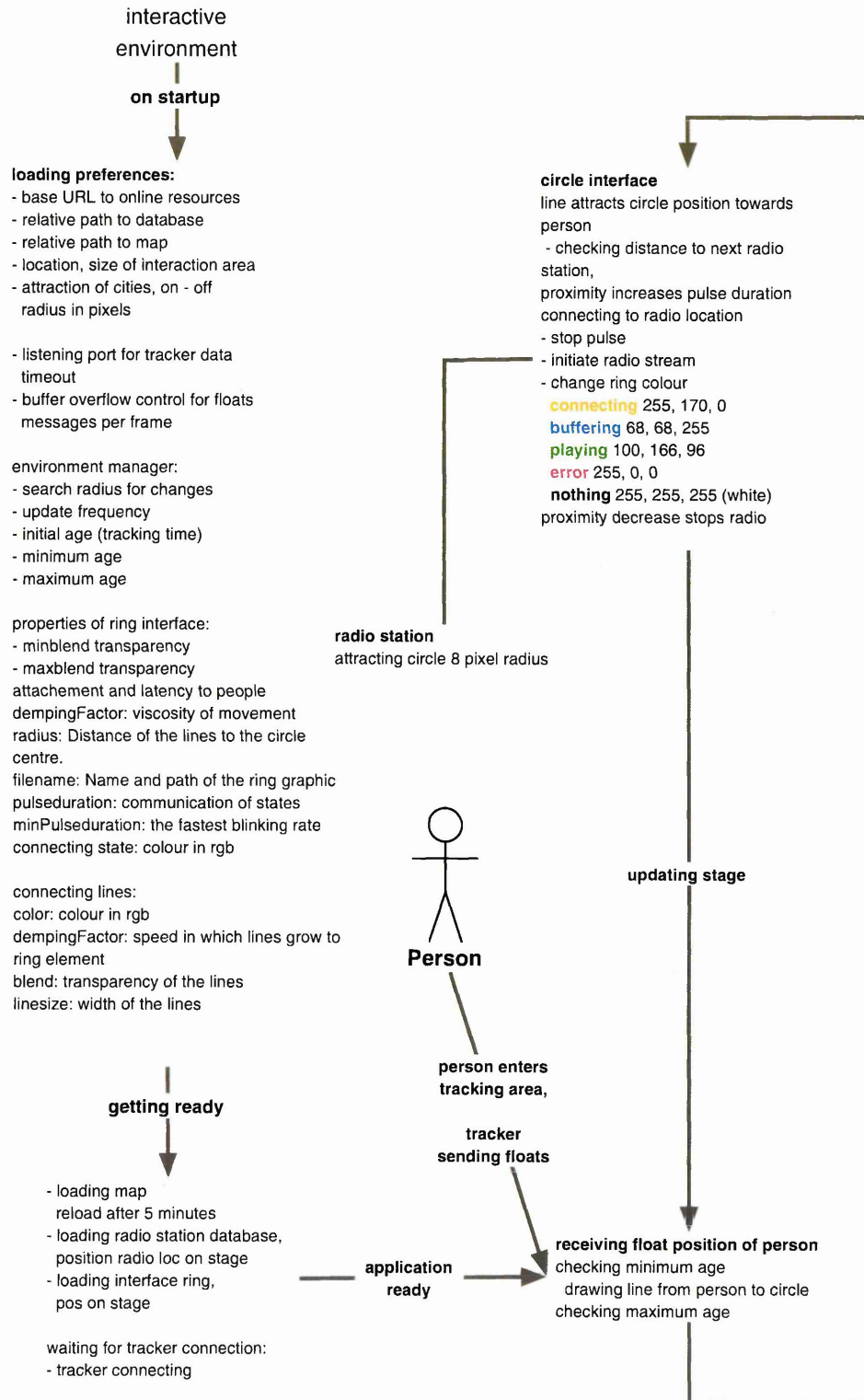


Figure 68: Scheme of the processes and interaction of the Radiomap environment.

Preferences are loaded upon start-up of the application. Connecting lines and the ring interface are individual objects.

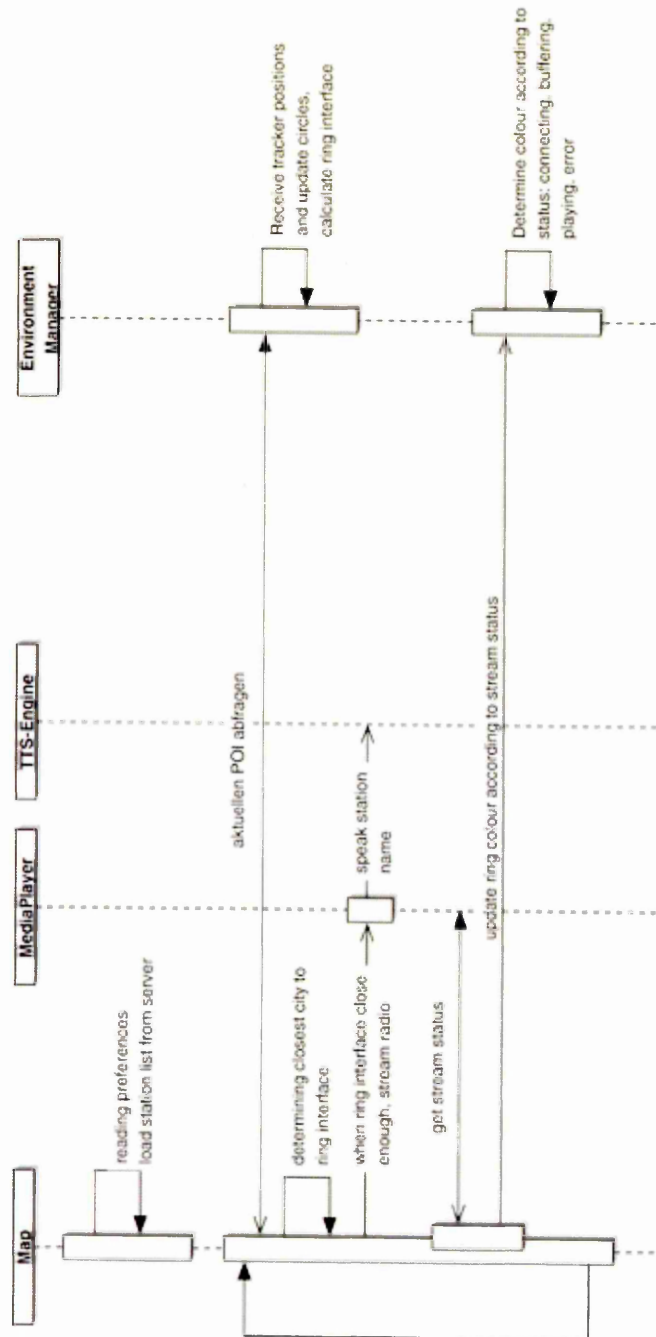


Figure 69: Structure of Radiomap application layers, UML by Stephan Huber

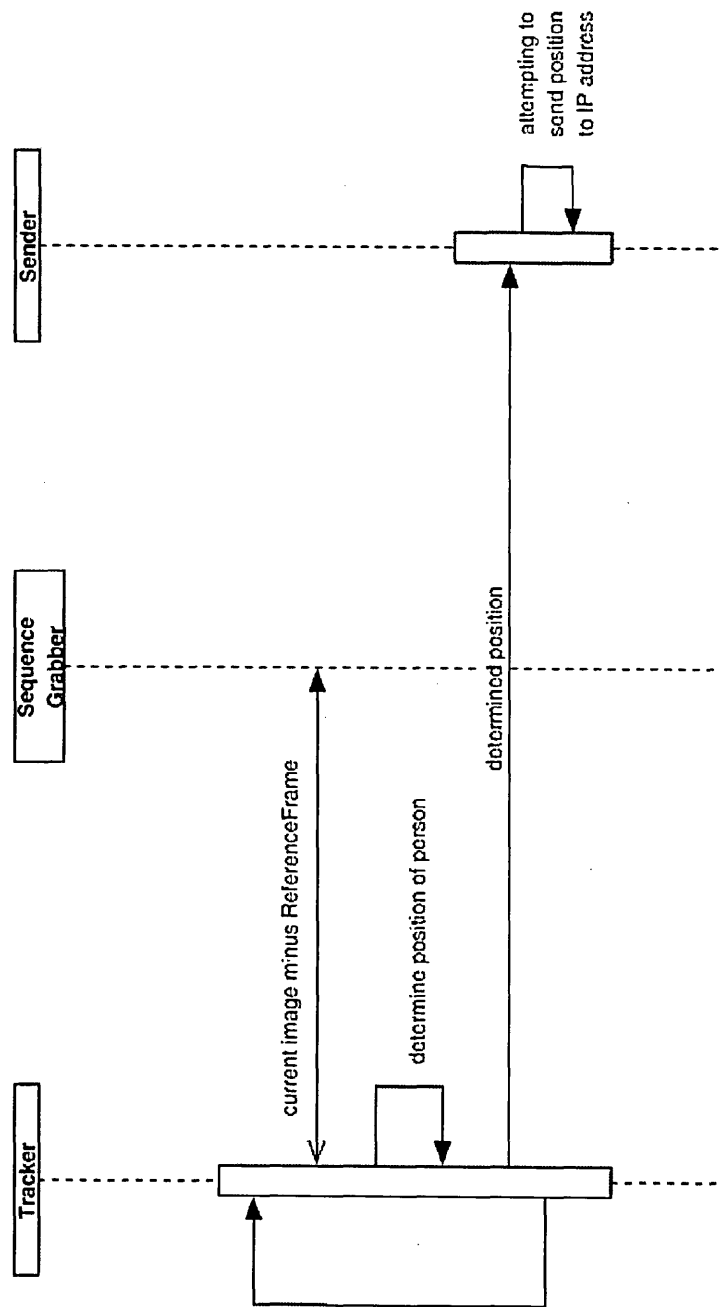


Figure 70: Structure of the video tracking application; UML by Stephan Huber

Appendix III: Questions, interviews, coded pages and notes, visitors book

Pilot Study

The interviews were conducted between September 29th and October 15th 2004 during an exhibition of "*Radiomap*" at Columbia University's Teacher's College, New York City

Questions of the Pilot Study:

How long do you think you just have used it?

Which places have you listened to?

Did you recognise immediately that these were live radio stations?

Did you recognise that the map is live as well?

Do you think there would be a good place to put it?

For which people do you think this could be interesting?

Did you recognise that the map was live as well?

When you came here what was it that you expected?

For which audience do you think it would be most rewarding?

How would you describe the project when you talk to other people?

What would be another place to exhibit it?

Could you tell which time it was in ... ?

Was there a place where you could hear the time?

Did you get an idea of the different time zones?

Which kind of station would you be interested in?

Could you imagine a group of people for whom the use of this application now, could be interesting?

What do you think young people or children would do with it?

Where could you imagine the interactive environment?

Where have you been to?

When you say you like it, what is it that you like about it?

Could you imagine having it at home?

How will you describe it at home?

Do you think it is more a fun thing - or a work thing?

What kind of companies would sponsor this?

If you say you land somewhere, you mean you get a sense of place?

Which would be a good place to show it?

Did it transport a sense for the different time zones for you?

What is so interesting about it?

What would you think a place be to exhibit it?

How important is that you don't need any computer knowledge?

What is so great about it?

So you really associate with it being at the place?

So you have your interests already and you know what you would do with it?

What do you think other people would do with it? For whom is it interesting to have?

Do you think it is better to have music stations - or people talking? Or a mix?

So for you the music experience is more important?

I think it is more than just a tool to listen to radio.

Would you like to include your own stations?

Do you think it is better to have a political map or this map?

Don't you think that the local news connect you more to the place?

Pilot Study Interviews

The 19 interviews were conducted between September 29th and October 15th 2004 during an exhibition of "Radiomap" (screen-based) at Columbia University's Teacher's College, New York City.

Interview 01, female, 30+

You said you have a live experience? (Before I switched on the camera she said she had had a "live experience" so this was my first question.) *That's what it is doing for me. Of course, I love it! Did you recognise immediately that these were live radio stations? I didn't, but I could sense when I was browsing through the channels of radio, I realised that I connected to EPRAIM?? opened a whole vision of reality and actually disappearing into that world. Which is not part of a daily-world, but definitely in another sense of time and space somehow. I felt I am floating above the whole map, and I zoomed in on down a particular city or place. And that is*

very revolutionary. You get a sense of being there. And zooming in and out, and they don't know you are interacting, you are an outsider. But yet you go into. It is exiting! **Do you think there would be a good place to put it?** I think it is great, and I would love to see it in my own country, where someone hasn't had the intelligence to hook it up to the director software, which would mean to be more globalised. It is just a little door - but it hasn't been opened. **My idea is actually that people can download it and use it on their own computer.** It is a great way to connect in another sense. Into another time/space and another geographical space. And it is all available. As an artist you feel this is opening another dimension, of reality. **For which people to you think this could be interesting?** I think it is a great educational tool. With little children it could work because it is simple. You put on the headphones and it could be very exciting, interesting ... in a way ... as an educational tool, as an art educational tool. Get a sense of being there. The local flavour and the local colours coming to play. Language doesn't matter. A kind of imagery can crop up, create images out of memory, create pictures out of that. It opens a lot of possibilities. In my view. **In a couple of minutes there will be daylight in San Francisco.** This really will be very fascinating for children. I am really becoming a child when I look at it. And when I am experiencing it as a child. I don't know the software and the technical background. **It should be an environment.** This could be really used by children. I will be happy to receive an email to download.

Interview 02, female, 40+

You seem to like it. I love it! The feeling of interconnectedness, what's being transmitted throughout the world. Where some things on the one hand seem very localised while other things are universal and all at the same time. I suppose that if you kept on going round and round you would find both the (?) and the similarities intertwining and interconnecting - and that's really kind of cool. As a teaching tool, that's what I am thinking, as I am working with teenagers, we try to really look at cultural bridges and looking at ways of seeing, ways of perceiving(?) (home?), where the intermediate is formed - and the impact media has on your life. And just not looking, just like the president of this country unfortunately does, that this would be a wonderful vehicle to transport through what is really going on right now in this moment. Really understanding there is a bigger world out there. **What would be another place where you could see it?** I would love to use it in my community arts program. The kind of art that could be stimulated, poetry, visualising what you are hearing, video or painting. Creating art, doing a research, finding out more about what is being said on air. There are a lot of educations that could be done with this. It is so easy and so quick in response. It is pretty stunning. **Did you recognise immediately that the radio stations were live, and the map as well?** The first time I didn't I was listening to the music entirely. I didn't get that I was in Thailand yet. When I finally got the concept of moving around, I said "Is this live?" It just occurred to me that I was really, actually listening to something like a Tuner. When you are seeking what station you are on. The dimension of that. So it kind of struck me that it was live. **What do you think young people or children would do with it?** First of all, the live-ness of it makes it something really

real for them. And that fact that they can switch it, and that they don't have to stay at one place, that they have the opportunity to maybe go back, makes it very interactive. Kids enjoy learning. They are very fascible?? with video games, so I think it could be a great tool with a smart teacher, facilitator. Whatever the particular area of study might be, you could integrate so much in that process. It would give it that live-ness and immediateness especially when they hear a commercial, it is instantably recognisable, in a place they don't expect it to be. Pattie Labelle in Guadalajara, stuff like that. **Interesting effects happen when you use it for 20 Minutes, then you recognise that is already Thursday in Australia.** What is really interesting, when you navigate the content on the web, the fact that your are audially stimulated while you are going over the globe, allows you to come to these connections on your own. Which I think results in deep (instance?) learning, so I think its really fabulous. **So this aspect of exploring it?** You need no computer literacy. Yes, it is very accessible, and also the fact that you have to figure it out is a good thing for children. That you don't have any directions. You just have to figure it out and make the connections. That is a type of learning opportunity. **The idea is to have an interactive environment where people walk around.** People are not used to experiences like that. Let my know when I can download it from your website. I will let the kids write their responses to it - and my observations. **Great, thanks.**

Interview 03, male, 30

When you came here what was it that you expected? I had a vague idea; I thought it was something that you would walk on. **Did you recognise immediately that it were live radio stations?** Well, we talked about it before. I didn't know what the lights were that where flashing, and so I just had to play around with it. (Now there should be a question about "playing around"). Still, it is kind of mind-boggling that its the actual radio station they are hearing. That's what I find wild. **Did you recognise that the map was live as well?** Yeah, that was really cool. In a way its almost like being in space. Looking down. **Where could you imagine the environment?** I would like to put it right in the middle of Times Square. Somewhere where there are a lot of people. I think it is interesting that one has to engage with the other people walking around. Because you are experiencing the same thing. **For which audience do you think it would be most rewarding?** I think it would be really mindblowing in an Elementary School. I think for kids to be able walking around on a map, the fact that you are hearing all these radio stations, when you are little you know that there are these other places around the world. You read about them in books, and such. But to experience something that is alive, what is actually happening makes it much more real - as an interesting educational thing. I could see it being interesting for all types of people. **Would it also be interesting for you to download this version from a website?** Sure it would be. **How would you describe the project when you talk to other people?** For me the actual radio aspect is interesting. Not the whole project. That would be the first thing that I would tell them. A map of the world, that you can explore and hear all these live radio feeds. You immediately get connected all over the place. You can listen to ... Sydney. Somewhere you would never thought that they would have a radio. So this is very

interesting. Thanks

Interview 04, male, 30

How long do you think you just have used it? Well, it seems very short. But I wouldn't be surprised if it was very long. I think it was 5 Minutes, but wouldn't be surprised if it was 10. I lost track of time while I was looking at the little red flashing lights. (It was 10 minutes) **To which places have you been?** I think I went to South-America, to Libya, Mauritius, then I went to Kazakhstan, some I couldn't log on to. A couple in Northern-Africa. I few weren't connected. **Did you immediately recognise that it was radio stations. did you recognise that they were live?** Oh yes. I assumed because of I have listened to radio stations on the internet before, and since I saw the connections being made in the upper left hand corner, the download speed etc. - that made me believe it was live. **What would be another place to exhibit it? I have to add that it should be an interactive environment, projected onto the floor, and multiple people can walk around on it. People share one station ... People have to collaborate.** My first thought was to put in some sort of courtyard or lobby. But if it was a space that had a flow of traffic through it that would be difficult. you would want a contemplative time, and a traffic centre. It would have to be a place that invited people in that space, a contemplative space. Maybe a lobby, maybe a courtyard. But I could see it with this negotiation as a training device. Install it in the courtyard of corporation and see how long it takes people to figure out what was going on, and how to work it in a different sized group. **For which kind of people do you think it would be interesting? You just said corporate ...** Funny, from my experience in teaching I would say they would be the last to catch on. A group of pre-adolescence or adolescence, they would probably get it in short amount of time. So that would be interesting to see, which groups of people. It would also be interesting to put in one space where more then one ethnicity or nationality was at ... because of the nature of looking at the earth without the boundaries. The idea of these ... I went to a station in Kazakhstan and there was this americanesc techno, euro music ... the whole idea ... that I was thinking that the boundaries are washed away in this view ... so is the music in that kind of sense ... they are in a situation, in a space, a building because they have this kind of nationality, ethnic ties. That they than have to see the boundless part. I don't know what this specific group may be. I used to work in an international school ... I could see it in an international school. In a foreign city, where the kids. I thought in Shanghai, where the kids are from Europe, Asia but now in China. **Was there a place where you could hear the time?** I got a sense of time just from the map. I was wondering where the information came from. I am in Kazakhstan and it is midnight. Radio disco sound. I got more of a sense of time from the visual.

Interview 05, male, 40+

Did you recognise it was live? I expected it was live. (His email address indicates that he is a System Administrator at Columbia University.) **Did you get an idea of the different time**

zones? No. Most of the stations that I listened to played music or the like. Or I just didn't understand it. **Did you recognise that the map was live as well?** No, I didn't notice that because I couldn't see the whole thing at once. I just couldn't perceive that. That is great. **What would be another place where you could imagine it.** It would make sense to make it accessible on a website. **Another group of people that might benefit most of it?** Kids in school. It could be interesting for them. To explore and make those connections, different languages, especially if they study a language, what they hear of a place. What else comes to mind is people that have to wait ... at an airport ... that could be interesting. You would figure that people at an airport are interested in the world. **Which kind of station would you be interested in?** It seems a little subtle ... the red dots ... you have to get the cursor quite close to those, make them more sticky. I scanned over island. ... **only realaudio stations.** It would be cool if something was there in the Antarctic - because it is so big.

Interview 06, male, 30

It is wonderful. It is very surreal. **For how long have you been using it now?** Three minutes. (estimate is right) **Where have you been to?** I have been to Latvia, Finland, Northern Ireland, Madrid, Armenia and the Netherlands. Do you have Iraq? **What is it that you like about it?** There is something moving about it. Just to hear ... the noise of the city, of the people, just by moving across the map, it is actually kind of moving. Very intense. I like the display you have chosen ... it is a night time view, yes? (He didn't recognise that the map was live.) **Starting at night was particularly moving as well.** To see a view of this chatter of cities. **Where is a place where you could imagine this?** I think it would be wonderful for children, or in a Museum. You just figure out what radio is, and get a sense that radio is global. And they can tie it to learning their geography. My first idea is that I want to have this on my computer at home because it is kind of fun. Lovely to do. I have to think about it more., I am sure that there is some use, some interest. **Which place would you put it?** (Other f: I could see it in a performance piece.) I could see it at an airport. Especially getting music from all over the world. It could be in a lounge where people wait, and people can access it. Its just sort of a nice thing to engage yourself. While between planes. **Did you recognise times at places?** I didn't listen enough. I heard some unusual music. Madrid chattering. Londonderry played Daft Punk "around the world", Radio BBC.

Interview 07, male, 30+

For how long have you been using it now? Probably 15 minutes. (estimate right) I enjoyed it very much. I love maps and I like the interactive quality of choosing your location. Listening to these stations. **What is it that you like about it?** I like the feeling of being so instantly connected to the rest of the world, and feeling that its is very small, seeing the progression of the sunset & sunrise where you are on the map. That is very exciting. **Could you imagine having it at home?** Of course! **What would you do with it?** I would probably being attached to

it day and night, listening to music and news from different parts of the world. **So which station have you been listening to?** I have listened to stations in France, Spain, West-Africa, Tunisia, Australia, Kyrgyzstan, Kazakhstan. Just a click on the globe - except the Americas. **Which would a place be you would like to see it?** I can imagine it in the lobby of a television or radio company. As a sort of fun introduction company or perhaps a library. **Could you imagine a group of people for whom the use of this application now, could be interesting?** I think people who are gathering information for new stories, if they have access to the world just with a snap of the finger. **Do you think it is more a fun thing - or a work thing?** Both. **What kind of companies would sponsor this?** I would go to the communication companies. That could be a good thing. **How will you describe it at home?** I would say that it is great to see the map. I enjoy seeing the change of light in parts of the globe. It is like an exploration unlike as before when we were only living in our area we can now travel throughout the world very quickly. You have this wonderful image of the world and you can land an area you are interested in and have a one sided communication with this area. You can react to it. **If you say you land somewhere, you mean you get a sense of place?** Right. You get a sense what is going on in the region, you hear news, you hear local folk or pop music. Sometimes you hear the same music around the world. 1950ies music that we have been hearing for decades. **If you leave me your email address you can download it to your computer in a few weeks.**

Interview 08, female, 40+

Which places have you listened to? I went to some of the places have been to. I went to the place of the current Iraq war, I listened to some of the United Emirates, France, Italy, to Norway because I have a relative there, some places in Asia, This is phenomenal, I think it would really appeal to people who have a history of enjoying things like amateur radio and that kind of thing. It is very appealing to have a visual connection to the places and then be able to hear them. I think in terms of the theme of this exhibition "multi-cultural exchange and globalisation" and the meaning of that I think it captures a kind of sensibility about how media can help people erase borders and yet maintain difference of borders that divide and been fuzzy. There is dramatical difference with this whole (interface). **Did you recognise that the stations and the background map was live?** When I came up I recognised the little red blinking lights - and when I went over the blinking red dot I could see that it was buffering ... So it took me one time and then I just knew that I have to look for the blinking red dots and I would find a station there. So it was immediate. **Which would be a good place to show it?** At home. I want one. I would listen to it all the time. I think it would be fantastic to have it running in the background while I was working on my computer. I would listen to the Emirates for a while; to a station in France ... enjoy integrating it in my life. I think another time I might use it as when I get homesick to some place, like I am homesick right now to (Maui?). Things you might be hearing there and feeling kind of connected somehow. **Could you imagine a group of people where you think this would be really good for them?** I think for educators it would be excellent. I have been working in education for media for a long time. I think to give this to teachers in little school

grades in the United States and it would give them an opportunity to talk to young people about all sorts of things; globalisation, geography, cultural difference, media, development, history, social sciences. I think it would be an interesting way to give young people a sense of connectedness and relationality. There is something about the auditory senses, that don't get usually drawn into education in a way that the visual senses do. Except for talking-talking-talking and this is about rhythm and accent, force of voice and hues of voice, use of the body that those kinds of differences come into play. **Did it transport a sense for the different time zones for you?** I must say I didn't pick on that. But I can see now that you have the shadow of the timeline, daylight. **The map in the background is live, look for 4'o clock in the morning. There the music is quiet and calm.** It is wonderful. And you have this auditory cue that says soft music in the morning, fun music in the evening, **If you leave me your email address ...** (I give you my card ...) I would love to talk to you a bit more about it. It has to do with a project I am doing with teachers at middle schools, that might use it as you want it to.

Interview 9, male, 40+

Which places have you been to?

Spain, France, Netherlands, UK, Milan. And your impression was that it is the same everywhere? Some exceptions I was looking for. **Did you recognise that it was live radio?** Yes. There is little reason to believe that it is not live. If you would go through just canned pieces you might recognise. It would be interesting to have another indication of the real-time notion to some extend. **That is the map in the background in ten minutes the shadow will move.** Of course this a completely different timeframe. I look at the screen, and this (mouse?) is much slower ... and you need a way into the next timeframe. Because you are here for hours & hours. Wht is this? Maybe half an hour time interval that you would notice it? me: you recognise 15 minutes. **Is there a place you think the program could be exhibited?** (New York? a port?) where people come and go. As a utilitarian thing ... yes, but the interesting thing is the "sweet spot" ... the whole together ... and the whole together? **What is so interesting about it?** Where is the sweet spot? As an artist you are interested in the sweet spot. In all these media you want to go in -between the place. Engineers do the things right - so we give them the problems. But there is something in between, they don't do, and that is where we work, in between. Since so, .. yeah, ... in between, yeah. One could work. **Could you imagine a group of people for which it was the right thing to use?** I can't answer that question. **Some people say children, they learn geography etc.** That is such an interesting question, new technologies and children, robotics for example, every time they make something they get children involved. Because you can get children to almost do anything. Sell them anything. It is a low level of discrimination. It is interesting for PR, but less interesting for you as evaluation system. You have things like the different perception rates, here, ... and that is not interesting for you, right? **Could you imagine having it at home?** If it where always updated, if the radio stations where on, ... you see the thing is .. one thing it implies, that doesn't match is locality. This isn't here, this is not ... New York any more, I have the sense that place is replace with circumstance. The situation

very much in our lives. And I like to find things as a lookup table, but as an implication of connection to real places - not my map of the world. I go between (continents/conferences??) all the time ... and I work at a different place then I live ... so, maps in that sense are ... the map of the mobile phone, maps that people really use right now. **I did this project a couple of years ago, then it was a map of wealth. Some places where not on the map. There where many station in Japan, Europe. Two in Africa none in Russia. Now this changed. If you ask where to put it ... one thing is to see it as a navigational information art piece ... if you are looking for applications, in a museums you could scroll back in time ... and then prewritten communication ... Pangaea ... if the map is so central. This is only for now, it would require a different interface. I would say an airport.**

Interview 10, female, 40+

Could you imagine having it at home? *Very nice. Very nice.* **Did you recognise that the map is live as well?** *Yes. (Just half an hour ago it was dark in Taiwan.) You have no stations from Turkey! (windows media player)* **Did you get a sense of the times at different places?** *You have to listen for a long time. You think you only listened for a minute - you actually listened very long. More then 10 minutes I think. How about any stations from the south pole?* **Could you imagine a group of people that would benefit from it?** *Everybody would like such a system. If I was a composer I would like to hear a lot of local music if I was here in the United States. It is nice to see the locality ... maybe change the resolution ... in case you have very crowded stations ... but at this point you don't need it ... you only have 200 stations. There are two different applications. If you want to download it ...*

Interview 11, male, 30

What would you do with it, if you had it? *You said you were working with kids. I work with kids, and I would see what they would find interesting about it. I would love to set all stations to new stations only. This way I could compare what was going on in the local news. All around the globe especially when covering political events. I think it would be fascinating to find out what they are saying right after the debates. Before something has had the chance to circulate the media. And you watch it on Television, which is broadcasted nationwide ... where local stations are saying what just happened. This would be a really exciting use for this in my opinion.* **What would you think a place be to exhibit it?** *I would like to see a version of this in the computer lab of my after school program. Kids come in, and they just want to kill time on the computer ... and they don't know what they want to do. They might like music better, just to see what is going on ... in the music scene ... In public computer labs, museum as well, if it is relevant to a greater exhibit. Something about political boundaries ... I could see this of relevance, or anything on interactivity and multimedia ...* **How important is that you don't need any computer knowledge?** *There are no menu's, you just move the mouse ... That is definitely very important. Especially if you will be showing it at a museum, or anywhere where*

people don't necessarily have a lot of technical knowledge. The one thing that might annoy people is delay in starting the music or radio station because they may not understand why it is taking so long to start. **Did you recognise immediately that it is live radio?** I was listening to NY .. it wasn't until I went to London that I was sure. The way the time zone changes ... once I saw we're almost in the evening here, that's what the map shows, Wow, that really got me interested! **Could you tell which time it was in London?** No, I couldn't - until they said it on the radio.

Interview 12, female, 50+

What is so great about it? It always plays one station until you find a new one. I love it because I listen to radio from France over the internet all the time. I just like the graphical interface. I used to live in the south of France. It reminds me of it ... it puts me back there. And I can pretend I am in my studio in France ,instead when I am in my studio in the US. In my mind I visualise that. So this is a nice graphical interface. It would be really cool to go past the globe and have images of the place. **That is another program. This is the radio program.** I don't mean moving images, I don't mean webcams, I mean what reminds us of the place. Just like seeing the globe. **So you really associate with it being at the place?** Oh Yes! Especially if it is a radio station that I know well. Because I used to live there. **So you think the combination of map and sound ...** So the sound puts me in the place ... so I like this as an interface that would allow me to choose my radio station. That's what I like. I like Radio "Nostalgia" in the south of France, because I like to listen to things that are like old chansons. At some point in the fifties these hits were translated ... and last week I listened to "itsy bitsy teeny weenie yellow polka dot bikini" in French. I had never heard it before, that was hysterical. I have been living in France off and on ... since 87. All the music ... and now it is oldies. **So you have your interests already and you know what you would do with it?** Yes, but there is also the discovery of other places that is cool too. **What do you think other people would do with it? For whom is it interesting to have?** Obviously it is an educational thing for people who want to know different parts of the world, and people what language do they speak, ... but then you don't really know. In the US, in Providence Rhode Island there is a Portuguese radio station and I listen to it a lot, even though I don't speak Portuguese, just the fact, that there is this other population ... mmhh ... so I am not sure if the geography and the culture do always line up with the culture people are expecting. And I spent some time in Senegal, but I couldn't find it. There is a station in South-Africa in French, that I can pick up, very easily in my studio ... **In Mayotte, Reunion and Mauritius they also speak French ...** So it is also here on the map. So the other thing I do is listen to other radios during important events, like the US Invasion of Iraq for example. I listen to it first in Paris, secondly in Montreal, and thirdly on NPR in the US. And it turned out that much of the NPR was translated from the French ... from France or whatever, as it was the same - but Montreal was different. **Over here is this image of an interactive installation piece where people walk around on a map ... where would be a good place to put this?** That reminds me a bit of the Boston Children's Museum, that is an obvious thing that

kids like to run around doing things with their bodies, but the thing is that I think adults like it too. I have been accused of getting the children off the computers, which I don't mean that children should be not on the computers ... but ... we keep learning, we keep on having experiences. And it is not all about teaching them - but about teaching us ... the thing about partial nuance wouldn't be lost on children, but its something adults tend to discover too. Maybe more so. I like the fact that it is just plain beautiful, the image is nicely done ...

Interview 13, female, 20+

Did you recognise right away that it was live radio stations?

Yes, I did. I have listened to Internet radio before, so I did. I picked up on that right away. I instinctively went to the places I have been, ... because it's a good feeling to go back. Then I went to places I was curious about, where people close to me have been and love. It is a way to kind of visit ... in a sense. **Which places have you been to ...** First it brought me to Armenia - but that was good, because I have close friends that are Armenian. Then I started going through Europe and I was looking for French stations. To Normandy, which is there, I think. Then through Spain, ... and then I started to go down to Africa. And then to Australia, just out of curiosity. Then I went up a little bit to Indonesia, and Asia, and then to Russia. Then I went over to Brazil because my boyfriend loves Brazil. I haven't been there. So I checked through Brazil. I went through the Caribbean's a little bit, my parents live in Florida ... and that was my journey. **Could you imagine having it at home?** I would love it. Actually I like going through iTunes to go to international stations, so I enjoy that anyway. I enjoyed it. I really like the principle behind it. How it can bring people together ... cultural understanding. **Do you think it is better to have music stations - or people talking? Or a mix?** Personally, I think predominantly music. I don't think it is a bad thing hearing people speaking and the news, but personally I think that music is a combination of music and language. And so you can really bring people together in that way. The reason I am here today is I am taking a class at the Newschool, called mediated learning environments and we are in the process of creating our own mediated learning environments for museum spaces or public spaces. We are just at the beginning of the creative idea stage and actually my idea in principle is probably closest to this - in terms of anything I have seen here today. It is not this exactly, not at all. I want through music and movement and a sense of celebration to create a public space experience where people can come together and appreciate other cultures through that. I have a specific example that I personally experienced, that leads me to want to do that. What I can see what is going on behind this is similar to what I am trying to come up with. What I came away with was this is one of the most powerful experiences. So that experience is motivating my project. And I relate it a lot to what you are doing. **So for you the music experience is more important?** Let me tell you my little experience: When I studied in Paris, there was a little Greek restaurant right in the Latin quarter where a friend of mine went every week, and we became regulars. All the people there were Greek, a lot of North African, Middle Eastern people, and we all just spent so much time together dancing and drinking and eating and laughing - it was just such joyful celebratory

experience - and I came back home to NY and I had all this music from there and all these things. My parents where curious what I had come back with. My Dad was coming from his own background and views and was against to what I was listening to. No, not against, but he couldn't understand it. He was very pro Israel - and for him, me listening to music that was Arabic was something he couldn't understand. And that was, in my mind, his misconception. What I tried to explain to him was that this has nothing to do with politics. I experienced this music through celebration, through people. And I came away with that as one of the most powerful things that I experienced. So that experience is kind of motivating my project, and I connect it a lot to what you are doing. **Which place could you imagine where this application could be useful and what would they do with it?** Obviously in some museum space it would be a thing. Museum are becoming more multimedia. In Schools it would make sense in a way. Schools in some way. They have become so much more technological and kids are more open to computers and sound, and are using more and more multimedia. And I think the sense of the "global experience" is so important for kids. ... trying to be creative now really fast ... You could see it at an airport in the international lounges, or wherever people come in and out and have a few moments. If there were computers, there could be a few explanations, while you have some time check this out. I could see that at an airport. This could be really interesting at my school.

Interview 14, male, 30+

Did you notice that the map was live? The first thing I notices was that it was dark over Europe and light over here. Let me think. The sun is setting for them. (Is it now - or does it calculate the 8 minute difference the light of the sun takes to come here? **This is what it looks like now from space. There is no time difference in that sense.** (Long discussion about the accuracy of the map.) There is something nice about ... moving around ... you have to shrink the screen ... if this is the size for an exhibit. **It is different in the environment ... the problem is that Europe would be much too dense ...** What's the size of Africa? Is this a proper projection? Where does the map come from? What is it connected to? When I was in California I was listening to Utah. **It keeps playing a station until you select a new one.** (long discussion about interface) **How important do you think is news and talk?** Everyone wants different things. Some stations could only play music all the time ... That's great. If it is music I want to hear ... it depends on the listener. It is like shortwave radio. I would like to hear news from Europe and stuff like that. Because I need English news and don't like NPR any more which is Or in certain cities they have great radio shows. And that would be frustrating for me ... Africa is smaller than the United States and then you are not getting something (...?). My point is anything that is really global connects you with different cultures and images. I'm trying to figure out this thing ... it is bright over here, and dark over there. And being an American I think its bright over here because we are the centre of the world. This is so ingrained in us - although it depends on what time of day. You will never have someone here over night, so it will always be bright, because it will always be daytime when the exhibition is open. Which is interesting.

The next time I will be showing it in London, some Americans will come ... Yes, but I will never see it during the night time unless I am doing it at home. In which case I am up at 3 in the morning. Why is it dark now? And that's when I would get this. My point is that if I see it as an installation **Which would be a place to put it?** You mean like a DIA centre for the arts? I think a place where there is a lot of commerce. A place that is trying to make peace ... or an island, A place that needs to where you have better human relations. Anywhere in the United States but like a public place. An art space is private. It would be a great installation as you show it, where people come into a room ... being more experiential. **Could you imagine a particular kind of people for which it would be** I wouldn't show it in India. I would do it with people that have access to radio and media. **I think it is more than just a tool to listen to radio.** I don't mean to imply that. I think obviously there are lots of ways to listen to radio on the internet. Just not as nice as this. Also it does have this useful component. I think it is very, very technological. It would have to be ... You make it more exclusive if it is only technologically. If you provide it to people like my grandparents. My grandmother would never use this. **In the installation piece you don't need a computer ...** There grand central is a great space, or Penn Station ... or some place in Washington. Places where a lot of people go through like a train station, it really depends on the city, places like NY people would eat it up, Washington, Chicago would be a great place. **Which are the people? At a University?** No, No I don't think it should be elitist. I wouldn't do it at an University. Why should they get all the fun? You can test it at an University. It should be a place where everyone from all classes could enjoy it. **Do you think it could be particularly interesting for children?** Yes, ... I think this is something you should ask children. I think it gets them to think ... I can think of no reason why it wouldn't be fun or useful or stimulating for a 5th grader. Even for an 8th or 9th grader. I think when you get to High school my guess is that it is more useful for a younger child or an adult. But an adolescent think differently. So I don't think adolescence would be impressed by it.

Interview 15, male, 30+

You don't have any stations from my country. Slovenia. I find this very interersting, it is a great idea. I like it because I like travelling. I can just browse through Italy and I have the radio there. Just hearing the different languages is so simple ... **Did you recognise that the map is live as well?** Yes, I recognised. It is night in Slovenia. (Timezones discussion, add Zoom), It would be interesting if you made this as a web version in Java. This version for exhibitions is very good. **Would you like to use it at home?** I would like to use it on the web. **Would you like to include your own stations?** Yeah. Will there be a form where I can add a station? The idea is great, I like it. **Do you think it is better to have a political map or this map?** I would like to switch between. With a zoom you could access much easier.

Interview 16, female, 20+

What do you like about it? *I am trying to understand a learning environment, cross cultural, just the effect that you scroll, that it is in your hand to go around the world. Is very nice.* **Which stations did you listen to?** *I went to Japan, Sri Lanka, I heard some news from Goa, ... somewhere in Egypt, i was trying to find [what] I never hear.* **Did you hear any news or any evidence what time it was?** *No, it basically was music, which I think right away - puts you there. Sends you to the place. I mean it was so nice and playful ...* **Do you think it is more important to hear people speak or important to hear music?** *I like to speak Spanish ... and English but I think if you just go to really understand the language, unless it is French or Italian, something that you kind of get a sense of it, or Portuguese - in my case ... is not that easy to connect ... with the audio ... but you just listen to music ... and you're right away somewhere else. And I think you make a stronger connection.* **Could you imagine having it at home?** *Yes, .. I would love to. Definitely.* **What would you use it for?** *I think it's like a trip around the world. Let me have this morning trip, let me check ... how is everything going? You know ... I think its just like (??), its like an inner, nice experience ... I mean I have been so interested in multiculturalism.* **Which stations would you add? Which stations are missing?** *I don't know ... I didn't go that much around ... there are plenty .. you cannot get bored with this. Besides you have it 20 hours a day ... different cultures I think. You know, the only thing that I would say is [m:8]that you don't really know where you are ... until like the third try ... because you don't find easily where you are ... that's what I found ... i think you are so distracted with the beauty of the map. It takes all you attention.* **Did you recognise that the map is live as well?** *Yes,* **Which people do you think could benefit from it? Whom should I give it to?** *It is an amazing tool for ... educational purposes like schools, like interactive schools, ... I think that could be children ... that is where you can learn that you are not ... (?) I think this is the most important moment of (gravitate?) with different races. (?) This is absolutely my idea ... To do this.* **I think it was important to choose local stations, not music stations, not national stations, because small places give you an idea of traffic and weather ...** *And I think I would not be so interesting for the format. From one country to another. CNN all over Latin America. They have the same tone, the same kind of texture ... voices.* **What is your background?** *I am from Colombia.* **Are you studying media design?** *Yes. exactly, but I am not that media oriented. I have worked more with the government. With projects that involved education. Like communication for educational purpose. All the government issues. There is a huge war in my country ... for me it just to understand that everyone is different. (...) Sometimes this is a reason to get killed in my country. That is something that really has (?) me, my research,*

Interview 17, female, 20+

What did you like about it? *With just one click you can listen to a radio in polish ... and they play the same music as you listen to here then you go ... I'm from former Yugoslavia ... so I went to see what they are doing ... and there was a show about this poet ... some traditional music ... and it brought me back to my childhood ... what we were reading at school ... it like this*

experience ... like travelling in a different zone ... you don't even have to move from a chair and you are, in history, in a different place ... in terms of knowledge, it is free if the mind. Its fantastic I love it. **Which other places here have you been to?** Not many. I couldn't connect with many stations. I was mainly in Europe, everything is close together and there are different languages. I went to Germany as well, because I speak German, and there was of course a very boring traffic report, "Stau, bla" Like you usually hear when you travel. The places south I went there was more music - the northern there was more text. That was my superficial observation. **What do you think is more important, music or to hear people talk?** Music attracts people. It speaks to your senses. Of course you're going to sit and say "Oh, this is nice." If you hear news its interesting if you hear international news, but not local. Local, you know, you just move forward. So everything that connects us, ok this is something I can relate to ... is listen to the news ... something that is similar all over the place. **Don't you think that the local news connect you more to the place?** That is certainly true. But I have to say again, because of the shortage of time I can not really enjoy listening as much I had liked to. But I think if you are interested in a place, if you know somebody from there ... i would stop at a station ... listen to the radio ... the local news ... information **Which would be a good place to exhibit this?** New York definitely ... this is the place. Or any multicultural, international city. Interview 17b Interviewee 16 joins in. f16: "... a feature of the screen that attracts you so much ... for instance you have like a drawing of the map, with the countries, with the different kinds of oceans, there is something about the viscosity of the image that really, really attracts you and makes you go there. ... with another map, a political map, not that one with the mountains and rivers ... that is really a hunch on the viscosity ... and on the project. And I think that makes a huge difference the aesthetics. The most important I think is the idea, ... but I think its both. 17: It also resembles the feeling when you travel. But its so short, its not frustrating, its not eight hours. Here you can be in one place at a second. Its great. I think your mind is wandering. ... I want to travel to Europe for example; you go from one country to another, its very close. Different languages, different conductors, different passports. You go from Hungary to Netherlands and you have so many different languages. You are in a different zone. It (Radiomap) has this kind of examples of experiences. Travelling. I don't know. **Did you see that the map was live?** Yes. Amazing idea.

Interview 18, male, 40

What would you do with it if you had it at home? I have a few sources of good radio in San Francisco ... i'm lucky. But usually its really hard to find radio on the web and this is a great way to find this information. Genre lists don't work for me. First of all Genre-radio is quite bad ... I don't like listening to radio that has only one channel. A lot of local stations don't have these interfaces, and if they do they are hidden very well. Just the option to discover other stations. **So which stations have you listened to here?** I went to SF to see what you have there. Flagstaff Arizona.

*This is pretty interesting, I can watch it from anywhere ... I want to. I just went to another country, somewhere where I can understand the language. I went all the way from Africa to Europe, some places in Asia, [...] listening to music, jazz, rocknroll, I actually have a whole list of ideas. **Sure, go ahead.** I would definitely integrate a DVD. mp3 player, that would revolutionize handhelds. There is people I know, and other people I meet, and multicultural settings ... just different cultural (?) just different kinds of (?) maybe in an internet cafe ... maybe in a radio bar ... which would be really cool. [m:1] know people that sit down for hours ... I know I could. I think it would be a big rush for a lot of people ... one thing that I would like to see is, a listening of the cities and countries or what is displayed right now, you know having a list without necessarily having to click on it ... this is the right country before you go to the next one. (?) Maybe a way of including more stations. Maybe a listing of genres of different types of music. What if news is going on. I was looking around, I wanted to listen to classical music and at one point. And that's one point to consider. I just love this whole idea of being able to watch the sun setting. And the different time zones, maybe it was possible to include the different time into it? So that you can say that it is 3 in the morning in France. I just came from Buffalo NY to go to college and I think it would be really nice to listen to some of the great radio there. Just to be able to focus in ... maybe have websites come of these cities. And this is what you can learn from this area. So ... I just have all these different ideas. Is it satellite radio? **Internet. Its real world radio stations that also broadcast on the Internet.** So they have to be both? I think this would be much popular if you introduced it to bluetooth or any handheld because people like to use this stuff. **What is more important for you to hear people talk or listen to music?** Have a selection. Decide whether I want to listen to music or (?). Also thinking of other people that know languages. Sometime its nice to be able to understand and know other people. Maybe for travel, to know where you are going. **What do you think people would do with it if they had it at home?** Listen to it. I would. I just love this. this is cool. It is fascinating how I am able to listen to all kinds of different types of (?). **Could you get an idea what time it was at other places? Which places have you been?** I will go to India this Winter, and I have been all over Europe. To Israel twice. And I have been all over the states. **You can send me an email and suggest something you have found and it is always possible to incorporate it.** What happens when you go to a denseley populated area? **Of course, yeah. Then you would have a dropdown menue. And you can also filter out showing only the Jazz stations. That would give it the possibility to display 5000 stations on the map.** The only thing I didn't like was that as you move by that you can't decide if you want to go to the station, it just goes automatically. It would really be nice to click. (jump) Showing environment. I think it could be another version of internet cafe. And I think both of them could go hand in hand. I think it could be in many places. And you could also use a handheld. I can never find decent radio and if would be great. I would never take it of. (...) Why is Europe the size Africa is .. ? Some people might not recognise that its a map of the earth. If you show it in England people would probably look for content that are providing similar cultural content. ... Does it keep data of any kind? It becomes a navigation device. I may not be learning geography specifically, but I am actually*

going to learn a lot. You pick up a lot. People will become very knowledgeable. It becomes a resource with my increasing ability to learn things. Especially about the world. And I am going to use it for more things. male 2: I want to customise it just what he is talking about ... making a list. And I can give you my own. It might be nice if there was a capability in there to track how people are using it and how they would customise it. There is always a feedback channel over the web. People can send an email ... **What is it that you like? What problem did it solve? My idea is to understand why people are excited. Imagine the map was just an outline, without shadows etc.** male 1: I don't think it would be that interesting. The complexity is very nice. It almost makes you feel you are really experiencing the world as it is now. And I think thats a very important part of it. f. Also your position that you are above in space. male 1: I think people like having control over something. (questions about stations and timezones. 30 % different stations, it would be nice to ...) In the real world I don't know where I am going, I just go out and explore. And you can do that to some degree a text search. But here on the map ... geographically ... which is I know ... male 2: In that way it is self explanatory. You just open it up and and its a toy in some way too ... thats why it would be very powerful. It would be an incredible source of entertainment. male 1: If you use yahoo you have to type ... you have to have a computer ... with something like that ... lets say it was in an museum or an airport ... people could come from anywhere in the world and they could interact with the system and thats whats so nice about it. People with basic computer skills sit down and its automatic. But you could make it automatic for everybody. Computers can be in the background. This makes it great having a lot of prediction. Girl: I wonder if you are interested in zooming in further. You need some pre-knowledge that this is Spain. Could you zoom in further into cities and streets. But for that you would need some ... You don't need all these requisites to ...

Comments from visitors of the Pilot Study left in the visitors book in successive order:

"Project it on the inside of a planetarium."

"Very innovative! Interesting!"

"Imagine it in an airplane, in the back of every seat."

"Create a website where people can leave comments & suggestions, opinions about stations."

"More Radio from Lisbon, Paris"

"Very Nice! Short wave radio and gnu radio would be interesting."

"Very intuitive and easy to use. More intuitive then a list."

"Everything is home, radio world connections, does the Internet mean every one is connected? You loose the sense of interconnectedness, don't zoom. Leave it as it is."

"It gives you a sense of the world and cultures."

"This is a truly beautiful idea ... and manifestation."

"It is extremely interesting how you build a cross cultural audio landscape - how you preserve in a beautiful way the uniqueness among the worlds differences."

"Its like travelling"

"Great stuff! Long live local radio & culture."

Main Study Interviews

The interviews were conducted between November 30th and December 9th 2005 in the Research Studio B309, Sheffield Hallam University, Psalter Lane Campus. The participants are family members of colleagues and friends of these, mostly from a non-artistic background and came in the evenings between 17:00-20:30.

Interview 01, male, 30+

Did you know what was expected of you to do? *Its about exploration. I went to places that I was familiar with, places I have been to. Its quite interesting to see what's the XX at these places at the time. Would you say you get an idea of the atmosphere of a place? Certainly, especially when you go to the one down there at the Ivory Coast, you get a real sense that you are in Africa. What do you think is more important to hear music or the listen to people talking?* *I would say to hear the music. Yeah. The other thing is that you will hear western music in an eastern country. When did you recognise that the map was live?* *I recognised it by the shadow. By the shadow that was cast. It was only that when I stood here, that I could see ... aha ... Which place should I show it at? Who do you think would be interested in it?* **Some people that could benefit from it?** *Purely because of the multicultural nature at a show in London. Currently at the moment there is a show in London on how many cultures actually are in the one (city?) and it would actually interesting to see, to actually understand from where people are. I think on that level it is very good. Did the interface work for you? Was it clear how to move around and interact?* *No, not a hundred percent, I am still not certain how I was to get the circle to move across. When I was working with Sabine the ? was a little bit more clear. Because I spent the first two minutes (of my xx xx) I was just focussed on where I was going. (long bla from me) It is actually very interesting, I avoided this area down here, because there is a shadow on it. I thought Maybe it doesn't work there because ... Until other people went there.*

Interview 02, female, 30

Its wonderful, it works very well. That's why I wasn't listening to the radios, I was listening to the voice telling me "Your in Venezuela ... your in Colombia .." Because there are no ... , because the map is not a political map so it hasn't got frontiers on. Uh, so here is Venezuela, and here is Colombia, Belize, I didn't know that Belize was there; by the way I thought it was somewhere

completely else. It was really really interesting, the geography. And the fact that Europe is so busy. So central still. ... **also a map of wealth** ... Of course ... and I couldn't find anything in Africa, just, where was it, Ivory Coast? **When did you realize that it was radio stations?** Very very soon. When I came in S. asked me: „Do you know how the image is produced?„ I have no idea how the image is produced. But then again I am someone who believes in magic. Who doesn't look for the trick. Within the first minute I realised it was radio stations. (She observed others for a while.) It sounded like when you put the dial (gestures radio dial) it sort of registerates. And also the voice tells sometimes when the radio stations is called“ radio catalunia” **And did you recognise that the map was live as well?** No, I didn't. What do you mean? **Every five minutes the map is updated, so you can see that the dark part is moving, that the sun is setting where we live ... and the sun is rising ... its maybe 3 or 4 o clock in Australia.** I didn't realise that. (goes to Adelaide) I didn't realise that. **Some people recognise it immediately ... Really?** I recognised the interaction, I recognised that you had to do something. I didn't realise that it was live and actually that is another dimension. to the fact that half of the world is awake and half is asleep and that you really see it. You always know that I have never seen a map like this before. **Often it happens that people don't know what is going on, and its frustrating ... and after five minutes you can see on their faces ... now the penny drops.** I pretty much knew that it was live radio mmhh but soon after I came in someone was talking about international AIDS day, which is today, first of December. Mmhh. Okay! And it was good that this was a radio in the UK, so it made it really international and proved that it was something. **Would you say that you get a sense of the different atmospheres of the places?** Yes you do, yes you do. There is a great sense of east and west I would say. More than anything. When you go to America they talk about Starbucks. That's very interesting, and Australia was Gotan Project which is a band that is really well known in Europe and South-America. And when you go to China its very different ... and Moscow. and Lebanon as well. **What do you think is more important, hearing music or hearing people talk?** They are both communication, they are both language. To me voice attracts me more then the music. mmhh And that goes also for the computer voice. For me the most interesting thing was the computer voice. To me the most interesting thing was the geography of it. More then the actual radio. I like the radio geographically rather then just as a means of communication. That's why the first thing I did was go for Spain, because I come from Spain. Oh, lets have a look (speech act) **And it worked?** It did work! Catalonia was talking about food politics. Oh, I am at home now. I think it is the geography for me, that's the most interesting thing. In terms of placing, culturally. it makes me think about conceptions I have of the world. About globalisation, about the fact yes, Starbucks comes from America. That is all that way away. The music is interesting when I recognise it. Not when I don't. it talks to me about culture more then anything. When Gotan Project was playing in Australia, that was like: That's so good! It was very interesting to see, (that it? to?) travel all that way. **I think you also used it together with someone ...** Yes, I did it with E. **What's easier, using it by yourself or with someone?** Two ... I also used it as well with S., ... 3 ... three was a little bit many ... it was difficult to control. I found it very difficult to control with one. You can't be selfish when there is more then one

person. You have to find out what the other one wants to listen to as well. Where do you want to go. You know you ask each other. Where do you want to go now? When you do it on your own you can immerse yourself more. You can stay on one station as long as you want. And then you don't worry about anyone else. But what is really interesting as well I think is when I was on my own I was having this relationship with this circle that didn't want to go where I wanted it to go. It jumped to the other side ... but I want to go there. But when I used it with you (to E.) I had a relationship to you ... that's what I want, this was easy. But when Simon was there the circle again had some sort of personality and went just with one person ... **Does the circle interface work for you?** Yes, it does. I like that fact that it is not only a circle but a line as well. So it is a guided circle a circle linked to my feet, I think this really works well. **How do you negotiate that? Do you talk about it?** Generally its more polite to talk about it. If you just move they think you are doing your own thing. I think it's just more polite to mediate, to talk. But I think, you know, when there is two people, there is more of an intimacy there, when it is three it is a crowd already. Affirming yes - Like you say, when it's all a mind game. That's why I think it works with two, not with three. I worked with a lot of people at the same time. The circle really having a mind of its own. And I really want to see it massive with dozens of people there. See what happens. **You say you were frustrated when there where 3 people.** Yes. Two people is perfect. Three people is not so good. **What will be when there are twenty?** Because it becomes a crowd, probably somebody will adopt a leadership position. „Lets go that way.„ Or something. (Laughs) I imagine there is something geopolitical about it that because the interface is doing something I think someone would adopt a leader position. That's why I didn't like it with three, because it wasn't good enough to say „I'm the leader.„ type of thing. With two is more partnership. And with one you're just trying to work ... E: With three there is got to be a leader. because he decides to control the other two. **So it works for up to eight people. But at the moment the limit is for people, and that is already total chaos but I think you are right, it is worth trying.** I like the idea of crowds. Multiple people become one crowd. Normally, when you go to a concert you don't know where to go, but the crowd just leads you. And I imagine, when it was massive, and you really had to walk the Atlantic ocean people would do that ... they would say: „Now we are going to Europe.„ and its a travelling exercise. **The map should be twice the seize.** I would like it to fill the room. The whole room. **yes, i hope I can do this in my final presentation when my examiners are coming.** In this day I have to do it. I think it is a wonderful piece of work; it is really interesting and very thought provoking. I mean it has got lots of layers, you can think about many things, whether in terms of culture, politics, geography, you know how the world is structured. But also about communication, radio and accessibility of it. **That is one of the ideas of collaboration. So you walk around and you hear the radio, that is one of the layers, the news, what is going wrong, what they are doing here, what people are concerned about. Something totally banal, something tragic. And so when you are standing there as a crowd of three people, four people and you have to negotiate, in the small level, here, as an atom. You have got the big picture of the whole world - and you've got your small group of three people. If you can't decide where to go ... Its kind of metaphorically speaking If it doesn't work on the small level, it will**

never work in the big picture. But it is also another level that I found, is the fact that I found. With technological advances and culture ... postmodernism, and the way culture is advancing, the world has become our oyster and a majority of people have been to America, maybe have been to Japan, Australia. And I thought, when I was on my own and I used to play „Risk,, (explaining risk) the world is yours. And you can choose to go to Canada. it gives you those thoughts as well. **How would you describe it to a friend? To someone else?** That is complicated. I can only attempt to describe to someone to actually go and see it. Go and experience it. I would describe it as a sum of elements, like I would talk about the radio a little bit, about the interaction a little bit. I talk about the map a bit. But that is not really a representation ... its a collection of bits. But it is more than that, its more than the sum of its parts. So I think it will be quite difficult to actually describe it - you have to experience it. **You sound as if you had read my webpage. That is exactly what I am writing there. Its just radio and an image and its magic. It is happening in your mind. Of course. And the really good interesting thing about it is that the description telling somebody can let you know about something, but you don't gain knowledge! I mean: While I was doing it I learned something about myself, about the world, it made something conscious that wasn't there before. I cannot explain that to somebody. You can just go there and do it and see what it talks to me of my own history, of my own experiences, you know, with the thoughts I have had before about the world and about globalisation. And I love geography, that why to me I talk about geography. For two years it just was an idea, that I had in my mind and three weeks ago was the first time I experienced it myself. and I got the same feeling as you, that having the idea and thinking about it and then really experiencing the almost real thing is a big difference. I tell you what it can compare to me about this. I am a crazy ballet-dancer. I really like ballet. When I take people to ballet with me to show some performances, the people I take there, they cannot understand, they can see it, they can see the narrative, but they don't dance - so they don't understand. It is very different to just dance move and have this sort of kinetic intelligence developed, how difficult it is, your body weight, you know feelings etc. But even if you don't know, you get the idea of the perfection, of the control of the body, or? Not if you don't do it! Some people I have gone to ballet with, they assume that this is natural (xxx?) to a certain extend. That depends on which ballet, of course. But there is not a level of naturalness, once you are there. If you don't know, you don't get the idea of the perfection, of the control of the body, or? Not if you don't do it! Some people I have gone to ballet with, they assume that this is natural (xxx?) to a certain extend. That depends on which ballet, of course. But there is not a level of naturalness, once you are there. That's because it is a complex of things (?).. its more than the sum of its parts. There is sort of an interviewing of complexity. That is very difficult to separate the parts of because its interwoven. Its a whole. The experience is very difficult. And it's the same with dancing. Its more complex then visual. Or the manifestation of it is a lot more complex. It goes from inside to outside. If you don't have the inside, the outside is difficult to see. Its the same here. If I describe it to my partner tomorrow he will only get part of it. As if you only had the world map - and not the radios. Yeah, okay, that is not the same thing. Its not that complexity. Are you happy, to have it here? Yes, I am, but this is not what I**

intended. The map is breathtaking and beautiful and I have got the wrong projector. But this is the only projector I could get. And normally if people would come into the room, they would be like „Aahh,, ... you got beautiful details in the night areas, going on in the cities, and its a different experience. If it was bigger, and if the projection the aesthetics, it would be a different order of experience. Now, its very simple and minimalistic. Its small and it works. This is the minimum experience. This is where it starts. And the map should be bigger, the projection should be brighter. *I think this is really interesting. Because what you are talking about is the visual, the visual experience. And the auditive experience and certainly the cognitive experience. Because you recognise it , you know what it is, it works on this level. But I know what you mean about the visual experience the fact that instantly you are there. What could be done better? I think the size of it. I think the size needs to be bigger because at the moment visually - and I am a visual artist - so the first thing I see is always the visual. It is located somewhere, so the surrounding speaks to you, the things that are around. That's why I tried to focus on the biggest gallery and the tallest gallery in heights. The space that you have around you is quite important. So that is something that ideally in my head would work better. To have it bigger. Why did you choose to put it this way and not towards the doorway? People would stop at the door and not continue to walk into the room. People would try to get the used to. A map that is upside-down people would try to set it in the right order. What is very important is not the real map I It works! wanted to use, I wanted to use the Buckminster Fuller map. Its arranged differently as one island in one ocean. This map is a huge lie. But people see what they expect to see. (bla by me, Lat/Lon, disorientation, twice the size, people would be lost, recreating their own mental geography, maps in our minds are lies of history, being in the middle, Australia, Japan. Maps are maps of convenience of the winners.) Voice of Vietnam ... Hanoi, Vietnam. Radio Thailand. Beijing China. (none of it works) Vladivostok works. Radio Caledonia. works. Countries in terms of dress ... Eurovision is taken serious in Spain.*

Interview 03, 2 females, 30

(These participants didn't receive any instructions. She did not wait long enough for the radio to begin.) f 2: *Very nice, very interesting. What did you know? What did E. tell you?* f 2: *You told me before about putting it on the floor and you can walk and stand on a city and listen to the radio from that city. Of course when you told me do what you want, I didn't get that impression. If I stand on the city it will play because I didn't know that I had to wait although I figured out that the city should be in the circle I would (move?) the circle to a city and nothing would happen ... but knowing that the colours change, that has a meaning. So you have to know ... otherwise nothing is happening when you go on?* f 1 *Because it takes time for the system to work you may loose you patience if you don't know why the circle is moving and changing colour. You do see changing its colour, but you think its visual effect. Its nothing meaningful. I see, good, okay. (to f 1): How about you? What did you know?* f 1: *I knew about the map. and the floor. And I knew I was listening to radio. But I thought I really had to stand on a city ... and I was wondering what's that circle ... what does it mean. The information*

you get through the colour changes of the circle is not enough? Its not transparent?
information? No. I think knowing about the circle and about the colours is enough. To make you know. Its quite simple to figure it out once you know. **And is it easier to use it alone or to use it with someone else?** f 2: Together with someone. f 1: mmhh f 2: But you didn't try alone. f 1: Tries it alone ... (Panama city) **to f 2: Do you think you get a sense for the atmosphere at the different places?** f 2: Yes, sometimes you can. I think the voice in the background creates a picture of the atmosphere because every time you build a kind of picture in your mind what's going on in that city at the very moment. The next time when you move the guide comes on again „Radio blabla“ The whole picture breaks down again. And so every time you have to rebuild it. It really doesn't give you much information. Except which city you are on. **But it is the only information. Otherwise you would never get an idea which city you are on.** f 2: If it just said Netherlands, and nothing else, but the fact, that it tries to tell you the radio name, the country name ... and then it breaks down and starts all over again ... breaks the picture that you build in your mind about what goes on in the world. But overall, yeah, if you filter that out you kind of ... **Do you feel through the exploration ... did you recognise that the map was although live?** f 2: No, that I didn't recognise, but I figured it was live. **If we wait now the sun rises in Australia. it must be four or five o clock in Australia now. And now the people start getting up to go to work there.** f 2: I remember when I stood on the map, Australia was so dark, that I only could see the lights. I thought of it but I didn't realise it. **(connect with these places.)** f 1: Once you walk on it you actually have a feeling of contact, I don't know how to say it. Its really something related to physical contact. What you are listening to, your mind and your body. **Do you get a sense for the places? The different languages? What do you think is more important to hear music or to hear people talk?** f 1: Music f 2: Music f 1: I think it was quite typical. When we went to Africa, the voice, the music was quite typical. **Which stations did you listen to?** f 1: Italy, because I am from Italy. Canada. At some point the music was Greek. I remember Russia, something in Canada. I remember Germany ... in the end we didn't listen to the sound. **Yes stations are very close together and it is jumping easily. How would you describe it at home to friends?** f 1: There is this map on the floor and you have to walk on it ... I would tell about the circle actually ... you can walk about this map and listen to different stations on earth ... I would actually underline that you can listen to stations of that country so I listen to an Italian radio station then yeah, then I would explain about the circle that changes colour. **What is missing, what could be better? More stations in Europe?** No, I would do that. Maybe if the map is bigger that would be better and the stations wouldn't overlap. So the size. It worked for me. (Break) **Who would you like to show it to? Children?** People would be under pressure, too impatient. They would be just running here and there. **What would be a good place to show it?** f 1.: United nations. Anything that works with a global picture of the world. International corporations. A museum that shows the history of technology. One of these places for international communication. I can see it at the entrance of the BBC. Laughing. **There are so many different stations by the BBC world service. Canada has the CMC. They have so many stations at the end of the world. But I cant put them on there.** f 1: How does it work? **It is normal radio stations that are also broadcasting on the Internet.**

The map is created by a software on the server and is updated every 5 minutes. And then there is one program connected to a video camera looking for people and translating it to latitude and longitude and send it to the other computer. Here is a card and you can send me some comments if you want to.

Interview 04, m + f, 30+

Observing: collaboration, Radio Ivory Coast. Works very fine. Radio Adelaide. PopMusic. China, Minan Dialect. (silence) **What instructions did you have?** Lebanon (silence) (we have to include) f: *We came here completely unprepared for anything. Its all about listening to the radio stations.* f: *I like it.* (Listening to Mexico or Lima, Radio multikulti) f: *Is it live, or?* **Yes.** (Observation: Listening Berlin, talking about Berlin.) m: *Its difficult to use.* (Listening to Latvia.) **(Telling about blue ring colours).** f: *How does it work? I will tell you later.* (She is trying to stretch out her arm to create a second „person“.) **No, that doesn't work.** m, (using it alone): *Its like a tail.* Saint Pierre Migelon. Sidney playing. New Caledonie. f: *Its a good thing. Would you like one at home?* (I am making remarks such as „mmhh„. Good or bad thing?) **When you have found a nice station you can just sit down and stay there.** m: *Its nice. You can also make a game of it or something like that.* **In what sense?** m: *Trying to understand what they are talking about.* **A geography game: Find Lima ...** m: *Or something like that.* f: *Plot (?)* m: *I can show you.* Collaborating: f: *Come back again.* f: *You can definitely learn a lot. About languages, about geography, You kind of have to work together to get where you want to go.* (Both laughing. Insider joke?) **How does that work? Do you talk? Do you say Lets go here, lets go there? Or how do you do it?** f: *I think its bit of both. Its verbal communication.* Gesturing. **Does it work for you, the interface? Meaning, how long did it take you to discover that you use the circle to select stations?** f: *The stations itself took a little bit longer, but it was pretty obvious soon that you could select the blinking points on the map. As soon as I found out that the circle moves, yes. And that the colour changes. You just have to understand what it means ... I think I have to tell it, that if it is blue you just have to wait one little moment ... that you have to be patient. Would you say that you got a feeling for the atmosphere at the different places? Of, what it is like there?* f: *No, to be honest. Because the voice is very artificial and it doesn't give a feeling about the place itself. I mean the actual radio program.* f: *OH Yes!* m: *Only at stations where they were sending programs that where characteristical for the country. At the beginning there was one station somewhere in South America there were some sounds like a demonstration (rally) ... that produced pictures in my mind of people out there demonstrating against the government or something like that and I think on stations where they are playing English music, I would say that, that is not typical for the country, that is just radio like everywhere else.* She: *It really depends on what channel you get. For example the one from Germany was just ...* (Gesturing indicating bad) **Ahh, okay. That was Berlin, they are always playing something different all day long.** f: *We just had one song ...* m: *I was on a city radio made by students, and they where sending all this special stuff. Just crazy music all day long?* m: *No, also news which you don't hear in commercial radio, stuff that is more important for students.* **What do you think is more important to play music**

of a place or hear the language of a place? f: I think its both of that. m: I think only both makes a country typical. Only the combination of both the language and the music. f: No, I think music is less specific then language. I mean in English its a different dialect and you can clearly say that from there and that's from there even it is the same language. m: yes f: From music you can't distinguish and some things are played all over the world. **Did you have the feeling that the music for the places was what you expected was characteristic, or it wasn't??** f: I think I didn't listen long enough to judge on that. **That was what I started at: I thought it doesn't make any sense because they would be playing the SpiceGirls and the Backstreetboys anyway everywhere. So I have no choice. But it is not true. Its is actually very distinct. Every country has its own profile if you select the right radio station you get the right good local mix.** f: I think it is good to select something specific. **So which stations have you listened to now? What do you remember?** He: Beirut. She: Italy, Spain, He: Adelaide, China didn't get the name, He: Caracas, She: We tried Russia though, Bishkek. He: For how long did you use it? Is it just today? **Today is the second day. And it will be up for another week. If you know of more people who would like to come please let them know. Send me more people.** She: Did you have many visitors so far? **Maybe 15 ... but I haven't announced it really. Because it is not really ready yet and in the state it should be in. This is just research finding out if it works. Did you recognise that the map was updating live as well?** He: Honestly I know the map, its the movement of the sun around the earth. And I know that you can get it from somewhere as a screensaver. **So while we are talking the sun is rising over Australia.** She: I didn't realise that at all, to be honest. You have to stay long enough to see that. He: Do you get the map from the Internet? Or what?? **The map is a software, it is from NASA I think created from data and it is just ... I think it is freeware. But you are not allowed to distribute it. Because someone wrote the software but the rights it is called xPlanet.** He: How many people can use it at the same time? it works for up to eight people, but if it are more then 3 using it, it becomes almost impossible to use it. But I will find out. **What did you expect when you came here?** She: We didn't know anything. We were really completely unprepared. **Good. wonderful.** He: I knew it was something interactive. I expected everything, but not that!! **And are you positively surprised? YES! And I like it! What do you like about it? What is it?** He: Its just that fact that its that you can go everywhere in the world and you can ... I think if you listen a bit longer you can get an idea what is going on in the country ... that makes it very interesting. We listened to Sydney and they where talking about something between the states there. **So you would say it really gives you a sense for this place?** He: Yes, if they are talking about the country itself, yes. And I also like that you can see where it is day, and where it is night. **How would you describe it to someone else ... if you go home and tell your friends to come here? How would you describe it?** She: I think I wouldn't describe it at all. For me it was more the effect of finding out what is going on instead of the thing itself. he: mmhh So just stepping on the map and seeing oh, it is moving and changing colour ... **So when did you get the idea, is this live?** She: Quite a long time. **Recognising it is live, does it change the experience?** She: Does it? He: Yes, I think so. The first one we listened to was the demonstration, all the shouting people,

and I thought it was a historical tape which you can listen to some important thing that happened in that country. That is what I thought at first. At some point I recognised it was radio, but that was I think due to the fact that the program from the country was there. She: Yes, I think if there is music running it is very difficult to find out whether it is recorded or live.

Interview 05, m, 40+

Did you recognise that the stations were live? I think it was. Unless it's a (?) for the sake.

And would you feel cheated if it wasn't? Mmhh, I feel like the artist has taken too much control, if it wasn't. **Just as we were speaking the map updated, the map is live as well.**

Did you recognise that? I didn't see that. **What was the experience like?** it is nice to be able to walk around the world and choose where you want to hear the radio. So you can walk over from America to Africa and see the differences. It is nice that you are physically moving instead of just clicking on a button. That says African radio or American radio. **Would you say that you get a kind of impression, a sense for the atmosphere at these different places?** I was surprised that they all sounded so similar. I felt that the differences were to be more sharper. I think usually the stations in Asia and in Africa also (sounds as if they hadn't been working) ... and just these two techno stations on the main Asian continent in Vladivostok and Kazakhstan I could choose between leaving it empty and having techno.

Do you think it is more important to hear voices ... No no, I think it's important to hear both. Its interesting ... both are interesting. I wouldn't have a preference for one or the other. **Do you think, does this way of making it ... that map, and that you have to move about and the live character of everything creates a sense of connectedness with these places or overview ?** I think it is a good way to experience the range of radio stations available (into now?) I think physically moving around the room ... when you are actually walking on it you don't feel you are in a room. You feel like you are on the planet and that is a nice ... I know that it is only in your head, but actually while you are in there, you are thinking, You are only taking two steps ... but you are saying to yourself ... you are moving from Africa to America and that is what you feel that these two steps represent when you make that step. And I was literally thinking to myself: What part of the world do I want to go to hear what their radio sounds like. Oh, I want to go to China, and I walked to China, and you do feel that as a kind of ... you are moving across the globe, and you don't have the feeling that this is the floor any more. **I have many nice quotes from people: This is a global experience. this is not here any more.** yes! yes!

Interview 06, 2 f, 1m, 20

f1: A mixture of science and space and thoughts. I was like interacting **Did the ring work for you, to select cities?** f1: Yeah, when I got the hang of it, it will do. f2: Where is the music? f1: I think its because its two searching it ... (??) (The tracking worked very bad ... but she was very frustration tolerant. (radio mayotte) **What did you know when you come up, what did D. tell you?** f1: He only said that there was an installation and ... **Did you discover that it was live radio stations?** It took me a while to realise ... Why is it playing BBC news all over the world?

Did you like it? Did it work for you? Yes, it was fascinating to be able to tune into these radio stations in a way. And it is quite a bizarre thing when you hear the music the first impulse is to dance to it - but you have to do these kind of reverse musical statues. **Did the interface work for you? To move around with the ring?** Yeah, once I got used to it. At first it was sort of quite hard to stay focussed in but after a while you get used to it. You know the way to position the body in relation to the actual movements that the circle is going to make. **do you think you get a sense of the place through the radio station? The places atmosphere?** Yeah, mmhh, it depends I suppose whether if you tune into BBC worldwide newscasts and that sort of thing ... female student: Being British it automatically makes you think of colonisation. He: yeah. And the influence different languages have on the world. Female student: I am so stupid, I am guessing this (bright) area here is where the sunlight is, right? And there it is black ... First I thought what about the screen? **So you realise the map is life? The map is really like the world would look now.** FS: It is dense, really really dense. MS: It is interesting in a way walking over the map itself, because obviously everywhere has its kind of footprints left all over the globe. I suppose it quite interesting, makes you think how the world is quite (affirmative?) in a sense particularly listening to language and music. The fact is that language sort of goes over cultural boundaries. **Some people say that this is a global experience. Would you say that as well?** MS: Yeah, I think I would agree with that. Mainly from the point of view that it is quite strange to think you pick up a sense of the place that you are actually standing over. But also the fact that you obviously got also a lot of French radio stations appearing in areas traditionally colonised by the French. mmhh and the same with British of voices. It is a global experience but in an odd kind of way I suppose. **It is a map of wealth, of money of course. Europe is very dense, they have Internet and are rich. and here in Africa there are much less.** FM: Also the quality of the radio. Digital radio. (she means quality of the sound signal, static) FM: The way it makes you stand, the way it makes you behave is quite interesting. Because if you can see the people but not actually see what they are doing, watch them going (gesture) and try to stay really really really still. One thing is that the internet (...) it is to do one thing and then stand back (...) and this really really involves you. People watch you, people look at you. That is really interesting. MS: There is this temptation to dance. FM: And I listen and am still. MS: That very rarely happens. **Is it art?** MS: In as much as it affects the way that people move and act. And the fact that it raises this kind of issue that it is a map of wealth and of sub-colonial enterprising - in a way. **Does it make one think?** FS: I always associate this voice with Microsoft., as well. This computerised voice always makes me think of that, it is linked up, it instantly has this appeal of great wealth, globalisation, big companies. The empty areas are more interesting ... then the areas that are full. It makes you wonder what is there. MS: What I also find interesting about that is the fact, yeah it is a live map and that there is never silence. also some developing countries broadcast only a certain amount of time each day. That there never is any silence ... at all on the face of the planet. There is always some sort of voice (noise?) going on somewhere. FS2: Thats bee? there. FS: here in this area there is always sunshine. **Is it easier to use it alone or to use it together with someone?** FS: Alone I think is easier. MS: Alone,

yeah. **Alone, you think?** MS: Unless you are using it with someone that has the exact purpose in mind. FS: It is good that you can both do it. I see that when you first stepped on to it and there were two (people) it makes people act in quite an interesting way. **How long did it take you to figure out what to do and how it works?** FS: yeah, sometimes I just don't get things like this. MS: Its quit quick to figure out what the whole aim of moving the circle was, as I say it takes a little bit of practice to move it to the point where it locks into things. it takes a certain amount of time. Its quick to figure out to move the circle around.

Interview 08, 2f, 20

f1: Its very interesting. I never have any interesting to say. f2: You played on it quite a long time. **Did you like it?** f2: Yes, it was really good. **Do you think you get a good idea for that atmosphere of a place through this?** f1: I don't really, no. I don't know. I just like to listen to different music. That was kind of interesting. But I don't ever go beyond the obvious level" This was fun" It was interesting ... what annoyed me, when I got frustrated was, when I am on something and I really like it ... and I see something flashing and I what to go to that one, but I also want to listen to this one. So, this kind of makes you a bit ... **You seem to have had difficulties with the ring, it was jumping all the time.** It seems very interesting, but it also seems very complicated. **Do you think it is easy to use or not?** f1: No. You think you are in the hang of it, and it ends up behind you ... or you just can't. I suppose ... or a lot more practice. **Some people say its a global experience. Would you say that as well?** No ... I don't think so, no. I don't really think like that ... I thought it was really fun. **Ok, thanks.** f1: Sorry

Interview 09, m, 40

So for how long do you think you have used it now? 3 Minutes, 5 Minutes. (In fact 10) But it is hard in a way to gage(?) because I think you get lost when you are in there. You don't know exactly how much time you spent there. mmhh, right. **You said it is like a window?** Yes, its like a window into the world ... or into parts of the world, through sound. A sound-window. A sounding window. thanks ... **Some people call it a kind of global experience. Would you agree to that?** Yes ... in the sense that you take on the whole world, that you imagine the whole world. As a place when you are witnessing the work. mmhh, and in terms of gathering information, in terms of being kind of institutional ... the whole world. It kind of shrinks it down. So in terms of globalisation which tends to kind of shrink the world geographically it does that, in relation to the word/world(?) globalisation. **Did you recognise that the stations where live?** Yes, I think so, yet not immediate I think ...that kind of follows a little bit like a an idea being touched by an elastic band. That follows a little bit later. In a way, after a while of controlling it, or feeling you are controlling it, you understand that it is live. Maybe not on the first one. **Did you find the ring easy to use? Intuitive to use? or?** Yes, very much so. I like dragging it rather than pushing it. It seemed kind of appropriate when it was following you. Yes, I think it was very kind of immediate to use ... easy to use. (good, because sometimes it is a little bit jittery.) You get used to that I think. **Could you tell by the music you heard something about the atmosphere of these places? So which stations/places did you listen to?** One in

Bogotá, in South-America. Yes, you absolutely get flavours of places you listen to ... then you also get history, by the places that have been colonised, maybe; and have different kinds of histories that feed into the makeup of that radio station ... also the fact that radio stations might be playing wE.n music from different continents I think that is quite interesting when you think about globalisation. So it answers the question ... they can be quite specific and exotic and give a perfect kind of pitch onto what is going on in that particular country. And they can be quite deceptive as well. Because they might be playing something which you wouldn't figure would be coming from that place. It takes quite a lot of time ... I have got maybe 200 stations, not permanently here, it takes about 20 minutes to find every station ... and then, during the process I was surprised how much local flavour was actually still left. For example in Russia in the huge Asian landmass I have only got two stations one in Vladivostok and the other one in Kazakhstan ... and both are techno stations. So I had the choice of either putting stations where no one ever talks ... just techno. Or having nothing. I thought the gap.. when we went to China ... or the silence was quite revealing and that brought us back to that point where it is interesting that techno music is taking up everything for hours ... or silence.

Interview 10, f, 40

What did S. tell you about it? *He didn't tell me anything really other than it was an art installation. And I thought it was interesting and worth coming along. Thanks for coming, great. So I told you already how to use the circle to select and so on. When did you realise that these were live radio stations?* *I think as soon as you actually hear the radios. Maybe not the first one, but the second one when you start getting transmission because it starts halfway through. And it just has that quality of being immediate radio, live radio. And would you say that you get an idea of the atmosphere of this particular place that it is coming from?* *Yes, I think you do. Once you realise, that it is live you start to get an indication of the time of day as well. And that is giving you perhaps an indication of the atmosphere ... but obviously the language is the first thing you pick up on, really gives you a sense of where it is coming from. Could you tell somewhere what time of day it was?* *I suppose, obviously you know in the European region that it's gonna be fairly similar to where we are now. I don't know, I think perhaps if you are picking up things like traffic reports you might think that might make you think it was rush-hour. Did you find it easy to use, is it intuitive?* *Yes, once you get used to the idea that you have got to fine tune it and get the circle exactly over the middle of the dot, the middle of the circle ... then it is quite easy. Also it is quite sensitive ... sometimes you have the feeling you are standing still but the circle is still moving. But yeah, it is quite intuitive. I like the idea that you have got a map and you can literally walk across the map and pick the places that you want to go and focus on Italy and cite it, and trying to find the Italian radio stations. Some people say that it is a real global, a live experience. Would you say this as well?* *Yes, it is! It's kind of like satellite TV in a way in that you could flick around different channels. But it's ... I quite like having the map there, because it gives you more selection in a way instead of just random go to particular places. What ... What .. What would you change? What could be better?* *Well, it depends on the purpose really. Is this intended for a practical application or*

more artistic purposes? **In principle the same as here ...** (A. coming in with visitors.) *Well, on a practical side I think that it could lock onto dots when you are near them, as they are being quite sensitive. And ...I don't know, I was thinking of some kind of other experience that could be triggered. And as well as the audio ... some visual trigger or some pictures or something that could be generated at the same time. Webcam images? Something like that, yeah. Or other sensory experiences. Do you think that when you walk across the map and hear all these radio stations of different places, that it makes you ... that you feel connected to it?* *Mmmhh, yeah, you do! You do. You get an immediate sense of ... well, the thing is, I come here in my car listening to my radio .. that has immediately linked me into what is going on in this country and the music that is happening and things like that. Coming straight out of that environment into this where you sort of switching channels instead of getting BBC radio Two or Three you are getting Italy or Peru or wherever.... so yeah, you do get this immediate sense of having landed in that place. Good, thank you.*

Interview 11, m+f, 30+

What did A. tell you about it? What did you expect? *m: He just gave us a brief outline. That is was a projection that was related to radio stations. And that it was interactive in some way.* **And did you find it easy to use?** *m: Oh, yeah. As soon as I figured out how it was tracking me, yeah. But it seemed to be easier with two people.* **So it works better with two people?** *m: yes, I would say.* **So you have used it by yourself and then you used it together. And what was it like with three people? Did it work as well?** *m: it was with A. and so obviously it was difficult because he is always pulling in the other direction. (laughing)* **Would you say that these live radio stations ... aehm ... When did you recognise that it was live radio stations?** *m: mmhh, when they said that the music was live.* **And did you recognise that the map was live as well?** *m: Not immediately, no. But when the light was mentioned ... (?) it was morning time in America.* **Would you say that you get the feel for the atmosphere at a place?** *m: Yeah, it give I suppose a snapshot of what is happening at that time. And you can compare three cities in Australia. And just by a snapshot of the radio stations you get an idea what the place is like I suppose. But I wouldn't take it that far. (?) I think you have been to almost every station, you have spent now about 30-40 Minutes ... which places do you remember ...* *m: uh* **What was interesting?** *I would say the stations in the (United) States.* **Texas?** *m: Yeah, I suppose you're quite quizzical of what is going on. Talking about these stations. There is a lot of pop music going on. But still you have got ... what is it more ... is it more pop music or local flavours when you go to flavours.* *f: I think it is surprising how many places sound like you where in Europe.* *m: I would imagine it is hard for some people that are from our part of Europe whether the music you are hearing from Western Africa is either their pop music or not pop music to them it is hard to tell, because you are not familiar with their type of music.* **yeah, right.** *m: obviously in the English speaking stations you have more of an idea whether its pop music or not. If you are not familiar with the content its hard to tell if its pop or not.* **What would you think transports more the sense of locality? To have music or have people talking?** *m: I think it depends on the station I suppose ... obviously it also*

depends what they are talking about. If somebody connects people in a certain part of the world and has them stereotyped to be a certain person if this stereotype is reinforced how they are animating themselves when they are speaking like if you see somebody from Russia as an angry tyrant and then you move over the station and there is some guy on the phone at the station going crazy you think: Oh yeah. That gives a true representation. **Who would you think could benefit from this kind of installation? Where would you put it? Or audience?** m: I think you could put it in a school. f: I think you can put it anywhere where people have to wait, like in a hospital. You can put it in a waiting area, where people ... because it would keep people occupied for ages. And you could have a laugh with people that you don't know by using this 5 you have to cooperate with another person, and that doesn't have to be a person that you know. And then it would be good in a place where people are waiting. It would be really good. **that is a good idea. So when did you recognise that it was live radio stations?** f: mmhh, I recognised that it was a live map straight away, but I didn't recognise that it was live radio stations right away. Initially I just heard a sound and didn't know what the sound was. And then D. said: Oh, it is live radio stations, and I said: What did they say? I didn't hear what they said. I knew the map was live straight away, because I just had the feel that it was live. I just felt like :I know that it is dark where I am and that made me think it is a live map. It wasn't done to make it easy for us. If it hadn't been live it would have been made so that we could see where we were more easily. The fact that I couldn't find where I was very easily made me realise that there was something else going on. And it was a live map so it wasn't easy to see the outlines of some countries. And also I have seen the map with the points of light before somewhere else and I recognised it as a thing. **And what did you think about the ring/ Did it work for you?** m: I think it worked, but when you get two stations that are very close together it can be difficult. f: When you get two that fit within the ring then it becomes hard. m: One improvement that I could suggest is that you could project it onto a larger scale. f: Or pick the stations that you don't really ever get them at the same time. m: or like a railway stations on a huge tiled floor, then you can put the thing on a larger scale. **now we have the absolute minimum size ...** m: yeah, f: yeah m: Yeah, I think the ring works really well. Especially with two people or more ... f: I would like to see it with several people. With how many people does it work for, before it gets confused? It would be interesting to do that. I think in an open setting where you have it in a public place the natural impetus is for people to join the group ... and keep joining the group and I think it would be good to test it with a large number of people before you put it into this kind of situation. **it can do up to eight people ... but I have blocked everything above three because when you are four it doesn't really work any more. (it works, but the degree of control is not satisfying.) Especially because of the size of the map.** f: I think you should make this clear to people because you wouldn't want people to get frustrated with it. The natural assumption would be that the more people you have the better it works. That's how I would perceive it and you don't want people to get bored or annoyed with it, thinking it is broken. Make it clear that people know that three is the ideal number. Or whatever **Did it do something for you, recognising the live map AND the live radio? does it create , I don't know, a kind of connectedness with these places? Like in this divine perspective and you can go everywhere?** m: Well, obviously

one thing is that because it is live you can see where it is just beginning to get light, there it is morning ... so you expect it to be a morning type of radio station and you wonder what they listen to and so you have a look. You are not just comparing place for place, but you can see what changes on each time of day. **mmhh Where you able to tell the time morning and afternoon and so on, or evening just by ...** m: Well you can say at the first fringes of light it is morning in this part of the world. f: What do you mean? Tell from what you heard? **Maybe the time, or the traffic news announcing the time?** f: I didn't feel that massively, no. But that was because of a lot of what someone is saying you can't really tell what the kind of tone of a program is. m: You probably have to listen to them for a while I think to pick up on the time. f: exactly. **mmhh, Which places do you remember listening to?** Groningen, BBC Radio Sheffield of course, I think mh, mh, mh Tunis, the classical one in America, and the people ranting in Houston, and often I was quite astonished how a lot of places I was expecting to hear local music or what I perceived to be local music is - and it sounded very like western poppy music. m: The only one that didn't was Mayotte, f: Tunis, Madagascar, m: The small islands the music was different that was what I ... if someone had asked me what it would have sounded like it will be the local, it is quite an interesting experience about globalisation, that people are listening to things all over the world that sound very Euro. m: I think it is two things: You are drawn to places that you have been because you want to check if your perception of that place is till correct. Like I was drawn to Australia because I have been to Australia, I was drawn to Africa because I have been to Africa. You try to check if current affairs are running in parallel with your perception **mhh** m: ... of what the country was like. And then there is the other thing of you want to go and check out a place that you have never been to try to give yourself an idea of what the place is like. **So first you went to the places you had been to and then drawn to the new ones. I have never had people here that knew geography so well as you do.** f: that is very kind, thank you. m: ... for children they learn by walking around ... and when they hear the name they know that's that place. f: Also the darkness gives it a kind of mysterious quality to it. So I was thinking is this Kazakhstan or Kyrgyzstan? Because you can't quite see it gives it this nice sense of mystery. We tried to work out is this Vladivostok? And I quite like that. In America, that bit that is light, its obvious where everything is but over here it's like fishing in the dark, it's nice that you can't quite see. I quite like that. **Normally, the map would be of higher resolution and brilliant.** f: I quite like it, I quite like it! I also like the graininess of it. It has a kind of radar like quality to it that I quite like. I have seen and do like the original map, but I like the radar quality and the flashing lights. **The real thing that has twice the size will have this higher resolution and you can almost see people in India sitting around their campfires.** m: I think if it was the size of this room it would be amazing. And you could fit maybe 5 times the number of stations on without sacrificing jumping from one to another. f: The other thing I like is the synthesised voice of the map. Because I think it is quite funny that "he" doesn't always pronounce things the right way. I don't know why, but I like that. **I could try to force it somehow to do it right ...** f: no, it is better the way it is, because then it is that he is like a foreigner as well, he is foreign and we are foreign. If you hear him speaking in the accent of the place, and you don't like his voice it can put you of before you have listened to the station.

If kids would think: I can't understand him, they just walk away from it, to somewhere they can understand. So because it is synthesised it is the same continuously. You have no preconception of what the radio station will be like. Just step on it and take a listen. and explore ... I think it is important in the beginning that you don't know much ... aha, the ring ... how does it work ... if I don't tell people anything they are very forgiving ... and tolerant to frustration ... and after 5-10 Minutes you suddenly see the penny drop in their faces ... oh my god, its live radio ... and then they start all over again, at the top left corner working their way across the map. m: I suppose what type of a person someone is by the way they work around the map. We were from continent to continent skipping back and forth. We listened to some twice ... some people will probably do it systematically. Work down a continent ... I think we got them all. Thank you...

Interview 12, f, 30

I think the sound was going to come off. And did you know that these were live radio stations? yes. it is about 20 percent all the time that don't work, but you never know which 20 % Everything worked really fine. Could you tell a little bit about a places atmosphere by listening to it? I think it is quite hard, isn't it? I think the music they play is not necessarily from the place ... that the radio station is broadcast from. I also noticed that there are not an awful lot stations available in something like South-America? mmhh, and Africa is almost empty too, I wish I had more, but I don't. Of course, wherever lights are there are stations, but they use WMP - and I cant use that format. Is there any issue with permissions with radio stations that don't want to be picked up outside the area they are in? If they wouldn't want to they could just block my IP ... Have you found any that have done that? No, not really. You can never tell for which reason they don't work. And it is always a lot of effort picking out the stations. For how long have you used it now, what do you think? Maybe ten minutes? (right) Where you able to tell the time at some place? No, not of that ...i don't remember hearing any times ... it was mostly music that I came across that I was hearing. Are these time zones those lines that run across? No, this is just the floor. S: I didn't know if these were time zones ... How does it differentiate if there are two people? Just be the software ... it should respond to everyone, but we have just been fiddling with the light and with the sensitivity when you came in. it should be working totally equal to everyone. I can adjust the sensitivity. (Something is going wrong with the system and it freezes.) Did you see that the map was live as well? I thought as much, as the lights and things, and this half is dark. Oh, this is Belize ... now I know where Belize is. So while we are talking that map is continuously updating. ... in Australia the sun is rising. So more stations go online while the sun is going up? Actually there are more stations. But they are positioned too dense and it is very difficult to select a station in Europe, because the map should be twice as big. And due to size I had to limit it I would have to through out a lot of stations. so what do the white lights signify then? Cities, People. They are cities; the flashing lights are radio stations that are actively broadcasting. Well, the flashing lights are radio stations that are broadcasting and the bright spots all over of are of course people, You can for example

see Japan very well because it is densely populated. Cities, towns, villages. *Sheffield is the only one that is flashing in England ... That just looks like it. There are more stations ... Glasgow, Sheffield, London ... for some reason you cant see London. The flashing is much fainter. I think it has to do with the video projector and the pixels. it is quite calming to look at, the lights, and knowing that it is live. Sort of looking down on yourself. Does it give you the sense of looking down? Yes, very much so. What is the feeling like walking on a map instead of having it hanging on the wall? Would you say its different? Yes, definitely because you its obviously more interactive, you are part of it aren't you? You aren't only observing ... you are part of it. (I think one should provoke people with nonsense claims ... and see how they reply.) Did you find using the ring intuitive and easy or less? I found it a bit confusing at first, because it was sort of following me. Because of your shadow, its not exactly where you are stood. I am not sure how you could get around that ... because the shadow will always be there because the projection is from above. Unless if you put your hand out, as you said (did I say that?) you can direct it by your hand. Or something like that. I think its just exposure. if you try it after two or three minutes you will be able to do it better and better. It also depends on the colour of your clothes. If you are dressed black you have got a huge advantage over people that are not dressed black. (laughing) that is something that I have to change. What does it go by then when your are wearing blue? You disappeared? Me, no, but it is more likely to loose you. So you suddenly disappear. And it looses you all the time, so it is not very accurate. And do you like it? Yeah, its fantastic. its a piece of artwork on its own, isn't it? Even if it didn't do anything else it would be fantastic. Where would you put it? Which audience to show it to? I think a lot of people would appreciate this for different reasons ... geographical reasons. Where you able to pick up the time of day anywhere? I don't think I stood at the spots long enough to hear the local time. But I can see from the light that its nighttime ... and that the sun is coming up over there.*

Interview 13, m, 30+, m 7, f 10

Did you like it? f10: Yes, its cool! Would you like one at home? (laughter) What is cool? f 10: I like the way they flash. **So could you tell something about the places?** J: I could tell if they spoke English. **And which places have you been to?** f 10: When I went to Canada it crashed. **Which was the first one you found?** Papeete, the island in the middle of the ocean. **Was it easy to move the ring around?** Yes. **And was it easy to connect with a station?** f 10 You had to be kind of careful. **Whom would you like to show it to? Would you like one at school, or show it to some friends?** J: One at school. **How did you know how to find England?** J: Ah, well, I just looked for it. I have been to Australia and I am good at map reading. And to the East coast. (Others playing with Kyrgyzstan) J: I have a friend in Ghana. **Today it doesn't work regularly.** Me to m7: **Can I ask you some questions? Did you like it?** m 7: Yeah! **What did you like about it?** I like that you can choose where you are. m 7: **Can you go all around the world? In what way?** m 7: Isn't this just half of the world? **No, this is the whole world.** J: Stuck a knife in, cut it in half and rolled it out. **Me to m 30: For how long have you used it now?** For about 5 minutes, and I tuned into 5 or 6 different stations. I find it very

interesting to listen to these stations and ... kind of gives you an immediate picture of the world. And the fact the it is dark over there, and the time of day and what they are listening to. That is very interesting? **So which places have you been to, have you listened to?** m 30: I started somewhere in Northern Russia listening to a station with a weird language that I didn't understand. I went over to Vietnam and China and then I started to look for some English ones that I could understand. Like Australia. I found it interesting that some stations, was it Kazakhstan or China, that they don't broadcast in the middle of the night. mmhh m 30: Then I tuned in to one in Africa some real African drum music, very groovy, that was fun. **Would you say you could tell from the music, from the sounds something about the atmosphere there of the places?** m 30: I didn't really listen long enough ..because I guess ... I listened to a station in Africa to maybe 2 minutes. And because you have to stand still in one place in order to listen ... and our bodies are not really used to standing still in one place ... then two minutes felt like quite a long time mmhh, I would be very interested to have this map on my computer at home and to be able to just move the mouse and pick a radio station. I think that would be very very interesting and I think you would get a feeling of what those places where like. But I don't think really, working it like this, I didn't really get that. **I can give you later an address where you can download it to your computer. Where you able to tell the time at some places?** m 30: I didn't ever get a time check at any of the radio stations. The only way I could tell the time was by looking at the shadow was ... and then estimating. I guess there was one place where I was trying to tune into somewhere where it was in the middle of the night and the stations were broadcasting nothing. And in Australia it was a very quite, dreary Cheche(?) And then, where was it in Australia playing very heavy punk music. **How easy did you find the ring to use.** m 30: Fairly easy. I could it fairly easily to pick up the stations. **so it worked for you?** m 30: It worked for me. I mean standing still in order to listen ... I found difficult. if I want to listen for a few minutes and to do that I have to stand still. **Did you use it together with someone or only by yourself?** m 30: Only myself. **Who would you like to show it to?** m 30: Who would I like to show it to? I would like to play with it myself first. I think experiment with myself more, having it play in the background would be fun. **Ok, thanks.**

Interview 14, m, 30+

m 30: started of very thorough and systematic in Asia and worked his way over to the Americas. 20 minutes. **Did you know that it was going to be radio stations and a world map when you came?** m 30: no, I didn't. I didn't have any expectations in my mind. I came with an open mind. **For how long have you used it now?** 15 minutes or so? **When did you find out that it was live radio?** m 30: I kind of guessed almost immediately. But it became clear as I listened to the channels that the news and so forth ... especially in Australia, because they were talking about upcoming news which I knew was up to date. And it seemed the time zones as well. That the things would be in broadcast. Obviously I started out here in the East and all of these stations are unfamiliar ... so it did take a while to negotiate a few of them and start the thing again. Cause of course for me I would be interested in the channels I am most unfamiliar from different parts of the world. The different kinds of broadcasts being made and how different they

may be to radio stations that you are used to. Some of the places are very remote and what it changes geographically. So when you went kind of here (Anchorage) the kind of punk rock you have heard. Whatever time of night or day it was. Just got up and feel very energetic - that's the way to have a party. **Yes, I saw you where really systematically working your way from Asia over to Europe. Could you tell by the stations some of the local flavour? Would you say there were some distinct places that you still remember.** Yes, I got to Romania, traditional music, at some other places it was interesting to see how there is a generic style of broadcasting and you also get an idea of the impact of western music because you could go to several places and hear westernised music and so and so. There are specific places. But there is also a generic way of broadcasting. Down in Australia it was exactly the same as Radio Five in England. Local news, local sports and kind of important things down. It didn't get international when I was listening at all. They seem very fuck-off down there. When we moved over here, the Caribbean and Mexico and so forth you get the more ... actually it is interesting despite the fact that you got so many different countries in Europe ... actually America and South-America probably seem the most entirely divided in some ways because of the west-Indian station, the Mexican station - and then the bible belt station and then there was the native American station. They all seem really at odds with each other. Within a very small geographic territory. So that is kind of interesting, when you can go for xxx (?) and not find a generic form of broadcast. **Did you recognise that the map was live as well?** Yes, because of its changing the daylight. And the map, just purely and aesthetically, and so forth as well. I just like the idea of it ... it is how we are experiencing the world at the moment. Because of the .. I know it is almost default, you have got this pixelisation and also like city lights, and about the city in the night time and so forth. So this is very much how we are actually experiencing life outside at the moment. You get instantly tuned in to what's happening outside to what is happening in the world at the moment. So this is a different thing happening ... if you want sunshine, go to the sunshine state. (Laughs) I really like the way it's this mass observation, I really like that. I would like to ask you about the different ways you would like to present this. Obviously its a floor projection, wherever you like it to be global, or upright, so and so ... the idea of almost being a satellite ... **Does it do this for you?** Yes. As soon as you tune into the idea of yes, this is live and this is happening now, that it is very interesting about, and about the fact that you have got stations that have got a generic flavour to them, its all about information spread out over a large territory ... then the territory becomes redundant in some ways. This is kind of saying about the Internet ... talking about the exchange of information. Of course we have got radio waves around for a long time, satellites and the Internet. And we can receive signals clearer now. ... **and that geography does not matter?** I mean geography in the sense of territories. That some of the radio signals just in the short time that I have been listening seems to be quite similar. **mmhh** I am talking about the fact that you can listen to it in different places it seems to remove the sense of the physical territory. With Internet and the radio signal it seems to remove the physical territory. A different kind of search for identity and territory through and the information you are giving to the rest of the world. That's what I find interesting. If you look at some places where the territories are still so contested that this is another territory altogether in some ways. **When I selected the radio**

stations it was really important to me to listen to them and to get an idea if they are local. I think there must about 3000 genre stations out there that just send techno or house all day long without news or having another local connection. When I went to Berlin I almost knew ... I had a preconceived idea and I was expecting banging techno music. (laughs) And when it didn't happen it was a nice surprise. When you go to England and Scotland, again it seems so stereotypical, this inundation of telephone call-ins, and they are always talking about football as well. Yesterday we had suicide bombings and lots of killings and so forth but the most important thing is Manchester United being knocked out of Europe. So that was the great debate on the radio. It doesn't really matter what is happening all over the place. It is interesting in itself because the people that are phoning in, you get the complete different kind of extremes of opinion. You get kind of the worst people ever. **My idea was using a photorealistic life map and life radio to create for people the experience that they are live connected with the whole world. Does it do this for you? Or is this totally exaggerated?** I do find it interesting, I think that you can isolate the different things. Maybe another way of seeing it, looking at the work - I hear sounds in my head. This looks like cities at night, the stations look like they are broadcasting. So what I was thinking was almost the possible reverse that you could have the sounds of the stations all together and as you move to one station it isolates this station. **Ah, you mean that you have a huge cacophony, a huge noise of all stations playing together.** When I look at this and when I look at cities at night ... because you have this kind of onlooker look ... you have the feeling that this is constantly making sound ... **yes ... beautiful** That is what I get. **I had this idea earlier, but I thought this is going to be a horrible mess ... and I don't wanted it to be a horrible mess ...** (laughs) but a nice experience. (Battery change) I guess I said I liked his idea very much, it makes sense. This is it for me, the shimmering cities, its very beautiful image, one thing about the work is that it is very seductive as well. And I think that is important, that people ... I know that some like a lot more confrontation with the pieces ... but I like the idea that this is our world and this is an amazing thing to build. Kind of traverse ... and it makes such a difference with the idea you can traverse the world through the Internet and broadcast satellite so easy ... its quiet ... but there are things happening ... its an interesting conundrum ... it is alive, but it is also ... I need to think more about it. What I like is that anyone who is interested in anything would find something interesting in this. They must be curious what is happening in China at the moment. What's happening in South-Africa, they must be. **And everyone you know and everything you know is somewhere here.** Its great for lazy people in some ways as well because you can instantly find out information. You know news researchers ... but that is good. You find information and then the curiosity starts ... What you are dealing with here is about people about territory, about the world itself ... there is so much in there ...you could just talk about it for hours and hours ... people will have very individual things to say ... it makes you conscious ... like an astronaut looking down at the world for the first time. **That's what it should do with people. How was it for you using the interface? When did you get used to manoeuvring the ring around?** I did get used to it. A couple of times I found it maybe a little bit clumsy but that is probably me as well. It is very precise and I got used to it. **Did it work for you?** Yes, it worked. But I was wondering as well. What if you had it upright? It

*depends on the format. it should be like this. It would perfectly well without the ring ...the problem is when we are two people ...(just come on the map - Belize city) and so ... we have the difficulty what am I playing if there are two people on the map? It was a necessity. Lets embed it into the concept. People have to negotiate on the local level to work things out ... and on the global. Kind of a metaphor ... from the atom of the individual, to society to the state ... that is what I wanted to play with as well. What about the sense of it being actually the viewer freely moving into the space and using it? Because if this was situated in an art gallery often people are afraid to touch, oh, this is an art piece so therefore I can't touch that. If you go somewhere like ZKM, which is all interactive, people, are looking for the trigger, because they know that is the work. But for example an exhibition recently playing on John Cage there was a piece of work you where meant to walk over - but because it was on delicate rice paper on the floor, people thought "I cant walk on this" because it will damage the work - but that was the point of the work as well, to leave traces. So there seems to be something there about this. unless people feel happy, because the is always something sacred about an art gallery You are not allowed to be too close, you are not allowed to touch ... Would you be happy if people just where coming and used it ... leaving instructions? This is how it works. Aha. **This is how it should work. It should stand by itself ... and only every ten to fifteen minutes there should be a signal ... please get of the map, we have to make a new calibration to reset it. The software has difficulties if the map moves too fast. It takes changes of the map as moving people. (What is this here? that is fantastic, I just put in in today. Radio Polynesia, Papeete) Its hilarious to hear Tony Blair over there ... he doesn't seem important in the rest of the world. (I think I have to reset the system something doesn't work.) Behind this is a large database of radio stations and I can easily add a station or take one out. 20% don't play. The voices are interesting as well. The proliferation of English speaking is quite something. South-America and Barcelona are really strong in their languages, aren't they? (This is a Greek station in Toronto.) Canada is almost European...***

Questions of the Main Study/Environment Study:

How long do you think you have used it?

Which stations have you listened to?

(When people say "there" resolve it, ask what they mean.)

How would you describe it to a friend?

Would you say you got an idea of the distinct atmosphere of a place?

Could you get an idea of the time there?

Who would you like to show it to?

Do you think it is more important to hear talk - or music?

Did you feel connected to the places you listened to?

Do you feel connected when you are listening to a station?

What in particular did you like about it? / dislike about it?

What would be a good place to show it in public?

When did you realise that it were radio stations?

And did you recognise that the map was live as well?

What's easier, using it by yourself or together with someone?

Does the circle interface work for you?

How do you negotiate that?

How would you describe it to a friend? To someone else?

Do you think you get a sense for the atmosphere at the different places?

Would you say that you got a feeling for the atmosphere at the different places? Of, what it is like there?

Some examples of the original coding pages from both studies:

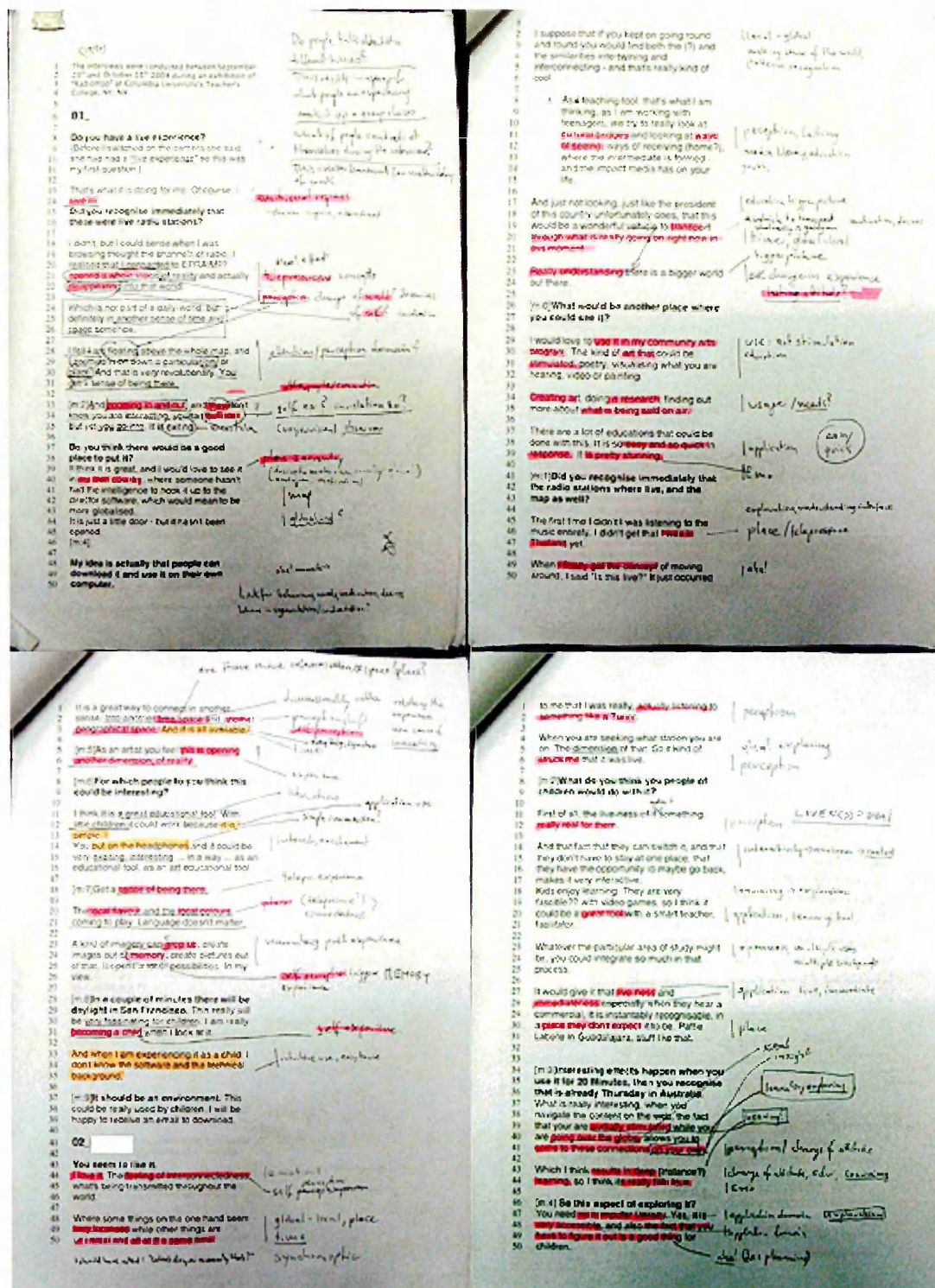


Figure 71: Four examples of coded pages from the Pilot Study interviews at Columbia University. The interviews are 9500 words long, covering about forty pages.

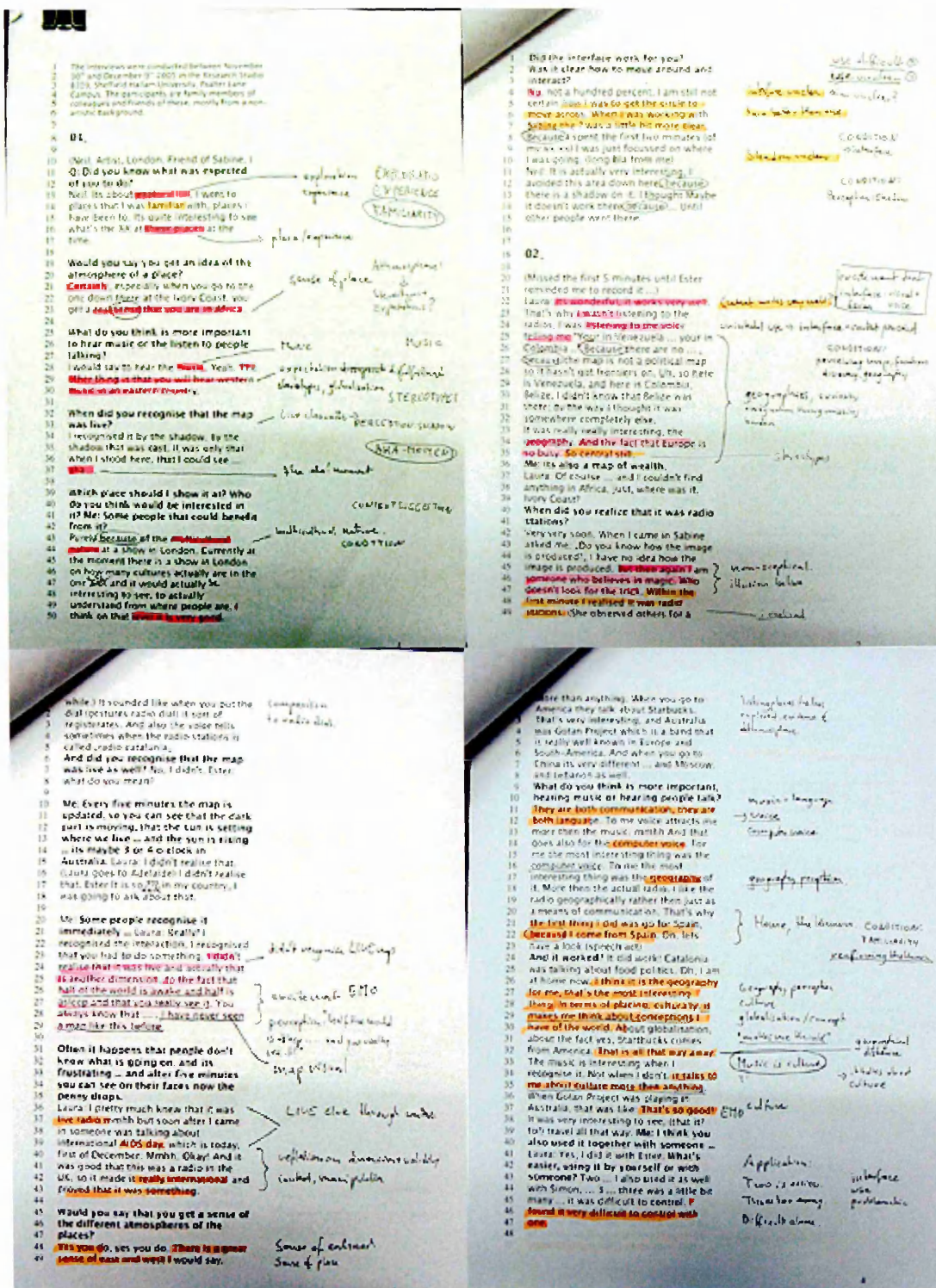


Figure 72: Four examples of coded pages from the Main Study interviews conducted at Sheffield Hallam University. The interviews are as well about 9500 words long, covering forty pages.

Appendix IV: Technical construction of interactive environment

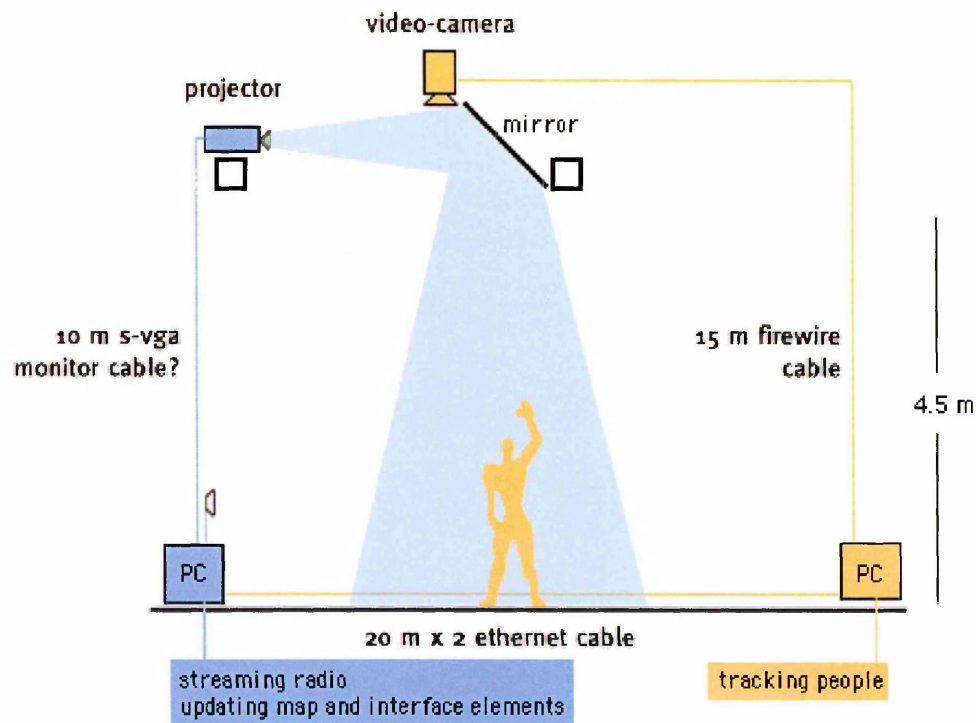


Figure 73: Technical set-up of the interactive environment: The video camera tracking the participants is connected to the PC with via firewire. The data is sent via TCP/IP to the second PC which is allocating people positions on the map, augmenting the ring interface, playing the radio streams and sending the output to the video projector.

Main Study: Studio Set-up

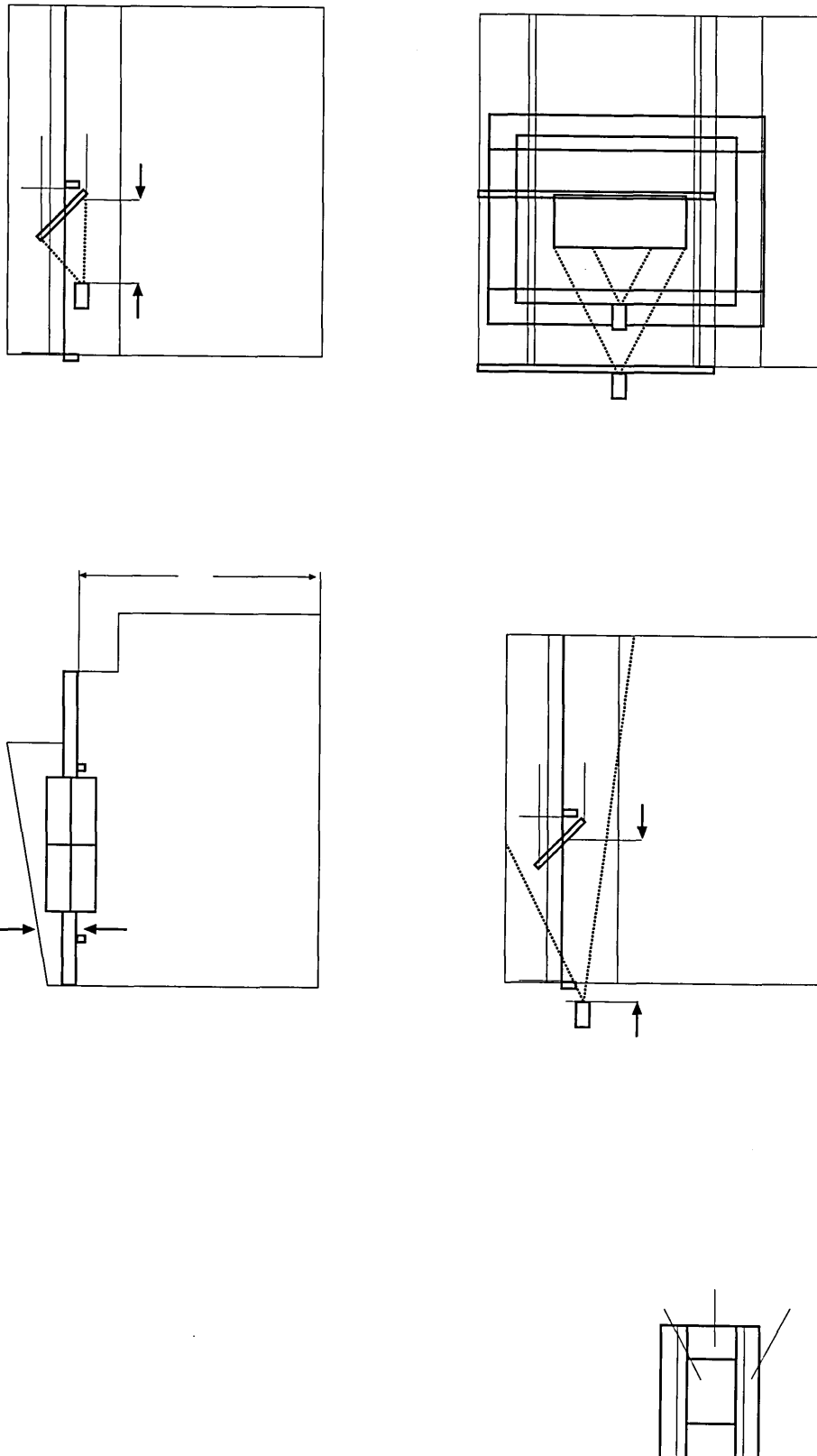


Figure 74: Setup of front surface mirror and projector distance at the Psalter Lane Studio, B309. There are two basic distances for the current mirror: Adapting height or adapting width. The map ratio is 2x1 as the mirror.

Appendix V: Secondary sources

sensory modality \ coding form		auditive	visual	
			static	dynamic
photographic	true to life	recorded original sounds	picture	film
	schematic / standardized	recorded artificially produced acoustic imitations	diagram, graphics	cartoons, animation
symbolic	verbal	recorded spoken text	written text	moving text
	non-verbal	recorded non-spoken acoustic symbols	non-spoken optical symbols	moving optical symbols

Figure 75: Sensory modality and coding form (Tulodziecki and Straka, 1997)

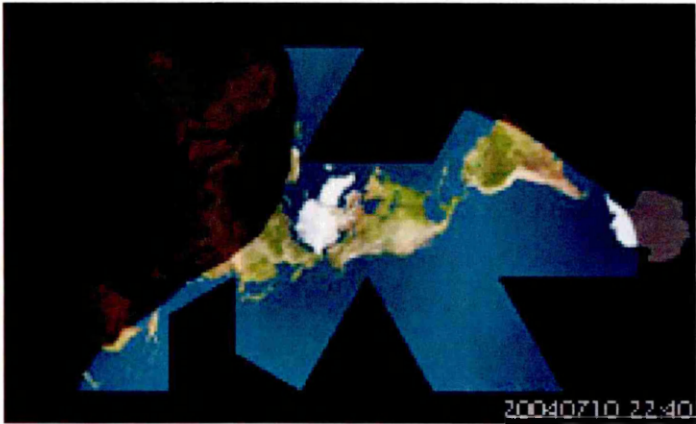


Figure 76: Buckminster Fuller's “Dymaxion World-map” in a simulated day and night view, without illuminated cities.

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3: Footnotes

1. The first symposium on "Non-visual & Multimodal Visualization" was organised by Keith Franklin and Jonathan Roberts from the University of Kent in 2004: <http://www.m2vis.org/2004/index.shtml> accessed June 27th 2006.

2. Dainton writes in his essay *Simulated Synesthesia*: "I want to explore effects as a means of **transforming** from one medium to another, from sounds in time to light in space and time. I am gaining to see a new role for these machines - helping us to reveal ourselves- not to impose ourselves on each other." (Emphasis by the author.) (Reichhardt, 1968, 43)

3. Ueda's 1999- work "Hole in the Earth" is only documented online at this time. Information is available at <http://www.ueda.nl/> accessed September, 14th 2006.

4. Stewart Brand interviewed by Joseph Corn, Stanford University, February 27, 2002. Accessed June 29th 2006 at http://shl.stanford.edu/Bucky/web_content/bucky_conversations.html the original quote is "Once a photograph of the earth is taken from outside the atmosphere, is available ... once the sheer isolation of the earth becomes plain; a new idea as powerful as any in history will be let loose." in Hoyle, Fred (1950), "The Nature of the Universe: A series of Broadcast Lectures," B. Blackwell, Oxford

5. Globes have a history back to roman times. In the English town of Bath is an ancient Roman Tympanum displaying a globe. Most notable are the large scale immersive spheres of the 19th century which the visitors viewed from inside, Delanglard's *Georama* from 1823 (Bruno, 2002, 161), and Wyld's *Great Globe* Model at Leicester Square from 1851 (Bruno, 2002, 162).

6. Documented comment during the "I Congress of the Association of Space Explorers," Cernay, France, October 2-6, 1985 by The Association of Space Explorers, Houston, Texas available at www.space-explorers.org/congress/congress1.html accessed September, 14 2006.

7. Taos Group's multidisciplinary members: Shinichi Takemura, cultural anthropologist and Associate Professor / Yoshiakio Nishimura, Teacher / Ichiro Higashiizumi, Art Director and President of a design office / Soichi Ueda, Television Director / Koichiro Eto, Artist and Designer / Yumiko Hanuki, Freelance Programmer / Pamela Virgilio, 2D/3D Designer and Translator / Tetsuya Ozaki, Editorial Director, Writer / Hiroyuki Ohno, Professor / Takuya Shimada, Programmer / Suguru

8. The main members of Taos Group included Shinichi Takemura, Ichiro Higashiizumi, Yoshiaki Nishimura, Soichi Ueda, Yumiko Haruk, Koichiro Eto, Takuya Shimada, Pamela Virgilio, Hiroyuki Ohno, Suguru Yamaguchi, Yasushi Watanabe and Tetsuya Ozaki.

9. These details from <http://www.sensorium.org/beware01/> accessed on June 27th, 02006

10. The documentation of the original version of the Global Wind Chimes Project can be found here <http://www.floweb.org/works/windchimes/index.html> while a current version is available here <http://www.floweb.org/beijing/> both accessed on June 1st, 02006.

11. <http://www.lukejerram.com> accessed March 29th, 02006

12. <http://lukejerram.com/installations/tide.htm> accessed March, 26th 02006

13. A whole range of tools that assist Veejay or Video Jockeys in creating live music and/or live visuals can be found at <http://www.audiovisualizers.com/toolshak/vjprgpix/softmain.htm> accessed December 8th, 2006.

14. "Free DSCOVER!" by Mitchell Anderson for Seed Magazine, September 18th, 2006 available at http://www.seedmagazine.com/news/2006/09/free_dscovr.php?page=all&p=y, accessed September 2006

15. Acousmatic sound or acousmatic space originate from Pythagoras who placed a black curtain between him and the audience when giving lectures so they would focus more on his words than on his appearance. Origin: *Akousma*, Greek,: "What is heard."

"Acousmatic sound is sound one hears without seeing their originating cause - an invisible sound source. Radio, phonograph and telephone, all which transmit sounds without showing their emitter are acousmatic media." (Chion, 1994)

16. This brings to mind that Mail art is still thriving today despite the success of the Internet and other technical media. Its material and physical qualities, affordability, collaborative nature and asynchronous global communication structure does also have telecommunication aspects. It tingles with the geographical distances of its distributed members. It is also possible to see mail art as a demonstrative gesture against technology, against the ease and speed of modern information exchange. It celebrates the unique artefact over digital replication and the daily round of the post-man over instant messaging technologies; patience and creativity are emphasised over the speed and ease.

17. We see what we want to see: Aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it deosn't mttatr in waht oredr the ltteers in a wrod are, the olny iprmoetnt tihng is taht the frist and lsat ltteer be at the rghit pclae. The text is the beginning of a letter that circulated on the Internet in September 2003. Cambridge researcher Matt Davis documented this at <http://www.mrc-cbu.cam.ac.uk/~mattd/Cmabrigde/> accessed on September 14th, 2006. Marvin Minsky's book "The society of mind" also touches upon these and similar issues.

18. Annie Dillard has the most vivid description of the process of selective perception in her 1974 book "Pilgrim at Tinker Creek" in which she describes her strategy to sneak

up to very shy muskrats until she was close enough she could touch them. She only moved when they looked into another direction and concludes that muskrats seem to be only able to “see” things that move..

19. Maturana’s writing is intricately connected to the work of hearing specialist Tomatis, pedagogue Jean Piaget and anthropologist Gregory Bateson where it concerns the influence of the environment upon physiological and psychological development.

20. A current example of what Heidegger described as the end of philosophy by scientific development: *“Dr Owen said: ‘We said to her, when you hear the word ‘tennis’, we want you to imagine being on the centre court of Wimbledon playing a big rally and every time the ball comes to you, you struggle to get it back. Then, we had a second scenario in which we wanted her to imagine going from room to room in her home. The two scenarios were chosen to trigger activity in different parts of her brain so they would be picked up by the scanner. While thinking about tennis, the scientists hoped to see a part of the brain called the premotor cortex, which governs limb movement, flicker into life. If she thought about walking around her flat, they expected to see a brain region called the parahippocampal gyrus, which handles mental maps of places, light up. During the scans, the scientists said the words “tennis,” “home” or “rest” every 30 seconds and looked for changes in her brain activity. Remarkably, after each word, her brain lit up as expected, suggesting she was responding to the instructions. Further tests showed her brain activity was indistinguishable from that of healthy volunteers doing the same task.”* Source: The Guardian, September 8th, 2006: Title: “For first time, doctors communicate with patient in persistent vegetative state” by Ian Sample

21. Jared Diamond has explained in detail this historical European attitude in “Guns, Germs and Steel” taking into account the hypothetical question why the Spaniards conquered Mexico and not vice versa.

22. “Joycean collage,” Ascott quoted by Frank Popper, source: The archive of The Western Front Society, Vancouver, Canada: <http://www.front.bc.ca/details.p?record=2393> accessed June 29th 2006.

23. Roy Ascott in an Interview with Sabine Breitsameter in January, 2003. At http://www.swr.de/swr2/audiohyperspace/engl_version/interview/ascott.html accessed June 29th 2006

24. Documentation of “Dialtones: A Telesymphony” is only available on the Internet at <http://www.flong.com/telesymphony/index.html> accessed September, 14th 2006.

25. Warburg writes: *“The forces of nature are no longer viewed from an anthropomorphic or biomorphic relationship, but as endless waves which obey the hand of man. The culture of the machine age destroys what the natural sciences, grown out of the mythos, have so clumsily achieved, the transformation of the space of meditation into the space of thought. (Denkraum) [...] Telegram and telephone destroy the cosmos. The mythical and the symbolic thinking create, in their fight for the spiritual connection between man and environment, that space for meditation or thought, which is murdered by the instantaneous electric connection.”* (Warburg, 1988, 59)

26. Examples for this type of unencumbered interaction upon a floor projection include the “T’Garden” system by Foam Brussels, “Loser Raum” by Anja Kempe, “Courses” by Alessandro Valli, “Pool System” by impressx.com among many others.