

Deliverable 1.2

Documentation and capturing methods for unstable media arts

1. Introduction

A. Objectives of this deliverable

In Deliverable 1.1 several approaches for the preservation of unstable media art have been outlined. In this Deliverable, V2_ proposes its own approach, coined 'capturing' (see chapter 2.3). After describing the scope of this term in chapter 2, we outline capturing strategies for different kinds of electronic art activities and their associated documentation in chapter 3. In chapter 4, V2_ proposes a formal modeling of essential aspects of electronic art activities, the Capturing Unstable Media Conceptual Model (CMCM). Chapter 5 outlines some general ideas on establishing and maintaining a digital media archive consisting of documentation; in chapter 6, research results from this Deliverable are summarized in a short list of recommendations.

For this research we selected eight different historical cases (electronic art projects, see table 1. below and Deliverable 1.4) from the V2_Archive plus two current case studies from the V2_Lab – the latter being the main case studies of this research project. With respect to the historical cases, we selected one project a year, to cover for the whole range of electronic art activities, which took place at V2for the period from 1993 till 2001. Because V2_ assigns a different theme to each year, the diversity in projects was guaranteed, varying from a robotic exhibition and performance (*The Ancestral Path*) to a piece of artistic software stored and distributed on a CD-ROM (OSS/***). See Deliverable 1.4 for further details on these projects and the methods of analysis and evaluation of documentation.

Year	Title	Creator
1993	Telematic Dreaming	Paul Sermon
1994	Terrain_01	Ulrike Gabriel and Bob O'Kane
1995	Bar Code Hotel	Perry Hoberman
1996	Anonymous Muttering	Knowbotic Research
1997	The Ancestral Path	Amorphic Robot Works
1998	OSS/***	JODI
1999	DataWolk Hoeksche Waard (DataCloud 1.0)*	Archined/AIR-Foundation
2000	Afasia	Marcel.li Antunez Roca
2001	Body Movies (Relational Architecture # 6)	Rafael Lozano-Hemmer
2002	whisper*	Thecla Schiphorst and Susan Kozel

* The main case studies for *Capturing Unstable Media* are indicated in **bold**.

Table 1. Case studies for *Capturing Unstable Media*

B. Practices of unstable media arts

In order to define the domain of research for *Capturing Unstable Media*, it is first essential to define the boundaries of unstable media arts activities. As demonstrated in Deliverable 1.1, unstable media arts are defined by the kind of practices institutions are involved in. Because of their dynamic, interdisciplinary and heterogeneous nature, projects in unstable media art are often not realized by one individual artist. Rather they are a collaborative team-effort

between artists, scientists, engineers and designers¹. Together, such teams realize artistic and cultural expressions within the larger context of research (themes), public performances, festivals or exhibitions².

Electronic art stands in a longer tradition of movements in modern and contemporary art, such as installation art, kinetic art, conceptual art and video art, which have produced artistic projects with a high level of technical complexity, involving a diverse range of activities, materials and media. Furthermore, unstable media art and its aRt&D practices are closely related to the practices of scientific research projects. The capturing of such practices, or components of them, calls for a different methodology than the documenting of more simple and static objects (like sculptures) for which standard description models already exist. Questions arise around defining which elements should be documented, described or preserved (in short: captured).

¹ Nigten, Anne. Human factors in artistic research and development in multi- and interdisciplinary collaborations. 2002. V2_Lab. 31 December 2003 <http://lab.v2.nl/home/_docs/nigten_2002_humanfactors.pdf>.

² Grau, Oliver. Database of Virtual Art. December 2003. Kunsthistorisches Seminar Humboldt Universität Berlin. 31 December 2003 < <http://www.arthist.hu-berlin.de/arthistd/mitarbli/og/database.htm>>.

2. Preservation Strategies for electronic art

A. Ethics of contemporary art

Traditionally, concepts of artworks and their documentation have been oriented on the material presence of artifacts, corresponding to static models of documentation³. In contemporary art, however, both the use of materials and the production techniques are extremely diverse. Artists may use any material, varying from stone and metal to plastics and highly transitory biological matter. Still, in a museum-related context the notion of 'original state' is still prevalent, focusing on preservation and/or reconstruction of an original:

*Reconstruction of modern art should – according to existing codes – be carried out as far as possible only in a reversible way, that is: without impairing or destroying the original material, nor the traces of its construction.*⁴

The conventional paradigm of preserving the artifact will not be effective for electronic works of art. Electronic art practices are ephemeral and variable, in the sense that the meaning of these practices may not be specifically tied to any one element or artifact, or it may lie in its inherent transformation or degradation. In this respect electronic arts are more close to forms of performance art or other forms time-based of art. A common preservation practice for these has been to save a canonical form of the work (score for a musical piece)⁵, together with audiovisual documentation of all stages and manifestations of the work⁶.

Unfortunately, canonical forms for electronic art have not yet been researched and developed. Although the Variable Media Initiative has designed a framework for the description of variable appearances of a work, together with the registration of acceptable variables within aspects of a work, these were not yet transposed into some kind of formalized, canonical form. If we recognize that this won't be accomplished in the near future either, ancillary materials that explain and contextualize the work become more important to preserve⁷. Here, we can learn from the problems conservators of installation art already have encountered⁸.

³ Berndes, Christiane. "New registration models suited to modern and contemporary art." *Modern Art: Who Cares? An Interdisciplinary Research Project and an International Symposium on the Conservation of Modern and Contemporary Art*. Ed. Ysbrand Hummelen and Dionne Sillé. Amsterdam: Stichting Behoud Moderne Kunst / Instituut Collectie Nederland, 1999.

⁴ Wetering, Ernst van de. "Conservation-restoration ethics and the problem of modern art." *Modern Art: Who Cares? An Interdisciplinary Research Project and an International Symposium on the Conservation of Modern and Contemporary Art*. Ed. Ysbrand Hummelen and Dionne Sillé. Amsterdam: Stichting Behoud Moderne Kunst / Instituut Collectie Nederland, 1999, 247-249.

⁵ Besser, Howard. *Longevity of Electronic Art*. February 2001. 31 December 2003
<<http://www.gseis.ucla.edu/~howard/Papers/elect-art-longevity.html>>.

⁶ Stringari, Carol. "Installations and the problems of preservation." *Modern Art: Who Cares? An Interdisciplinary Research Project and an International Symposium on the Conservation of Modern and Contemporary Art*. Ed. Ysbrand Hummelen and Dionne Sillé. Amsterdam: Stichting Behoud Moderne Kunst / Instituut Collectie Nederland, 1999, 277.

⁷ Besser, Howard. *Longevity of Electronic Art*. February 2001. 31 December 2003
<<http://www.gseis.ucla.edu/~howard/Papers/elect-art-longevity.html>>.

⁸ Stringari, Carol. "Installations and the problems of preservation." *Modern Art: Who Cares? An Interdisciplinary Research Project and an International Symposium on the Conservation of Modern and Contemporary Art*. Ed. Ysbrand Hummelen and Dionne Sillé. Amsterdam: Stichting Behoud Moderne Kunst / Instituut Collectie Nederland, 1999, 272.

First of all, the environments in which electronic art functions need to be well documented. Compared with other forms of modern art, electronic art often has an even more direct relation to the appearance and behavior of the work itself:

*Context and relation is crucial for understanding conceptual and intermedia arts collections which are comprised of multiple objects in one performance or combine documentation with artifacts to exhibit process over product.*⁹

Secondly, sketches, drawings and the original proposal written by an artist, are important in understanding the artist's intention. In order to preserve 'process over product', we need to develop more dynamic models of documentation, focusing on various forms of evidence of electronic art activities.

B. Electronic art activities

Electronic art activities often take place in dynamic, networked environments, which include all kinds of social interactions (human-to-machine, human-to-human and machine-to-machine). It follows on the modern art genres like installation art, with its physical properties and video art/performance art, with its time-based character. Its practices lie in a hybrid position between the physical art object and the artistic event. Apart from maybe snapshots and source codes, the only traces of electronic art are their documentation, produced with means external to themselves¹⁰.

As demonstrated in section 1.B these environments mostly do not come into being by a single artist's effort, but are rather produced within the context of (media arts) institutions. The interpretation of environments in which the artwork functions, depends largely on the culture and history of places where they are produced or the context in which it is presented. So, in order to capture electronic art activities, it is important to determine the institutions' involvement in these activities.

As Michael Naimark shows in his report on technology-based art¹¹, the new kind of 'technology-based' practices are largely supported by two different kinds of institutions: research labs with an interest in art and art centers with an interest in new technologies. V2_ is mentioned in this report as an example of the latter.

What are the practices these centers produce and the environments they present them in? As we will see in Deliverable 1.4 several electronic art practices V2_ has been involved in the last ten years, are (part of) long-term (research) projects. Projects often include an artistic research and development process in which several parties are involved. For example, *Body Movies (Relational Architecture #6)* by Rafael Lozano-Hemmer¹² is a part of a larger research trajectory by the artist, exploring the concept of relational architecture in public space. In collaboration with V2_, the artist realized the first manifestation of *Body Movies* in Rotterdam. More manifestation of *Body Movies* followed, e.g. one in Linz, Austria.

In projects like *Body Movies*, technology is used as a tool or a facility to build or produce the artistic concept. The artist directs the process and team members bring in their expertise

⁹ *Archiving the Avant Garde*. December 2003. Berkeley Art Museum & Pacific Film Archive. 31 December 2003 <http://www.bampfa.berkeley.edu/about_bampfa/avant_garde.html>.

¹⁰ Depocas, Alain. *Digital Preservation: Recording the Recoding*. 2001. Ars Electronica Festival. 31 December 2003 <http://www.aec.at/festival2001/texte/depocas_e.html>.

¹¹ Naimark, Michael. *Truth, Beauty, Freedom and Money: Technology-Based Art and the Dynamics of Sustainability*. May 2003. 31 December 2003 <<http://www.artslab.net/>>.

¹² See Deliverable 1.4 for an elaboration on this case.

from different backgrounds¹³. Other projects are more oriented on interdisciplinary experimentation and innovation, like *DataCloud 2.0*¹⁴. Here, technology no longer serves solely as a vehicle for artistic thought, but becomes an important element of the concept, while the concept is the drive to develop or adjust the technology. *DataCloud 2.0* is a collaborative team effort, where different disciplines (from the arts, design, engineering, science) bring in crucial conceptual aspects and research objectives from their own field of expertise, focusing on experiment, rather than on a predefined final product.

The abovementioned aRt&D projects result in different outcomes, which are disseminated in different ways. In the case of *Body Movies (Relational Architecture #6)*, the theoretical background of 'relational architecture' is disseminated in a publication and the experience of this new kind of architecture is shaped through the *Body Movies* installations on different locations, through interaction with users or an audience. So, one could argue that *Body Movies* results in different artistic forms, like a publication, workshops and several public installations with different associated performances. These forms or manifestations depend on the context in which they are produced (research theme / exhibition / festival) and the environments in which they are presented (public performance / workshop).

DataCloud has also been operational in several contexts¹⁵. First, the project has resulted in 3D applications – a simple demonstrator and a more developed prototype – that were presented on-line, in workshops and during expert meetings. The project's research findings have been disseminated – apart from these workshops – through a project website and scientific papers. All these different activities are part of the same project. The challenge was to find a temporal logic in this inherent variability and to distinguish the successive stages in electronic art projects. First, all activities are initiated by a concept. Most projects include a research and development period, where the concept is taken into practice(s) in a development process. Finally, these realized practices are implemented in an environment, for example a web environment, a public performance or in a physical installation, where interaction between users and the work becomes possible.

Each of these stages is associated with different actors. For example, several artists and producers can be involved in the conceptualization of a project. Others participate in the research and development of the project, ranging from visual designers to interaction designers and software developers, so that we can speak of distributed authorship (see Deliverable 1.3, section on distributed authorship). Technical designers and production managers are more involved with the implementation of a project. Eventually, the project is ready to be disseminated by users, who actively participate in and interact with the environment. These stages were used as a first, rough, division and formed the basis of a more precise distinction of phases in the process of electronic art (**research, development and implementation**, see next chapter)

C. Capturing unstable media

As demonstrated in paragraph 2.1, long standing preservation techniques developed for physical artifacts cannot cover for the problem of preserving electronic art activities. According to Jon Ippolito¹⁶, when preserving and re-presenting media-based works of art, we should give up the notion of a single, authentic object and rather view these works as processes or sets of instructions, functioning in a specific environment. So, instead of

¹³ Anne Nigten calls this 'multidisciplinary collaboration model'. See Nigten, Anne. *Human factors in artistic research and development in multi- and interdisciplinary collaborations*. 2002. V2_Lab. 31 December 2003 <http://lab.v2.nl/home/_docs/nigten_2002_humanfactors.pdf>.

¹⁴ See Deliverable 1.4 for more information on the DataClouds.

¹⁵ See Appendix 2, Report of interviews for the DataClouds.

¹⁶ Interview with Jon Ippolito at V2_, August 2003.

focusing on precious originals created by a single artist's genius, we need to explore new paths of preservation, taking into account complex issues like distributed authorship, the interaction of users and keeping the essential aspects of electronic art activities accessible.

Addressing the preservation and long-term access issues for digital resources is one of the key challenges for capturing unstable media. Digital works cannot be allowed to wait for even a few years while solutions are found, due to the extremely compressed obsolescence rate and fragile nature of digital media formats¹⁷. Already, the fields of information science and digital archiving have developed several techniques to preserve digital information objects¹⁸. The three main techniques are static preservation, migration, and emulation (see Glossary for definitions of these techniques).

However, the art community cannot rely entirely on these techniques alone to solve the problem of preserving digital information, as unstable media art implies specific problems distinct from many other types of digital information like preserving the context and physical components in which the information functions and describing its hard- and software dependencies and interactions. The preservation of actual works is outside the scope of this research. As demonstrated in Deliverable 1.1, the arts are developing abstract models to cover for electronic art activities and its complex preservation problems, often depending on the institutional goals, interests and assignments (collection building, archival) and combining one or more of the above techniques, together with additional approaches, like metadata-schema's, documentation and/or contextualization. In section 4 of deliverable 1.1, the three main strategies for preservation of electronic art were already outlined. All of these strategies, though they propose different technical solutions, seem to agree on one tactic; collect as much original documentation as possible.

In the context of the research project *Capturing Unstable Media* V2_ has researched a number of specific metadata aspects of electronic art activities, to cover for the whole range of practices in this field. It provides for an abstract framework to integrate the overall description of the activities' history with a precise description and documentation of their specific components and problematic aspects. **Capturing** means assembling all necessary information on a project and its subordinate aspects, structuring this information in such a way that it gives a good impression of the different manifestations of the project and keeping the resulting metadata blueprints of the electronic art activities accessible for future research.

3. Capturing Strategies for electronic art

A. Typology of essential electronic art aspects

Typologies are often colored by institutional paradigms. The Variable Media Initiative (VMI) typology, for example, falls back on visual arts and the moving image paradigm of its participating institutions (like the Guggenheim Museum)¹⁹. V2_'s perspective on unstable media art is more art-technology inspired and is partly related to Wilson's conception of

¹⁷ Rinehart, Richard. *The Straw that Broke the Museum's Back? Collecting and Preserving Digital Media Art Works for the Next Century*. 14 June 2000. Switch 14. 31 December 2003 <http://switch.sjsu.edu/~switch/nextswitch/switch_engine/front/front.php?artc=233>.

¹⁸ See for example: Rothenberg, Jeff. "Ensuring the Longevity of Digital Documents." *Scientific American*, Vol. 272 nr. 1, January 1995: 42-47.

¹⁹ Hanhardt, John in "The Challenge of Variable Media.", p. 8: "*The Variable Media Network has its roots in the Guggenheim Film and Media Arts Program, which sees the histories of film and the media arts as fundamental to understanding the visual culture of the 20th and 21st centuries. The program's goal is to engage the museum as a critical and intellectual space able to embrace diverse histories of the moving image while responding to new developments within artistic practice globally*"

'information arts', balancing in the intersections of art, science and technology²⁰. It sees the history of art that makes use of electronics, especially digital or unstable media, as fundamental for exploring the meaning, the specificity and the boundaries of these media and it sees instability as a creative force which is fundamental to the continuous reorganization of the social, cultural, political and economic relations in our society.

Like the Variable Media Initiative, V2_ is interested in exploring the different visual manifestations of an artwork over the course of time, resulting in different implementations or displays. However, different from VMI, the primary goal of this research project is not to "embrace diverse histories of the moving image while responding to new developments within artistic practice globally"²¹, but rather to develop an appropriate capturing model for electronic art, as shown or (co) produced at V2_ in the last two decades. The projects selected for analysis are characterized by their interdisciplinary nature. They not only explore and settle new (visual) worlds of representation, but also involve technologies that manipulate physical things, for example: robotics, nanotechnology, biotechnology. These technologies will be increasingly important and point towards futures when technologically mediated material things have increasing importance²².

Analysis

For analyzing the projects from the V2_Archive and the two case studies, we reused a set of attributes, components and behaviors of variable media, as distinguished in the Variable Media Questionnaire (see section 4 of Deliverable 1.1). After applying these on the projects, we identified lacking components or essential aspects that were not covered. Each analyzed project provided new concepts and insights for the typology. In Deliverable 1.4 the methods of analysis are explained in more detail. Definitions for all concepts derived from the analysis can be found in the glossary.

We started analyzing the so-called 'interactive installations'²³, which vary strongly from case to case. Some installations focus on the technically innovative aspects, for example the use of an ISDN fiber-optic **network** for (video) data transmission in *Telematic Dreaming*, or the translation of brainwaves into light signals to steer solar robots in *Terrain_01*. Others are more concerned with exploring the artistic possibilities of interaction, like the interplay of shadows from passers-by in *Body Movies* or the way people can turn a black-and-white bar code world into a colorful three-dimensional space full of wondrous objects by scanning bar codes (*Bar Code Hotel*). In the latter, the technology is mainly used as a tool or a facility to build or produce the artistic **concept**. What these projects all have in common is that they explore new ways of **interaction** and communication. However, this essential aspect and the experience it provokes, is not covered in current documentation.

²⁰ Wilson, Stephen. *Information Arts: Intersections of Art, Science and Technology*. Cambridge, Mass.: MIT Press, 2002, 11-18. 'Art that is emerging from the information society and is inspired by scientific and technological research.' In its activities, V2_ focuses on the intersections and overlap between technology, research, society and art, where art itself is often not emphasized.

²¹ Hanhardt, John. "The Challenge of Variable Media." *Permanence through Change: The Variable Media Approach*. Ed. Alain Depocas, John Ippolito and Caitlin Jones. New York / Montréal: Guggenheim Museum Publications and The Daniel Langlois Foundation for Art, Science, and Technology, 2002. 31 December 2003 <<http://www.variablemedia.net/pdf/Hanhardt.pdf>>

²² Wilson, Stephen. *Information Arts: Intersections of Art, Science and Technology*. Cambridge, Mass.: MIT Press, 2002, 24.

²³ See Fauconnier, Sandra, Anne Nigten and Boudewijn Ridder: *V2_Archive: Archive of living actualities*. 2001. V2_Organisation. 31 December 2003 <http://lab.v2.nl/home/_docs/v2_archive.pdf> for a description of the so-called *classes* that were used as typology labels in V2_Archive's older metadata system.

Analyzing artistic (internet) applications, like the *DataCloud*, or OSS/**** provided other concepts, covering the essential aspects of computer systems, like system or screen **configurations**, software obsolescence and hard- and software dependencies. The *DataCloud*, for example, is a three-tier database application (see appendix2). This means we need to distinguish between **browser** type, **plug-ins** used for the application and the **database software** that retrieves the actual **artistic content**. For OSS/****, an application stored on a CD-Rom, programmed to hack into a client's operating system, metadata on concepts like **operating system** and the **computer hardware** necessary to run it, were incorporated in the model.

Another interesting set of projects is the category of co-called robotic performances/exhibitions²⁴. Some of these projects are mainly installed (*The Ancestral Path*) while others are more performed, either by the artist (*Afasia*) or the public (*whisper*). The most important feature these projects have in common, is the **physical space** in which the project takes place or is bound into. For *The Ancestral Path* this means not only documenting the whole set of exhibited robots (**electrical appliance**), but also the 'amorphic landscape' in which they move around (the **installation design**) and the interplay between them. Things get even more complicated with *Afasia* and *whisper*, where interplay between man, machine and software provokes some kind of projected narrative. Here, the whole system of machines, apparatus, audio and real-time rendered visuals that were set up for an aesthetic experience in a specific environment, needs to be covered.

A last series of observations and concepts was inspired by some elusive projects dealing with issues of sensorial **input and output** of a computer system (*Anonymous Muttering*, *whisper*) and dispersed (inter)communications (*Telematic Dreaming*). The latter is an early example of an art project exploring the possibilities of real-time visual communication between two people on different locations. *Anonymous Muttering* also experiments with data-streams (3D sound, light) distributed over **dispersed locations** (internet, discotheque and the roof of the Dutch Architecture Institute) and actors, but with different **interfaces** (web interface, physical installation, silicon membrane interface) attached to them. Like *whisper*, it uses an **input device** (the membrane interface) to feed data (sensorial signals) into a central **computer**, which is then converted into other signals and re/presented by some kind of **output device** (speaker, light bulbs). *whisper* even experiments with a combination of both (input and output device); participants wear a data suit to communicate with each other²⁵. For *Anonymous Muttering* and *Telematic Dreaming*, the activities on the different locations need to be documented, as well as its **systems design**, whereas for *whisper* the development and use of its **input/output device** need to be captured, as well as the light-output on the data-suits and the **moving image** projected on the floor.

As demonstrated above, a typology for aspects of electronic art needs to cover a wide range of concepts. On the basis of the analysis of the case studies (Deliverable 1.4), we defined as many concepts as possible, focusing not so much on the reconstruction and display of a finalized artwork, but rather on several manifestations in a line of work, all possible components of these manifestations and the interplay of these components. The manifestations of the projects themselves are often the result of a longer research trajectory combining various artistic and scientific disciplines. Unstable media arts are also situational. Projects are highly influenced by the culture and history of the places where they are produced²⁶, or by the environment in which they are shown, and may change over time,

²⁴ Ibidem.

²⁵ For further explanation, see appendix 1, *Interview Stock on case study whisper*.

²⁶ In his report on media labs for Leonardo Journal, Michael Naimark states that this new kind of technology-based art is largely supported by two different kinds of institutions: art centers with an interest in new technologies (V2_ is mentioned as an example) and research labs with an interest in

depending on several factors, like the technological progress which is made as a result of testing the work or the interactive aspects that are deliberately incorporated in the work, causing the work to be modified by its users.

B. Documentation strategies for electronic art activities

As demonstrated in chapter 2, V2_ has no interest in collecting electronic art works or pieces of works; the notion of capturing should be considered complementary to the museum-based tradition of preserving art objects. Instead of describing unstable media art in a medium-independent way, like Variable Media does, this research focuses on the (mediatized) environments in which an electronic art activity functions. When the focus shifts from product to process and we separate the activity from its technical and social environment, "we should find ways to describe that environment in ways that allows future viewers to better understand the work itself" (Rinehart, p. 4). Assembling proper and extensive documentation on both environment and activity, and system and interaction is a move in the right direction.

Already, the design of the V2_Archive database gives a first impetus to such a strategy. A large amount of information on electronic art activities is present at V2_, whether in this database or as physical archive items in suspension files. By means of the object-relational structure of the database, the projects are surrounded by a number of contextual information objects, such as texts, actors and related events²⁷.

The first method for assembling proper documentation, was to examine the available documentation for each analyzed case (see Deliverable 1.4), and then to determine if these provided for a good reflection of each case and all its discernable aspects. The cases were studied from the broadest perspective (including their social environment, development stages etc.) to the lowest meaningful level of detail (such as technical environment and network specifications). See Deliverable 1.4 for further details on methods of analysis and the evaluation of available documentation.

This analysis resulted in a series of general observations.

- Electronic art projects are often part of a larger entity or process (festival, exhibition or a research and development trajectory).
- Electronic art projects often include a number of practices, activities, tools and components.
- Electronic art projects often consist of successive stages, realized by different actors.
- There is a lack of documentation on the interplay between components and on hardware and software dependencies.
- There is a lack of standard terminology for practices, activities and components in electronic art and for the types and genres of documentation that describes those.

Through these observations, activities in the field of electronic art can be subdivided in various **phases**; including (1) A **research phase**, in which the draft of concept for a project, research of required know-how, the design and first conceptual developments of the project take place; (2) the **development phase**, in which the actual hardware and software development takes place and its outcomes are tested and put together in a specific configuration or set-up; (3) the **implementation phase**, in which the results of research and development are implemented in a specific environment, and finally the project is installed as

art. See Naimark, Michael. *Truth, Beauty, Freedom and Money: Technology-Based Art and the Dynamics of Sustainability*. May 2003. 31 December 2003 <<http://www.artslab.net/>>.

²⁷ Fauconnier, Sandra, Anne Nigten and Boudewijn Ridder: *V2_Archive: Archive of living actualities*. 2001. V2_Organisation. 31 December 2003

a whole. Implementation enables users to interact with the constructed environment. Each of these phases is associated with different types of documentation.

For our approach, we identify the appropriate documentation through which different phases can be covered, depending on level of interest and level of detail of the institution/archival department responsible for capturing. We then identify the documentation strategies accordingly.

(1) Documenting the aRt&D process

An aRt&D process generates different kinds of documentation, depending on the kind of goals and collaborations.

In a multidisciplinary, directive aRt&D process²⁸, the artist's concept is of central concern, outlining the directives to be realized by the team-members. Technology is often used as a tool or a facility to build or produce the artistic concept. Although there can be small innovative aspects included in the project, it is not the main purpose. Documenting this process means documenting the initial conceptual drafts, the design-documents which report technological (im)possibilities in realizing the initial idea and mapping the changes the pre-defined final product underwent as a result of this.

In an interdisciplinary, experimental process²⁹, the development process itself is most important, intertwining artistic concepts with specific research objectives from different fields of expertise. The technology becomes an important element of the concept, while the concept is the drive to develop or adjust the technology.

Documenting this process means mapping the conceptual aspects and research objectives from the different fields involved in the process, documenting the flow of technical experimentation and innovation, and charting the technical implications of the results of research.

(2) Documenting implementation

The electronic art practices that evolve out of the aRt&D process, often include 'original' artistic material, set up in a specific technical and physical environment. Therefore, the technical specifications of software, hardware and network configurations need to be documented, as well as the technical specifications of the physical environment in which the electronic art practice functions. Documentation of this phase would also include the actual construction of the physical environment and the artistic material in this environment.

(3) Documenting interplay between components and hardware/software dependencies

The essence of electronic art lays in the interplay between physical and digital components of the artwork. Yet, no all-compassing method of documenting exists. So, it implies the tedious task of mapping possible dependencies and relations between different components of a specific set-up. Therefore, we would need to identify special metadata on these dependencies and relations and possible interactions with them.

(4) Documenting user interaction

A cultural artifact only obtains meaning when it is perceived by someone. In electronic art, this role of audiences or users becomes ever so important, because users are often able to

²⁸ Anne Nigten calls this a 'multidisciplinary collaboration model' in Nigten, Anne. *Human factors in artistic research and development in multi- and interdisciplinary collaborations*. 2002. V2_Lab. 31 December 2003 <http://lab.v2.nl/home/_docs/nigten_2002_humanfactors.pdf>.

²⁹ Anne Nigten calls this an 'interdisciplinary collaboration model' (ibidem).

(physically) act within an electronic art environment – the so-called user interaction. Within a certain set of possibilities (as described in 3), this experience is ever-changing and subjective and can be captured at least partially by recording the intercommunications between users. Documentation in the form of registrations, like video recordings, provide for at least subjective documentation of the experience of the project. However, more research needs to be done in this direction; appropriate models can especially be found in the social sciences, where methods or standards for registering social behavior and intercommunications between humans and machines are under development³⁰.

(5) Mapping documentation with activities

As part of the in-depth analysis of the two main case studies for *Capturing Unstable Media*, V2_ has thoroughly researched the whole range of documentation that is generated as a byproduct of long-term research projects like *DataCloud* and *whisper*. Both have generated large amounts of data and documentation, some of which is accessible on the project sites, but most of which is stored in multi-user file-versioning systems (CVS) and back-end project sites³¹. The way such bulks of information are structured depends on **method of research** and the **different phases** in the process associated with this documentation (research and development, implementation).

The *whisper* project consists of a number of intertwined research and test activities, each of which has produced several information resources (drawings, questionnaires, images etc.). There is no well-defined research objective, but rather a series of experimental research activities, producing data and resulting in documentation. For example, a workshop on the subject of experience modeling addressed a simple research question and generated data. Eventually, those led to a concrete project result (in the case of *whisper*: a performance). As a consequence, to capture the project, we would need to document (the results of) each activity in the research trajectory.

Although the *DataCloud* project is also part of a larger research theme (data visualization), the different versions of *DataCloud* are better defined than is the case for *whisper*. So, they need to be captured as separate projects, documenting the different stages for each these projects. *DataCloud* 2.0 and 2.5 both use a file versioning system for multi-user development (CVS) to keep project data up-to-date (like sources, resources and libraries). The databases of the applications themselves are stored on different (server) locations. The technology is an important element of each version's concept, while the concept is the drive to develop or adjust the technology. Capturing *DataCloud* therefore implies identifying the different components of each version, describing the different stages of the project³² and mapping its documentation accordingly.³³

In short: after the identification of different components and activities of each project (see the analysis of section 3.A), we researched the associated documentation and tried to distinguish various documentation types and genres. Ultimately, this led to recommendations for their use of capturing essential aspects of unstable media art (see chapter 4). Definitions of types (in **bold**) and genres (in **bold and italic**) can be found in the glossary, typical examples are included as appendices to this Deliverable.

Analysis

³⁰ Dirk Heylen, *MultiModal Interaction*, a talk given at V2_, November 6th 2003. See the general appendix with reports of the advisory board meetings.

³¹ See Appendix 1 and 2, Interviews on Case Studies

³² See Deliverable 1.4 for a detailed description of each of the *DataCloud* versions.

³³ See Deliverable 1.4, Appendix 1 and Appendix 2 for references of documentation pieces.

The research of *whisper* started with its initial concept, written down as **physical text** in a **project proposal**³⁴. The first residency period of *whisper* in the V2_Lab focused on conceptual design, meaning the design of wearable devices and user interaction, as documented in a **hybrid research report**³⁵ with images, texts etc. and the design of the system as a whole (**deployment diagram**³⁶). Next, more detailed technical components were developed and designed, like the application software for the particle system (**source code**) and its bluetooth wireless network (outlined in a **wiring diagram**³⁷).

Between the first (June - July 2002) and second (January - February 2003) residency period of *whisper* several experience modeling workshops took place in Canada. These were not part of V2_'s collaboration and are therefore not covered in this research project – although the research findings of *Capturing Unstable Media* include recommendations on interoperability between complementary archives (see Deliverable 2.1). The second residency period focused on development and implementation of the hardware, software and physical installation components for the public performance during DEAF03. The physical properties of the installation space were mapped by a space **plan**³⁸ and in **sketches**³⁹. The required wireless network was set-up, together with the sensors, documented by **installation instructions**⁴⁰ and a **circuit diagram**⁴¹. Finally, the lighting, visual and audio systems were implemented (also in **installation instructions**⁴²). The resulting public performance during DEAF03 and its associated components (like garments, projected visual pools, audio and interaction between participants) were respectively documented with **photographs**⁴³ and a **digital video report**⁴⁴.

Documenting the *DataClouds* is even more complex. As demonstrated in Appendix 2, the first version of the DataCloud (*DataWolk Hoeksche Waard*) initially started as part of the *AIR-Southbound* manifestation. After a research and development period for the software (see **source code**⁴⁵) and the interaction design, which is documented in a **walkthrough**⁴⁶ and an interaction **scheme**⁴⁷, the first demonstrator of the project (with as only remaining trace a **screenshot**⁴⁸) was presented in a special workshop (22 November 1998). It took another seven months to get a working Internet application of the *DataWolk Hoeksche Waard* online. This prototype is documented by **installation instructions**⁴⁹ and the companion user interface by some **screenshots**⁵⁰. The Data Collection used for this application is almost entirely lost, only a few screenshots of media objects have survived. In November 2000, *DataWolk Hoeksche Waard* was awarded the Millennium Prize. With the prize money, version 2.0 of the DataCloud was developed.

³⁴ whisper documentation, documentation piece 1

³⁵ whisper documentation, documentation piece 2

³⁶ See appendix 3, whisper documentation, documentation piece 8

³⁷ See appendix 3, whisper documentation, documentation piece 9

³⁸ See appendix 3, whisper documentation, documentation piece 16

³⁹ See appendix 3, whisper documentation, documentation piece 22

⁴⁰ whisper documentation, documentation piece 24

⁴¹ See appendix 3, whisper documentation, documentation piece 13

⁴² whisper documentation, documentation piece 19, 20 and 21

⁴³ whisper documentation, documentation piece 4, 14 and 15

⁴⁴ See appendix 3, whisper documentation, documentation piece 25

⁴⁵ DataCloud documentation, documentation piece 2

⁴⁶ documentation, documentation piece 3

⁴⁷ DataCloud documentation, documentation piece 4

⁴⁸ See appendix 4, DataCloud documentation, documentation piece 5

⁴⁹ DataCloud documentation, documentation piece 11

⁵⁰ See appendix 4, DataCloud documentation, documentation piece 12

One of the objectives for *DataCloud 2.0*, as described in the project **proposal**⁵¹, was improving the user interface and the database design. To realize this objective, navigation through a 3D data environment was thoroughly researched (see **research resources**⁵²), together with interaction design issues. First, the functional requirements and the behavior of the DataCloud were determined in **use case scenarios**⁵³. After that, the graphics were designed and the texts and actions for the scenarios were written. The whole interaction design process is summarized in a **research report**⁵⁴. At the same time the database architecture was improved (represented in a **block diagram**⁵⁵). The intermediate results of the research were presented on an expert meeting on *DataClouds* and the related theme of 'mapping' (30 August. 2001). A preview of the 2.0 version of the application was also presented (see **meeting report**⁵⁶). Following on this meeting, the research project *Genetics of the Wild City*⁵⁷ was presented in a special program at V2_⁵⁸. This project provided for the content of *DataCloud 2.0*.

The *DataCloud* team had long been looking for an interesting collection of complex media objects that would fit the needs of *DataCloud 2.0*. *Genetics of the Wild City* by Stealth Group offered a collection of interrelated data of different types. The project mapped transformations of the city of Belgrade (YU) with a bulk of materials, like photographs, 3D maps, rendered sketches etc. (documented in a **presentation**⁵⁹). On the basis of these different media types and thematic sections, the material was mapped into the *DataCloud 2.0*. Eventually, only a small number of objects (**photographs** and a **database**⁶⁰) were implemented in the DataCloud. This data collection is an essential aspect for capturing *DataCloud 2.0*.

On 14 august 2002, a demonstrator of *DataCloud 2.0* was presented in a workshop on the International Symposium for Emoção Art.ficial in São Paulo, Brazil. The sources of this demonstrator are stored in CVS on an internal server at V2_⁶¹.

Documentation of *whisper* and *DataCloud* has shown that for capturing, institutions need to decide on the level of detail in documenting a project (how extensive should the documentation be?) and on the point of interest in a specific project (which stages, versions or aspects need to be documented?). During the research it also became clear that there is much confusion on which types and genres of documentation exist. There is a lack of standard terminology and a need for standardized definitions. Only then we can address how this documentation can be put to good use in the context of capturing unstable media art.

⁵¹ DataCloud documentation, documentation piece 17

⁵² DataCloud documentation, documentation piece 18

⁵³ DataCloud documentation, documentation piece 21

⁵⁴ DataCloud documentation, documentation piece 20

⁵⁵ DataCloud documentation, documentation piece 23

⁵⁶ DataCloud documentation, documentation piece 27

⁵⁷ See Appendix 2: interview with Stealth Group

⁵⁸ This program was Wiretap 7.8; <http://framework.v2.nl/archive/archive/node/event/default.py/nodenr-125478>

⁵⁹ See appendix 4, DataCloud documentation, documentation piece 15

⁶⁰ DataCloud documentation, documentation piece 16

⁶¹ Documentation piece 24. cvs://pancreas.v2.nl/

4. Capturing Unstable Media Conceptual Model

A. Background

As part of the proposed capturing strategy in this research project, V2_Archive has researched the possibilities for formal modeling of the essential aspects of activities in the field of electronic art. How is it possible to describe such an activity in a generic way, by using a structure of typical concepts? For this purpose, the Capturing Unstable Media Conceptual Model (CMCM) was created.

The two case studies of this research project – DataCloud and whisper – together with a number of selected projects from V2_'s archive, were used as inspiration for building this conceptual model. The cases were studied from the broadest perspective to the lowest meaningful level of detail; the concepts that were encountered during this study were incorporated as classes in the conceptual model. For more information about the case studies, refer to Deliverable 1.4 – Content research.

The CMCM is designed as an ontology (for the definition of an ontology, see the glossary), with a multihierarchical and object-oriented structure of interrelated concepts or classes (described below). The choice for an ontology, rather than another abstract information structure such as a topic map, was made because of the following considerations:

- The capturing model needs to be a standardized instrument that can be used by a wide variety of actors and institutions. For ontologies, various markup standards exist, such as the older DAML + OIL or the newer OWL; these are open, W3C-supported markup standards.
- The capturing model needs to accommodate a fine meshwork of interrelations and dependencies between concepts or classes; for this purpose, an ontology is especially suitable.
- The model also needs to be an instrument for enabling archival interoperability between institutions (see further and Deliverable 2.1).

B. Purpose of the CMCM

The CMCM is designed as an abstract reference model for outlining the different (levels of) concepts through which the activities in the field of electronic media art can be captured. These activities may be as varied as long-term international research projects and specific, short-lived artworks, R&D activities and pieces of hardware, workshops and user interfaces.

The ontology is not intended to be used as the fundament of a database structure; it can exist independently from the varied metadata and database systems that are used at various electronic media art institutions throughout the world. Rather, the CMCM may function as an independent reference framework, useable as a basis for interoperability, where each institution can map its individual concepts in its database structure to the corresponding concepts in the model. Not every concept in the CMCM needs to be included in an individual institution's data model; the choice of concepts depends on the institution's profile. Some institutions might focus on the description of technical details within R&D projects or artists' works, while others may emphasize the description of larger contextualization of projects, activities and actors.

For more information about the interoperability-related possibilities of the CMCM, please refer to Deliverable 2.1.

The CMCM tries to act as an umbrella for all these possible activities and approaches, covering all levels of detail – from long-term projects to specific physical, technical and design components of a work.

Apart from this, the model focuses on several specific problematic aspects in the area of capturing unstable media. The following aspects of the model result from research conducted by V2_Archive in 2003.

- The CMCM includes an extended system for integrating and interrelating relevant **documentation** of each activity in the field. V2_Archive's research project *Capturing Unstable Media* uses this model with activities and documentation as the basis for researching the quality and usability of various types and genres of documentation. V2_Archive will outline recommendations for generating and archiving appropriate documentation for several levels and aspects of the activities in the field of electronic media art; for an overview of documentation genres for appropriate captured aspects of a project, refer to Chapter ... of this Deliverable.
- The CMCM includes a system for describing **user interaction** with specific aspects of the activity in electronic media art. User interaction with works and activities is experimentally described through various metadata related to time, place, sensory input and level and extent of interaction. Thus, a series of abstract interaction models are created, which makes it easier to compare user interaction of different pieces and activities, with (expectedly) often surprising results.
- Finally, the CMCM tries to deal with the complex issue of **interdisciplinary, distributed authorship** in the field of unstable media art, by defining the roles of all involved actors as related to the specific aspects of each activities. This creates a more complex, horizontal and interdisciplinary meshwork of involvement, rather than a rigid list of credits with inherent hierarchy.

The problematic aspects of user interaction and distributed authorship were dealt with from a metadata perspective; more information about the research done in this area can be found in Deliverable 1.3 (Chapter 4. Distributed authorship, and Chapter 6. Metadata for interaction).

The CMCM emphasizes the interdisciplinary, international, trans-institutional and process-based nature of the activities in the field of electronic media art, as a necessary addition to the object-focused approach that is still prevalent in the art and museum field.

C. Terminology

For a further explanation of the specific terms used in the CMCM, check the glossary.

We never use the terms 'artwork' or 'work' in the CMCM because

- the model should be applicable to a wide range of activities in the field of electronic media art and research, not only to the description and contextualization of specific works by artists. Activities like research and development trajectories, workshops and seminars, publications, performances and works can thus be applied into the model at an equal level.
- the term "work" refers too much to a traditional artistic approach, where a cultural product is valued by its artistic merit and considered as a static, unchangeable entity. The CMCM wants to avoid this connotation.

Also, the hyped term 'interactivity' is not used in the model and avoided in the discussions related to the research project *Capturing Unstable Media*. Instead, the terms 'interaction' and 'user interaction' are used because these are more neutral. See also Deliverable 1.3, chapter 6, for an overview of theoretical background and metadata research on user interaction.

D. Structure

The CMCM offers a series of basic concepts that are of interest to the activities in the field of electronic media art, along with suggestions on how these concepts could interrelate with each other. An interactive overview of the concepts can be consulted in the HTML export of the CMCM ontology⁶².

As is usually the case with an ontology, the structure of concepts is multihierarchical and object-oriented – meaning that one concept may have more than one parent, and that it then inherits characteristics from all its parents.

The characteristics (fields, interrelations, dependencies or slots in ontology terminology) of the concepts described below are discussed further in Deliverable 1.3 – Metadata.

The list of basic, top-level concepts in the CMCM is the following:

(1) *CapturedThing*

A *CapturedThing* is any aspect of an activity in the field of electronic art that "happened" or "was created".

Three levels of detail can be distinguished here:

- *Project*
A Project corresponds with the entire, distinct process of a well-defined activity. Examples could be a research project, a festival, an artistic project with all its manifestations over the years.
- *Occurrence*
An Occurrence is a well-defined, distinct product or a usually rather short activity in time. It is characterized by its lack of fundamental change or evolution and is always part of a larger, more abstract project.
The occurrence level corresponds with the artworks and activities that are usually archived and described by institutions as separate entities.
Types of Occurrences (for definitions and scopes, please refer to the glossary):
 - OccurredProduct
 - PublicInstallation
 - Application
 - Performance
 - OccurredActivity
 - Meeting
 - Workshop
 - Performance
 - Presentation
 - Workshop
 - R&DPeriod
- *Component*
A component is a well-defined, distinct and strategic part or aspect of an occurrence but is not considered an autonomous work or activity in itself.
Types of Components (for definitions and scopes, please refer to the glossary):
 - ComponentPhysical

⁶² See http://archive.v2.nl/v2_archive/projects/capturing/cmcm/html/

- Installation
 - InstallationEnvironment
 - InstallationObject
 - Publication
 - Hardware
 - ElectricalAppliance
 - ComputerHardware
 - Computer
 - ComputingDevice
 - CPU
 - StorageDevice
 - InputOutputDevice
 - InputDevice
 - OutputDevice
 - Network
 - PersonalAreaNetwork
 - WirelessPAN
 - LocalAreaNetwork
 - WideAreaNetwork
 - InternetConnection
- ComponentDigital
 - Network
 - Subclasses: see above
 - Software
 - ApplicationSoftware
 - Plug-in
 - DatabaseSoftware
 - Browser
 - SystemSoftware
 - OperatingSystem
- ComponentConceptual
 - Design
 - InteractionDesign
 - Choreography
 - DatabaseDesign
 - InstallationDesign
 - SystemsDesign
 - UserInterface
 - ComponentContent
 - DataCollection
 - Audio
 - MovingImage
 - StillImage
 - ComponentTechnical
 - Hardware
 - Subclasses: see above
 - Network
 - Subclasses: see above
 - Software
 - Subclasses: see above
 - Configuration
 - SystemsDesign
 - UserInterface

The table below indicates the difference between the three detail levels of CapturedThings.

Project	Occurrence	Component
abstract	concrete	concrete
autonomous	autonomous	not autonomous
process-based	rather static	rather static
mostly multilocal	mostly unilocal	unilocal or not location-related
long timespan	shorter timespan	short timespan or not time-related
activity	activity/product	product

Table 2: Difference between detail levels of CapturedThings.

(2) Document

A piece of documentation which describes another instantiation of a concept in the model. In the CMCM, documents are subdivided by type or medium.

- DocumentDigital
 - o AudioDigital
 - o TextDigital
 - SourceCode
 - o ImageDigital
 - PhotographDigital
 - ScreenshotDigital
 - o VideoDigital
 - o HybridDigital
- DocumentPhysical
 - o TextPhysical
 - o HybridPhysical
 - PrintedPublication
 - o ImagePhysical
 - o AudioPhysical
 - o VideoPhysical

For more information about documentation metadata – especially genres of documentation – please refer to Deliverable 1.3 – Metadata. Recommendations for documentation strategies, for mapping of documentation genres and entities and for building up a media archive from digitalized or digitally born documentation can be found elsewhere in this Deliverable.

(3) Actor

An agent (person or organization) who plays or played a role in an instantiation of a concept in the model.

- Person
- Organization
 - o DocumentRepository

(4) Time

Mainly used to describe the temporality of other concepts (CapturedThings, Documents, etc.)

(5) Genre

A genre can be used to briefly describe the contents of a piece of documentation, but also for other purposes, e.g. indicating the genre of a piece of software (not elaborated in this research project). For more information on documentation genres, please refer to Deliverable 1.3 – Metadata.

(6) Interaction

This class or concept offers a formalized description of how users interact with CapturedThings. For more information about user interaction and about the proposed formalized metadata descriptions, please refer to Deliverable 1.3 – Metadata.

(7) CopyrightStatement

Used for clarifying the copyright status of documents; may also be used to indicate the copyrights of CapturedThings. This class accommodates a variety of copyright models, including open source models and Creative Commons licenses.

- CopyrightTraditional
- CopyrightLicensed
 - o CopyrightLicensedCreativeCommons

(8) Keyword

Including specific research themes for CapturedThings.

- Theme
 - o ResearchTheme

For an overview of the more detailed concepts in the CMCM ontology, please refer to the exported HTML version of the model⁶³.

5. Building and maintaining a digital media archive

In addition to recommendations about documentation strategies, it is important to consider good practice for the actual storage of these materials as well. In particular, this chapter will discuss storage strategies and recommendations for digital materials – both digitalized and digitally born.

A. Archival procedures

In a living organization like V2_ and the institutions presented in Deliverable 1.1, a lot of documentation material is continuously being generated. Therefore, it is important to design solid and realistic procedures within the organization for proper selection and handling of appropriate materials. The Open Archival Information System (OAIS)⁶⁴ model, currently an ISO standard (ISO-14721:2002), can serve as a general basis for such procedures, since OAIS provides a general framework of archival functions, activities and workflow.

The Flemish research project *Digitale Archivering in Vlaamse Instellingen en Diensten* (DAVID)⁶⁵ is a cooperation between Antwerp City Archives and the Interdisciplinary Centre for Law and Informatics of the K.U.Leuven. This research project has resulted in a series of

⁶³ See http://archive.v2.nl/v2_archive/projects/capturing/cmcm/html/

⁶⁴ *Open Archival Information Systems (OAIS) Resources*. December 2003. RLG. 31 December 2003 <<http://www.rlg.org/longterm/oais.html>>.

⁶⁵ *Digitale Archivering in Vlaamse Instellingen en Diensten (DAVID)*. December 2003. Antwerp City Archives. 31 December 2003 <<http://www.antwerpen.be/david/>>.

recommendations, including archival procedures, storage solutions and digital archiving strategies. In the area of procedures, four main factors need to be taken into account: what should be archived, who is doing the archiving, how to archive (through which strategies), and when to archive a document. Since these archival procedures are mostly institution-specific, we will focus on more detailed recommendations for storage and file handling, where it is possible to draw general guidelines.

B. Storage of documentation

(1) *Application-independent storage*

As a first principle, V2_ has always chosen to store its digital documentation as separate files in a file system, not as part of a database. The main reason is to keep the media archive as application-independent as possible; database applications may become obsolete or may lack support in the future, so that it can become difficult or impossible to retrieve materials stored there (see also Deliverable 2.2 – Implementation). The generic file systems have the advance of (apart from the operating system) application-independent readability – many people can access the files without needing specific applications – and of extremely widespread use and stability.

(2) *Storage devices*

The DAVID project recommends the use of magnetic and optical devices for digital archival documents, avoiding the use of backup tapes, hard disks and DVDs. For *Capturing Unstable Media*, we would like to make an exception for using hard disks – when the archival material is used as the basis for online applications (e.g. a web portal), at least partial use of hard disks is unavoidable. Furthermore, a lot of documentation (most notably source code and libraries) is generated on a hard disk based on a specific server with the CVS system, which is difficult to evoke on another storage device. The preservation of CVS-based documentation is an interesting issue for further research.

(3) *File structure*

When stored in a file system, digital media documents can be organized in a hierarchical tree of folders and files. It is recommended that this structure be based on the work processes and activities of the institution where the files were created. For further information on these recommendations, see the DAVID guideline *Folderstructure and filenames for electronic records*.⁶⁶

C. File-related recommendations

(1) *General archiving strategies*

When dealing with long-term archiving of digital media files, the following four strategies can be distinguished⁶⁷:

- Computer museum strategy; saving the original file along with its hardware and software. This strategy is only viable on the short term (5 to 10 years maximum).
- Emulation; saving the original document and relying on the creation of hardware and software emulation applications. This strategy has not yet proven successful; few

⁶⁶ *Folderstructure and filenames for electronic records*. December 2003. Antwerp City Archives. 31 December 2003 <<http://www.antwerpen.be/david/website/teksten/guideline3.PDF>>.

⁶⁷ *DAVID – Digitaal archiveren in de praktijk. Handboek: B. Bewaarstrategieën*. December 2003. Antwerp City Archives. 31 December 2003 <http://www.antwerpen.be/david/B_Bewaarstrategie.pdf>.

practical, large-scale emulation projects for digital archiving purposes exist at this point.

- Conversion; translating older digital documents to a newer version of the same file format. With this strategy, important characteristics of the documents can get lost, and the archive remains dependent on proprietary formats without guarantee for long-term support (see below).
- Migration; translating digital documents to a recommended format for archival purposes.

A combination of emulation and migration can be considered the most valuable approach; in V2_'s media archive, original documents are stored along with their "translated" version.

(2) *Recommended file types*

First, an important remark needs to be made about the very heterogeneous nature of digital materials that are acquired by electronic arts organizations like V2_. Typically, in unstable media art practice, a lot of heterogeneous, experimental material is created, in many cases digitally born. The archive of a living organization in electronic art is often unable to predict, let alone guide and influence, the types and formats of materials that are obtained and acquired. In this sense, a lot of flexibility is needed; it is not realistic to demand overall uniformity and consistent quality of such a media archive. A few file formats, furthermore, are dictated by typical activities of the organization – e.g. streaming media files.

As a general rule of thumb, it is recommended to give preferences to file formats in the following order⁶⁸:

- Official standards (e.g. ASCII, TIFF, HTML, ODA, JPEG, MPEG)
- De facto standards
 - o Specifications (e.g. XML, SVG, PNG)
 - o Open standards (e.g. PDF, RTF, SXW, MIDI, GIF)
 - o Closed standards (e.g. .au, .avi, Word, Excel, .bmp, .wav)
- Application-specific formats: only as a last resort.

(3) *File naming*

Finally, it is important to strive for consistent and clear file naming policies.⁶⁹

For the storage of documentation related to the two *Capturing Unstable Media* case studies, the above guidelines were followed.

⁶⁸ *Standards for fileformats*. December 2003. Antwerp City Archives. 31 December 2003
<<http://www.antwerpen.be/david/website/teksten/guideline4.PDF>>.

⁶⁹ For clear recommendations, refer to *Folderstructure and filenames for electronic records*. December 2003. Antwerp City Archives. 31 December 2003
<<http://www.antwerpen.be/david/website/teksten/guideline3.PDF>>.

6. Capturing Unstable Media: general recommendations

As a summary of the research in this and other Deliverables of Capturing Unstable Media, the following general recommendations can be formulated. These recommendations are deliberately kept general, in order to make them applicable to the individual situation of a wide range of organizations.

As a general remark, it is important to note that the recommendations for Capturing Unstable Media not only apply to electronic artworks, but to a very broad range of activities in the field of electronic art or unstable media art. Therefore, not only artworks, but also activities as varied as festivals, radio broadcasts or book publications can be captured through these recommendations.

A. Definition of object of research

(1) Context of object

For capturing an activity or object in the field of electronic art, the **context and scope of the object of research** needs to be determined. Often, it is part of larger events or processes (festivals, research trajectories) so it is important to get an overview of its range. This can be done by distinguishing the activities and products related to the object or activity, and deciding which of those, from the point of view and depending on the involvement of the organization, are inside or outside its scope. These decisions depend on the level of detail the capturer commits herself to and the level of institutional interest with respect to these activities.

(2) Contents of object

Next, it is important to define which inclusive entities of the object of research need to be captured. Here, again, the level of detail will depend, among others, on the commitment and involvement of the capturing institution.

Electronic art practices often include a number of objects, activities, actors, tools and components. Each of these is associated with different phases of a project (research, development, implementation). At this moment, it is important to identify the phases and states of a project and discriminate any aspect or activity that 'happened' or 'was created' within the scope of each state/phase. The concepts defined in the Capturing Unstable Media Conceptual Model (CMCM) can be very helpful here; the institution's own description model (see recommendation C below) may serve as a general framework.

B. Documentation of object

A next step would be the act of collecting documentation that is most appropriate to the entities of the object of research that need to be captured. A selection needs to be made, depending on the relative importance of the object or activity and to the level of detail in which it will be described; furthermore, documentation can be selected on the basis of its quality, variety and standardized readability (for more information, see Chapter 5 of this Deliverable, with recommendations for building a digital media archive).

A few general guidelines, resulting from the research on the case studies for *Capturing Unstable Media*, can already be formulated (see also the chapter on documentation genres in Deliverable 1.3). Some of these categories of documentation will not be relevant for certain types of institutions; for example, organizations without a media lab or workshop will not have access to, or generate, documentation related to research processes – which does not mean that this type of documentation is not important.

(1) aRt&D process

Depending on type of collaboration (multidisciplinary or interdisciplinary), documentation on concept, research objectives, design issues, the flow of technical experimentation and innovation, the technologies used and the results of the research process will be discovered. This category of documentation also includes information on the operation, interrelationships and interdependencies of the components of a system, as well as its software, hardware and network configurations. Most often this documentation will be textual or visual in nature and include genres such as source code of applications, research reports, schemes and diagrams of interdependent (hard/software) components and conceptual descriptions. Depending on the perspective and goals of the institution that is involved in this process, the selected documentation will rather emphasize finalized, implemented versions of the documented object, or may, on the contrary, emphasize the evolution of the research process itself.

(2) Implementation

Because of its complex nature, electronic art often needs to be implemented in a physical (installation) or technical (application) environment in order to function properly. Documentation here will include practical information and instructions on the technical and/or physical environment in which the electronic art manifests itself, as well as user-information on how to get started. The type of this kind of documentation is mainly textual or visual, and may include genres of a more directive nature, such as installation instructions, technical riders, schemes plans and documentation on ambient sound or lighting conditions.

(3) User interaction

A formal, restricted metadata model for describing user interaction can be found in Deliverable 1.3. However, the specific, subjective characteristics and quality of a user's interaction with an electronic art piece cannot be captured through formal modeling; specific documentation of a user's experience is needed here. Often, such documentation will need to be actively created by the person or institution involved with capturing. Available documentation may be textual or visual use case scenarios; but for a good understanding of user interaction, it is often necessary to create audiovisual reports or registrations of someone interacting with a piece (e.g. a screen movie of the use of a user interface, or a piece of video about a user involved in an interactive installation). Interviews with users may also prove very useful; in general, recordings and registrations of user testing activities are rare, but interesting documentation materials.

(4) Interdisciplinary collaboration, distributed authorship

The individual involvements of contributors to a project can be outlined in a formal model; the Capturing Unstable Media Conceptual Model serves as inspiration for this. However, it is also important to gather additional documentation on contributors and their specific roles or functions in the project as related to the specific aspects of each activity. This includes documentation on copyright and biographical information about artists, main contributors and technical staff, mostly of textual nature.

The documentation that is obtained along these guidelines needs to be appropriately mapped to the relevant entities as defined in recommendation A. Digitalized or digitally-born materials need to be stored according to well-defined procedures, respecting the basic principles of maintenance of a digital media archive as outlined in Chapter 5 of this Deliverable.

C. Modeling the object

Apart from gathering documentation about a researched object, describing the object and its documentation in an appropriate formal model is an important step in the process of capturing. A formal model, such as an archival metadata structure, makes large numbers of research objects accessible and makes it possible to compare and study them on an equal level. Each organization will inevitably develop its own modeling system according to its own activities and goals; the Capturing Unstable Media Conceptual Model (CMCM) was designed as a source of inspiration for providing clear concepts and terminologies that can be used in such an individualized model.

In any case, based on the experience of V2_Archive in developing a metadata system for electronic art activities, the choice of a flexible system based on objects and relations is preferable to a rigid record-based approach, because the former is better suited for describing the wide variety of activities in the field of unstable media art with a large emphasis on these activities' contexts.

Furthermore, the *Capturing Unstable Media* research project has investigated a series of problematic aspects of electronic art projects, for which metadata solutions have been suggested: terminology for describing electronic art (through a thesaurus), genres and types of documentation (see above), describing distributed authorship, hardware and software dependencies and user interaction. These metadata suggestions can be found in Deliverable 1.3 and can be applied or adapted to an organization's information system where needed.

D. Archival interoperability

For organizations active in the field of electronic art in the broadest meaning, it is important to be aware that activities in this field are extremely process-based and that each organization's information on a project is only a part of a larger picture or context of what a project, research trajectory or an artist's work has been. We want to emphasize that reducing such activities to stand-alone, fixed and collectable objects doesn't do justice to the correct capturing of such activities, on the contrary; we strongly recommend the design of individual information systems that are open for collaboration and mutual interoperability.

Because of this, the research team of *Capturing Unstable Media* has designed its conceptual model with the idea of archival interoperability in mind, offering a set of concepts that can be elaborated upon and shared by a group of complementary archives and information resources. More information about this can be found in Deliverable 2.1.

E. Maintenance

Finally, it is evident that description models for electronic art, their content and related documentation need active maintenance and updates on a regular basis, in order to keep pace with a quickly evolving field of research.

Appendix 1

Report of interviews for *whisper*

A. First interview on *whisper* with Kristina Andersen, interaction designer *whisper*

Tuesday, 25 March 2003
Rens Frommé

About *whisper* (from its project site):

For the period June - July 2002 Thecla Schiphorst (CDN) & Susan Kozel (CDN/GB) were invited to further develop their project *whisper* at the V2_Lab and the Rotterdam City Theatre. *whisper* utilizes wearable computers and wireless computer communication, builds upon physical practices such as dance improvisation, and manifests cultural and scientific theories of embodiment. The technology and the physical vocabularies are to be developed synchronously. The research done during the residency resulted in a participatory installation exhibited at DEAF03_Data Knitting and focused on the following aspects: (1) Creating devices and refining movement vocabularies; (2) In four particular areas; electromagnetic fields, temperature, breath and pulse; (3) Software/hardware architecture; (4) Movement work in the studio with dancers.

Interview

Kristina Andersen would like to think of the research-project *whisper* as a kind of laboratory where explorations take place. She first positioned *whisper* in the field media-art research. According to her, MIT is on one end of the line, while performances are on the other. If MIT conducts research, they start with designing a specific device/application/hardware. They then test this device, evaluate it, write papers and thesis about it and improve it according to the results. If electronic media performances are being carried out, the research starts with the theatrical settings and fictional requirements (in short a concept) and design devices/application/hardware in accordance with it.

whisper stands in between. The method of research was process-like, using input/output data of subjective experiences. *whisper* starts with experience modeling workshops addressing simple research questions, like how do people react to themselves and their bodies if they are deaf/blind etc. The workshops explore and stretch these research questions, and their data outcome is followed up in successive workshops. Each workshop explores different (sensorial) aspects of experience in a broad sense and at the same time function as a test bed for the design issues. The hardware and device design evolves out of the exploratory research trajectories.

All the different data coming out of the research, performances and workshops (images, streams, sketches, drawings, small questionnaires) is collected and used in a next stage of the research project. Although all this data is quantifiable and useable for data analysis, up till now *whisper* only treats this data as qualitative information. Almost all data is viewable on the backend project site, www.wagwag.org. More general front-end information about the different aspects of the project can be found on <http://whisper.surrey.sfu.ca>.

According to Kristina, different (research) strings run parallel to each other: theoretical strings, practical solutions, design-strings, experience modeling workshops etc. *Whisper* is not a project that starts with a canonical form that forms the basis of most instantiations (performances) of that work. Actually it works the other way around. So, to cover or capture whisper we have to make choices and try to distract the core of all this activity. Because the project is so huge (with different stages, techniques, trajectories etc. and complex, Kristina recommends to look at the way chemists and biologists record their activity. Or even better ethnographic researchers, who are interested in both the recipe (process) as well as the cake (outcome). So, instead of looking for a canonical form, we should both cover the recipe as well as the cake.

B. Second interview on whisper with Stock, hardware designer, V2_Lab

Monday, 30 June 2003
Rens Frommé

About whisper hardware devices (from its project site):

The devices track and trace each other while worn and carried between bodies, receiving input from physical body signals, processing data through a collection of networked devices, and outputting a range of mapped responses back onto other bodies participating in the installation. Devices whisper to each other, tracking undertones, secrets and their own intelligences onto the bodies that carry and wear them. Communication is not always overt, often covert. The network transmits and communicates when devices are in close proximity to one another, sharing data signals between physical bodies that wear them.

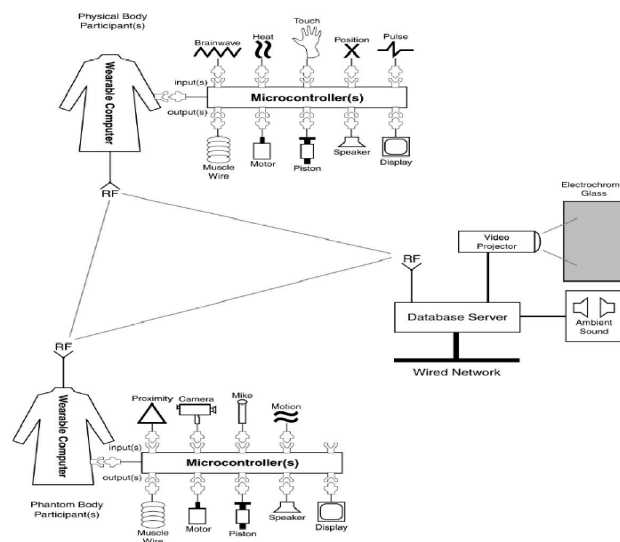


Fig 1. whisper system
<http://lab.v2.nl/projects/whisper.html>

Both the input and output components are worn close to the skin, on clothing, around the neck, wrist, or ankles, like jewelry, attached to a piercing, next to the heart, or on

one's sleeve. The components can output vibrations, temperature changes, sound, light and color, or miniature textual or image, even low-bandwidth video displays.

Interview

During the *whisper* residency at the V2_Lab, Stock searched for hardware solutions for wireless communications between the wearable systems, designed to wear on the body, and the server output systems. Development of these types of hardware stands within the larger (research) context of Stocks and V2_'s work on applications for wireless data transmission. For *Capturing Unstable Media* it is important to get an overview of the parts of *whisper* V2_ co-developed.

Stock documented his work in detail⁷⁰. He made strength-weakness analyses for the possible solutions, technical sketches, software, documentation on custom-made hardware, circuit diagrams of chips and a block diagram which visualizes the different modules of the *whisper* system and connections between them.

System

First of all we looked at the block diagram⁷¹. The sensors in the upper left of the diagram track analogue pulses (breath, hart-beat and touch) from bodies participating in the performances⁷². These signals are converted through a analogue-digital (A/D) converter and transmitted via one-wire connections to a central motherboard with a java-stamp mini-computer (chip), sewn on the back of the garments⁷³. The breath-sensors are custom-made (medical science), as well as the heartbeat sensors (military). Norman Jaffe was responsible for software implementation in the javastamp and developed a part of the java software responsible for sensor communication. The data exchange between hardware sensors is documented in Canada. Stock programmed the other module of the java software for wireless bluetooth-communication.

During the artist-in-residence period two blocks from the block diagram were developed: wireless communication between the wearable system and server, and between server and output (visuals, sound). Stock used custom-made hardware (like Dallas Semiconductor one-wire chips, Java-stamp etc.) and combined/soldered these in one printed circuit board. We discuss whether or not a clear distinction between hardware and software is meaningful? For documenting projects, Stock thinks it is an useful distinction, although 'firmware' is sometimes also used.

The 'main-brain' server of *whisper* consists of a protocol for data-exchange between hardware-sensors⁷⁴ and a data collector application, written by Rob Lovell in Max/MSP 4. The incoming data of each participant is, during the performance, converted into a kind of data blueprint for each participant ('body model' in the block diagram). When the participant starts to interact with others (pushes on sensors etc.), strong fluctuations in the data stream occur. These fluctuations in the 'body model' affect two output modules, the particle system and the sound engine. The particle system is a data visualization system that generates a kind of star system, developed by the mathematician Julie Tolmie.

⁷⁰ See <http://stomach.v2.nl/projects/whisper>. To access this server, mailto: archive@v2.nl.

⁷¹ See <http://stomach.v2.nl/projects/whisper/Whisper-BT-sys.png>

⁷² These sensors were developed in an earlier stage, so V2_ is not responsible for capturing these.

⁷³ See <http://stomach.v2.nl/pics/Whisper/dsc00300.jpg>

⁷⁴ See <http://stomach.v2.nl/projects/whisper/doc/DC2Micro1.13.pdf>

This visual output should be captured one way or the other (video-registration or rendered output). Audio output is transmitted to the participants via speakers above their heads, the sound domes. On the garments of the participant another output-devices was sewn, small LED lights. These are not represented in the block diagram.

Hardware

According to Stock, in the case of capturing *whispers* hardware, we need to deal with both physical components (garments) as well as electrical appliances (LED's, soldered circuit boards) and software and hardware specifications, possibly with the adjustments made in the software (code changes in javastamp) and network specifications (the innovation of the project lies in the communication between the different software modules). However, it is important to keep in mind that the starting point for *whisper* has not been hardware development, but rather theatrical performances, investigating possible ways of communication. The applications and hardware are then brought into accordance with that.

The subjective experience of and interactions between the participants are essential for the project and thus for the hardware development. A video registration of performances should definitively be part of the documentation, as well as interviews with participants on their experiences, after the performance. So, an evaluation of the DEAF03 performance should be part of documentation, and choices in hardware and software, based on these evaluations, should also be documented.

Data Models

We discuss which documentation would be necessary to reconstruct *whisper* in the future. First of all, you would need to preserve all hardware for the project. Stock thinks that is mainly the developer's responsibility. An important documentation piece for technicalities is a technical rider. This list specifies, for example, lighting conditions, sound requirements and network conditions for site-specific works, like *whisper*. Technical riders are especially useful for the construction of sites and environments of electronic art. However, these lists are not easily standardized, because of technical singularities within different projects. Next, some Variable Media Behaviors are discussed. According to the VMI definition, *whisper* wouldn't be a network project. Stock considers every project, in which hardware and software modules are connected to each other via USB, Bluetooth or any kind of wire, as a network project. He distinguishes between Local Area Networks, which is any kind of network established within one site or building, and Wide Area Networks, which are established in a wider range (outside a building).

Stock recommends to distinguish within the *whisper* system between visual system, audio system and user-to-user system, according to the following data sets:

Visual System

source: analogue sensor input
display: particle system of Julie Tolmie
material: 6 video beamers + 4 G4 power Macs
network: TCP-IP

Audio System

source: analogue sensor input
display: granular synthesis system 3.0, build in Max/MSP
material: speakers with 6 channels

network: TCP-IP

User-to-user System

source: analogue sensor input

display: low resolution monochrome pictograms on LED's of garments

material: whisper garments

network: Bluetooth

For *Capturing Unstable Media* , we used these data-sets as a starting point to construct our own data model for electronic art.

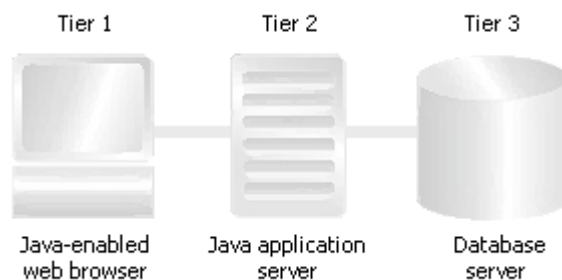
Appendix 2 - Report of interviews for the DataClouds

A. First interview on DataCloud 2.0 with Brigit Lichtenegger, V2_Lab

Thursday 12 June 2003
Rens Frommé

About the DataCloud 2.0 (from its project site):

" DataCloud 2.0 is an information space containing a vast collection of media-objects. DataCloud is constructed as a three-tier database application. The first tier is a **Java-2-enabled web browser**, which serves as our universal client. The optional Java package '**Java 3D**' must also be installed on the client's computer. The second tier of the application is implemented with a **web server capable of executing Java servlets**. The Java servlets use JDBC to access the database and store and retrieve information as needed. A dynamic output stream is generated by the servlet based on the database result. The third tier is composed of a back-end **database server**. The database server stores information used by the application."



from: <http://datacloud2.v2.nl/technology.html>

Interview

Brigit Lichtenegger has been concerned with the development, implementation and concept of all versions of the DataCloud up till now (DataWolk Hoeksche Waard, 1999, DataCloud 2.0, 2001 and DataCloud 2.5, under development). The applications are all part of a larger research-trajectory of data visualisation, which also includes other projects of the V2_Lab, like Amicitia. The project is under constant development (depending on incoming project money) and the software used for the first and second version of DataCloud has already become obsolete.

Existing documentation on DataCloud 2.0

DataCloud uses a file-versioning system for multi-user development to keep documentation up-to-date (like sources, resources and libraries). The database is stored on a different (server) location. Specific software modules can be compiled and deployed with a XML configuration file. Apart from that, special txt or xml-files are generated to document changes in source-code and in versions. The CVS has not been set-up for documenting a project, but for development. Therefore, it is hard to reconstruct the project or to decide in retrospect what files need to be preserved. In general, it is recommended to preserve the txt or xml-files, because these will stay readable in the near future.

For more information on technology DataCloud 2.0
<http://datacloud2.v2.nl/technology.html>

Capturing DataCloud 2.0

Different layers of DataCloud are stored on different server locations . This makes it almost impossible to store the project as a whole. Building an emulator of the original application could offer a solution for this problem. You would then need to take a small selection of media-objects for the database. Such an emulator could be build in HypersonicSQL, an open source Java Database, which can be used in applets, for testing, as a distributed application, and for production purposes. However, the problem of hardware-obsolescence still stands upright.

<http://hsqldb.sourceforge.net/web/hsqldbDocsFrame.html>.

Representing DataCloud 2.0

How could we (re)present the DataCloud application? Brigit Lichtenegger considers a visual representation of the application as a good alternative. Registration of user-interaction amounts to a better future understanding of the project. Also, a structured, visual walkthrough on the basis of screenshots, could be of help, although that would imply a subjective representation. Providing for the appropriate metadata would be another additional strategy. Possible categories could be hardware, content and software. Software could then be subdivided in Operating System and other programs, both with a server and a client-side. Other categories could be web and database-servers and browser and plug-ins (from client side).

B. Second interview on DataCloud with Marc Neelen and Ana Dzokic, Stealth Group

Tuesday, 19 August 2003
Rens Frommé

About the DataWolk Hoeksche Waard (from its project site):

DataWolk Hoeksche Waard (DWHW) is a project of ArchiNed, AIR Foundation and V2_Lab in collaboration with the Province of Zuid-Holland within the framework of the AIR Southbound event. DataWolk Hoeksche Waard is an experimental Internet site about the landscape design for the Hoeksche Waard (an island) in relation to the Randstad and the Rhine-Scheldt estuary. The site is aimed at designers, policy makers, administrators, inhabitants of the Rotterdam region and other interested parties.

In the DataWolk (DataCloud) anyone can join the discussion on landscape qualities in relation to urbanization and mobility. On the DWHW site, data is gathered by designers, policy makers and inhabitants. This information deals with specific locations on the Hoeksche Waard island. DWHW explores and documents the physical and non-physical contexts of the Hoeksche Waard and how these are interrelated, and makes this information accessible by applying methods and techniques from digital media.

From:
<http://lab.v2.nl/projects/dwhw.html>
<http://www.dwhw.nl/>

Interview

The first version of the DataCloud (*DataWolk Hoeksche Waard*) was developed for AIR-Southbound, an architectural manifestation in 1999 meant for artists and urban planners to explore new ways of urbanization⁷⁵. The concept of a DataCloud of information objects, was combined with the idea of active users, allowing them to upload their own view on the Rhine-Scheldt estuary. A demonstrator of the DataCloud was first presented on a workshop during DEAF on 22th of November 1998. Only in the summer of 1999 an online-prototype version was launched. In November 2000, this prototype won the Millennium Prize. With the prize money (approx. 45.000 euro) version 2.0 of the DataCloud was developed.

The main objective for DataCloud 2.0 was to improve several coding and interface issues of *DataWolk Hoeksche Waard*. Therefore an evaluation-phase of *DataWolk Hoeksche Waard* was planned, to start *DataCloud 2.0* with. Another objective was implementing complex media objects in the DataCloud. So, the developers were looking for an appropriate collection of media-objects related to each other in a meaningful way. The research project *Genetics of the Wild City* by the Stealth group offered such a collection, so they were asked to participate in *DataCloud 2.0*.

The first problem to solve was the implementation of the material from *Genetics of the Wild City* into the DataCloud 2.0. For *Genetics of the Wild City*, Stealth already classified the large amount photographs, models, rendered sketches and city maps in thematic sections and media-formats (jpg, tiff etc.). Stealth then made a selection of their material, meeting the demands of a multi-dimensional information space and taking into account the interface design of the DataCloud. On the one hand the possibilities of the DataCloud application needed to be fully used (e.g. the fact that an information object can be part of different collections and storylines), while on the other hand the different layers in content of the collection needed to be visualized (e.g. disseminating information in the right context or in the corresponding location of the city). For that, the material was subdivided into seven sections, like *Database of the Wildness*, including site-specific information or *Urban Genetics*, including simulation-models and the so-called DNA of transformations. Together with the DataCloud team additional metadata was assigned to the objects.

Eventually, only a small selection from these sections was implemented, mainly from the *Database of the Wildness*. In August 2001, this material (271 objects burned on CDs) was transposed to the server of V2_ and implemented in the database⁷⁶. This data forms the actual content of DataCloud 2.0. On special event on August 30th 2001, the project *Genetics of the Wild City*, was presented to the public and its materials exhibited. On the same night, an expert meeting on DataCloud 2.0 took place. Next, the team focused on the development of the interface and its design.

Stealth clearly makes a distinction between the concept of the second DataCloud, developed by *Archined*⁷⁷ and V2_Lab, the application itself, the research-project *Genetics of the Wild City* and the selection of implemented DataCloud 2.0 objects, taken out of the media-archive of *Genetics of the Wild City*. According the Stealth, V2_ has the responsibility for capturing these implemented objects, whereas Stealth itself has to take care of the whole *Genetics of the Wild City* material. Both parties have a shared responsibility in safeguarding the concept of and documentation on special DataCloud 2.0 features and functionalities, especially

⁷⁵ AIR Foundation. December 2003. Architectuur Instituut Rotterdam, 31 december 2003 <<http://www.airfoundation.nl/nl/?nodeID=48>>

⁷⁶ Documentation piece on Datacloud no. 16

⁷⁷ Archined. December 2003. ArchiNed, 31 december 2003 <<http://www.archined.nl>>

because not all functionalities were realized in the demonstrator, e.g. it lacks a user interface for information uploading. All in all, each DataCloud application is considered an autonomous product by Stealth. Every DataCloud is designed with its own technology (Schockwave for 1.0, Java 3D for 2.0) and the characteristics and content of the cloud grow accordingly.

In 2003, Archined and V2_ elaborated on the work done for DataCloud 2.0 and started the next phase in this line of work, the DataCloud 2.5. In this project phase, the main concern is the usability of the application. The team works towards a demonstrator that allows users to design their own collection of media objects and to add storylines to them. These functionalities will also be tested on users extensively. Note that Stealth was rewarded a research grant by the Daniel Langlois Foundation for a new project, *3/4 process + 1/4 matter*, for which the DataCloud application will be used⁷⁸.

⁷⁸ *STEALTH*Group. December 2003. STEALTH. 31 December 2003. <<http://www.stealth-g.net/>>

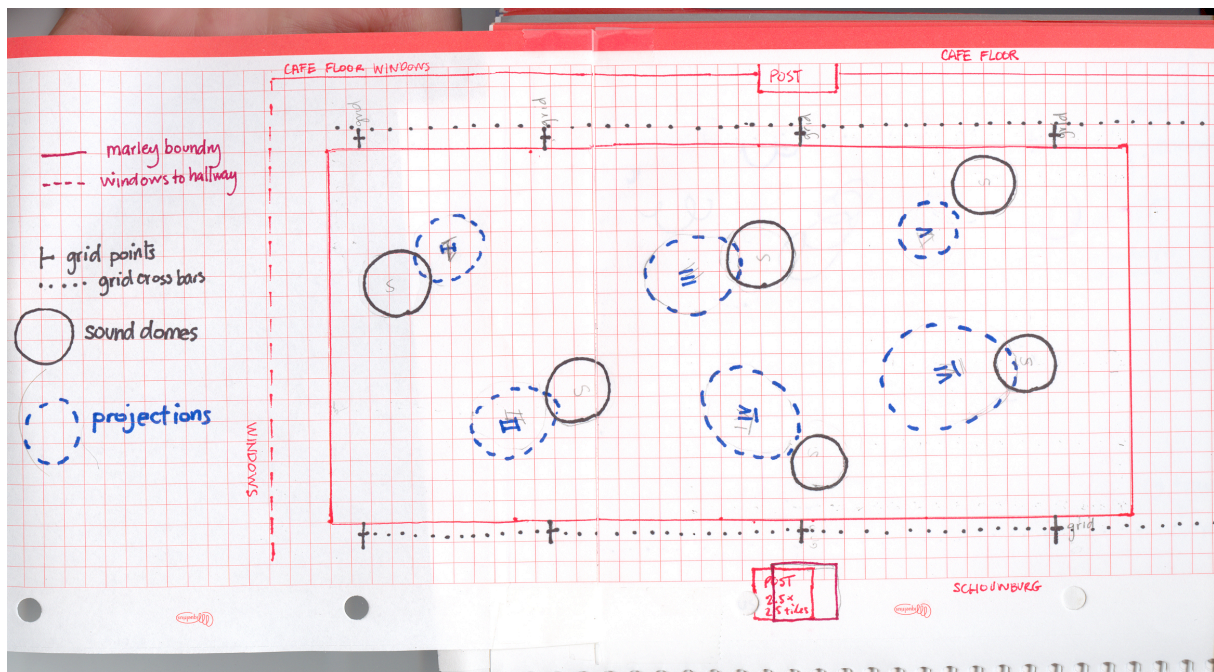
Appendix 3

Selected pieces of documentation about *whisper*



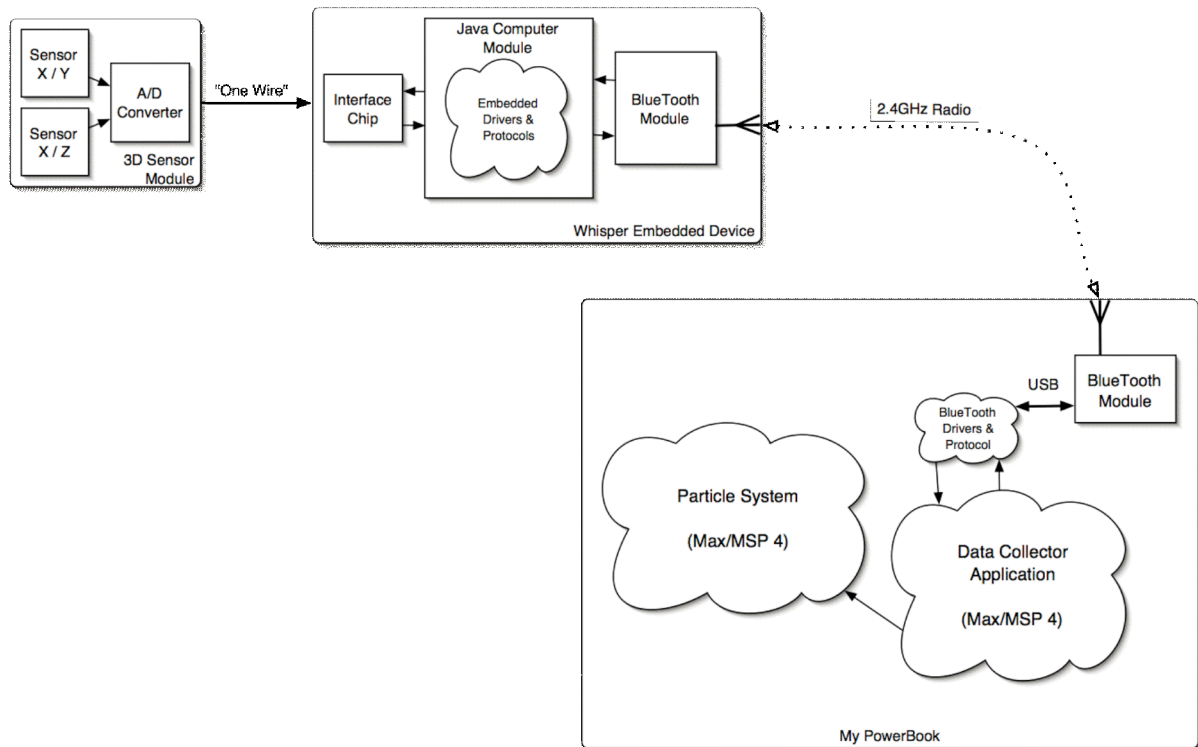
W04 whisper – garments
photograph

http://archive.v2.nl/v2_lab/projects/whisper/2002_whisper_garment.jpg



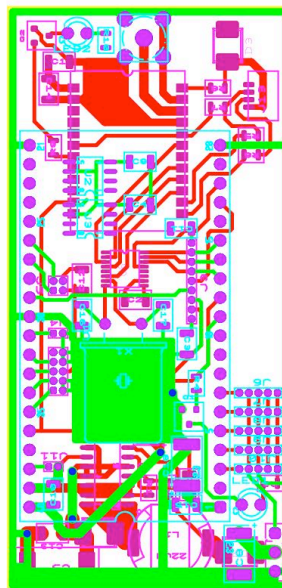
W07 whisper - pool visuals sketch
sketch

http://archive.v2.nl/v2_lab/projects/whisper/2003_whisper_pool_layout.jpg



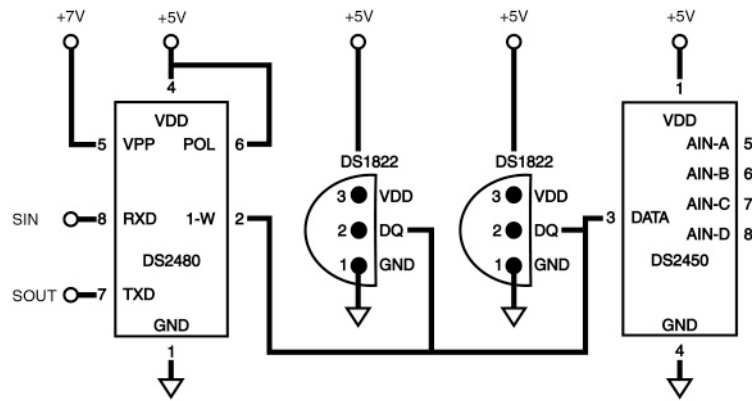
W08 whisper - systems diagram
deployment diagram

http://archive.v2.nl/v2_lab/projects/whisper/2002_whisper_system.png



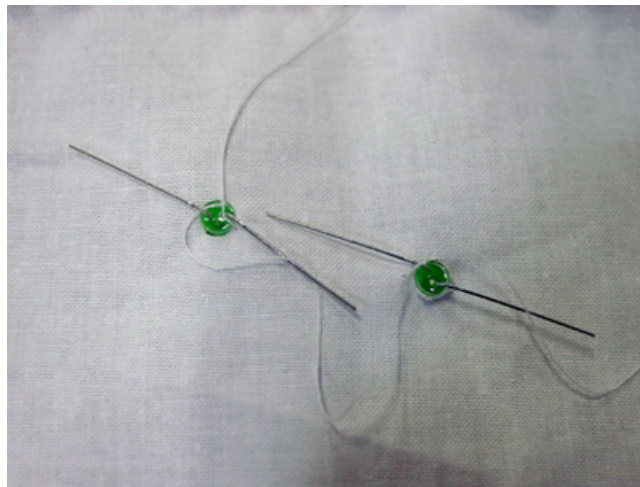
W09 whisper - bluetooth wiring diagram
wiring diagram

http://archive.v2.nl/v2_lab/projects/whisper/2002_whisper_bluetooth_wiring.jpg



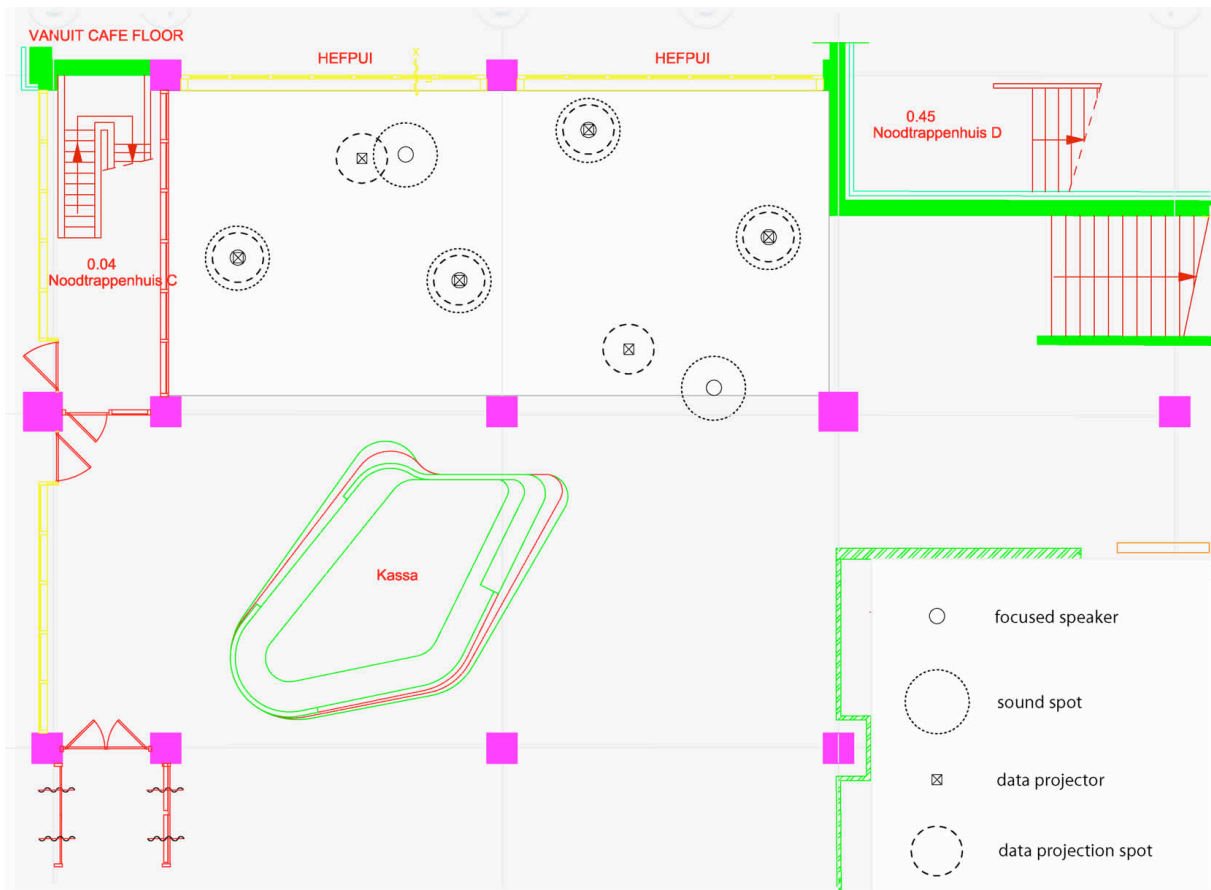
W13 whisper - sensor architecture diagram
circuit diagram

http://archive.v2.nl/v2_lab/projects/whisper/2003_whisper_sensor_arch.jpg



W15 whisper - LED's photo
photograph

http://archive..v2.nl/v2_lab/projects/whisper/2002_whisper_led_design.jpg



W16 whisper - installation plan
plan

http://archive.v2.nl/v2_lab/projects/whisper/2003_whisper_spaceplan.jpg

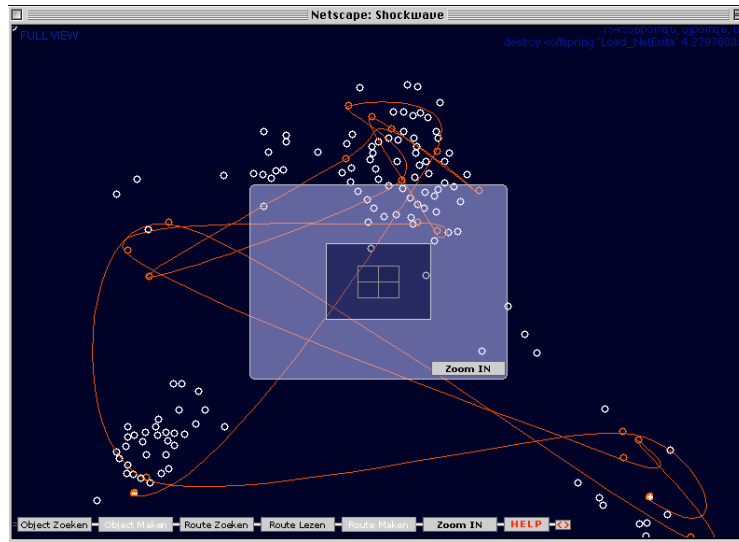


W22 whisper - sound domes sketch
sketch

http://archive.v2.nl/v2_lab/projects/whisper/2003_whisper_sounddomes.jpg

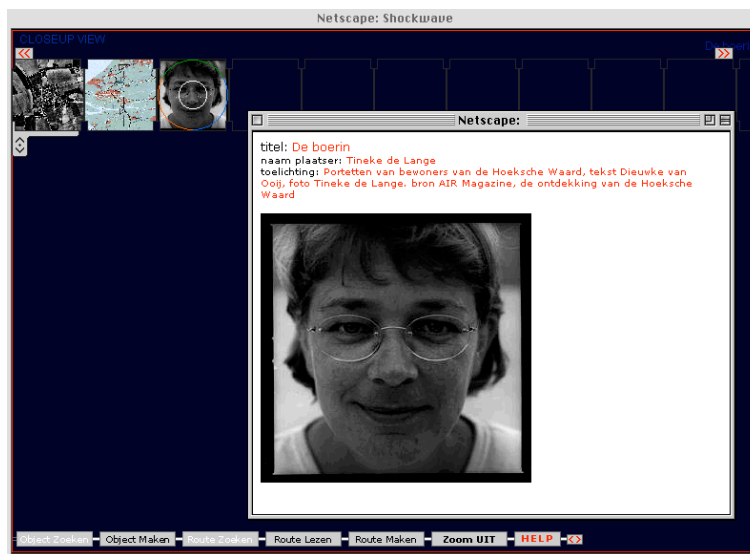
Appendix 4

Selected pieces of documentation about *DataCloud*



D05 DWHW – screenshots
screenshot

http://archive.v2.nl/v2_lab/projects/datawalk/dwhw_screenshots_better/



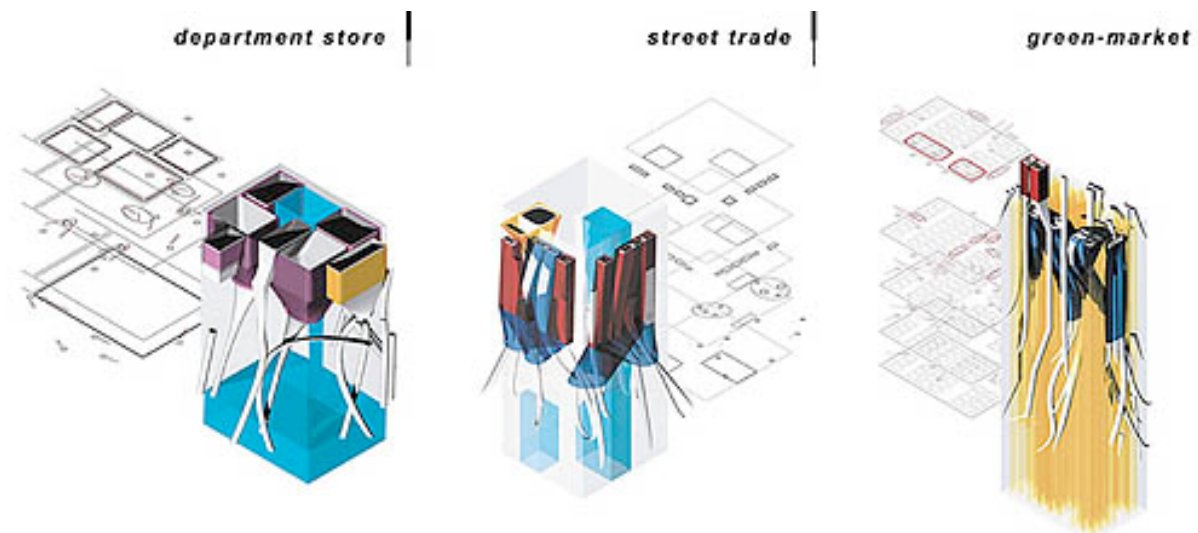
D06 DWHW - data object
screenshot

http://archive.v2.nl/v2_lab/projects/datawalk/dwhw_screenshots_better/08_object2.tif



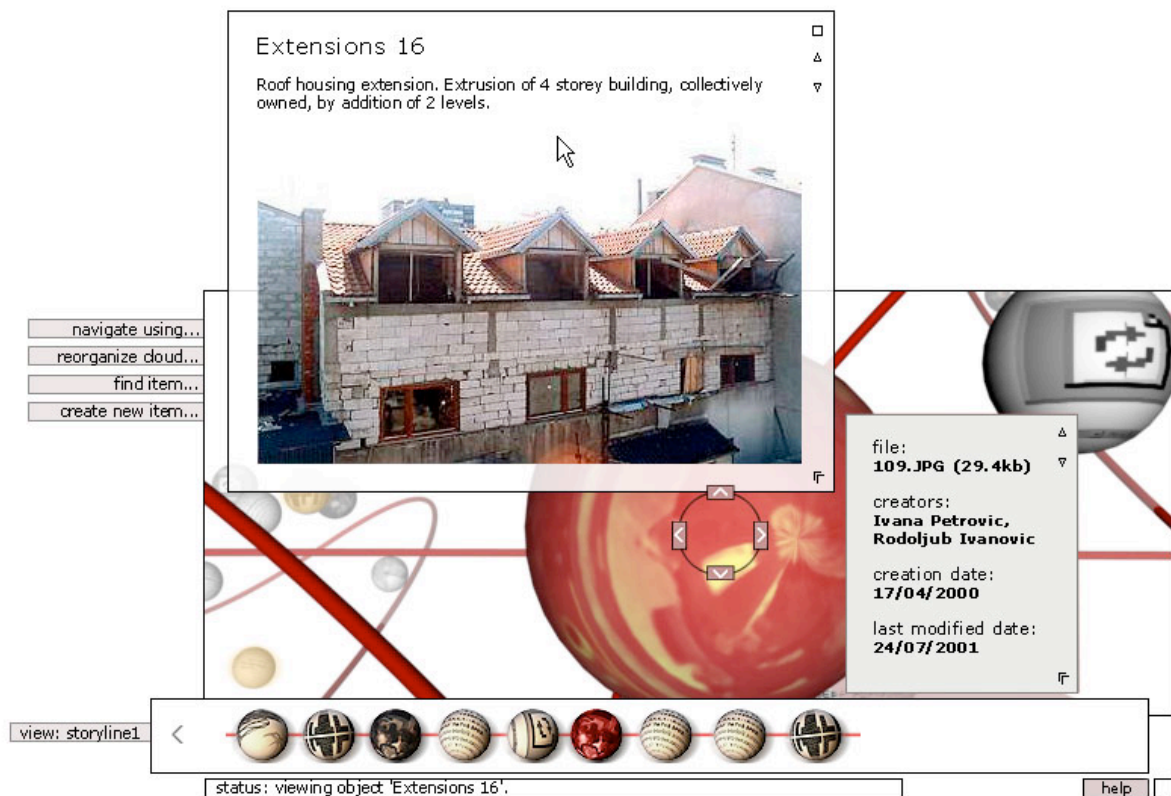
D09 DWHW - create route
screenshot

http://archive.v2.nl/v2_lab/projects/datawolk/dwhw_screenshots_better/10_MAAKR.TIF



D15 Genetics of the Wild City - slide show
presentation

http://archive.v2.nl/v2_lab/projects/datacloud2/2001_wildcity_slideshow/



D29 DataCloud 2.0 - user interface
screenshot

http://archive.v2.nl/v2_lab/projects/datacloud2/interface_step5.jpg