

**SUSTAINING DYNAMIC MEDIA OBJECTS AND DIGITAL SYSTEM ENVIRONMENTS:  
AN ASSESSMENT OF PRESERVATION METHODS FOR COMPUTER BASED ARTWORKS**

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**ABSTRACT**

The conservation of computer-based artworks, the subject of this paper, raises two key issues. On the one hand, artistic intentions, including where the selection of specific computer and information technologies is concerned, must be respected in the conservation of such works. On the other, specific methodological requirements arise due to the fact that we are dealing with both software and art. Beyond common migration approaches, as applied in long-term archiving, we are thus looking for process-oriented preservation strategies that enable the encapsulation of the authenticity and integrity of the artwork.

This research focuses on interactive artworks and digital objects like applications, which need to be executed for display. Therefore the results of long-term archiving, life-cycle management, and preservation of computer-based games are applied to dynamic and artistic media objects and system environments.

Introducing the concept of the work logic, we illustrate how conservation strategies and collection management policy might evolve in relation to one another.

**INTRODUCTION**

Since the mid 1960s an impressive array of computer-based art has evolved in the field of communication and information technology. In addition to artworks that are graphically plotted on paper (Klutsch 2007) or canvas, as for example in the practice of Bernard Tagwerker (b. 1942), there are manifold innovations ranging

from interactive CD-ROMs, DVDs, game-like applications, artistically designed environments and interfaces, community-based platforms and articulation patterns (which seem to be evolving cybernetically)—ephemeral as the end product may be. The artworks invite us to become *flâneurs* (Kuni 1999); to interact and participate (Laforet 2009); to shake us up through artistic actions (Ubermorgen 2011); and dispel some of the shininess of all too smooth surfaces—like *Shredder 1.0* (1998), by Mark Napier (b. 1961). This artwork disrupts the HTML display of websites and suggests that it has been run through a paper shredder.

On the whole, artistic strategies incorporating computer technologies demonstrate a high degree of heterogeneity, something they have in common with other contemporary artistic practices. They address processes and articulate technical and economic aspects of the media as well as social concerns. Unsurprisingly, as Frohnert and Singer state: “As a prominent art form, electronic media artworks are omnipresent in museums and collections, [raising] numerous questions regarding their documentation, storage, migration, emulation, re-installation, and conservation” (2010).

Computer-based art is reproducible. Indeed, some authors claim that its “fixity” is less of an issue than for any analog medium, since the medium remains equivalent (no media change). However, technical dependencies of the art form emphasize its ephemeral character. It seems that computer-based art is often associated with fleeting incidents, intangible obstacles, and barely restricted areas of operation.

### RESPECTING ARTISTIC INTENTIONS

While some forms of expression in computer-based art belong either to the tradition of abstraction or concept art, others relate to electronic culture (i.e., music and video); natural sciences (e.g., Hans Diebner (b. 1960), *Liquid Perceptron*, 2000, estate of the artist); or other subject matter in which the artist finds inspiration. By

means of hybrid formats and, increasingly, integrating content from everyday culture, many artworks are highly time-dependent and vanish on the cusp of time, such as Johannes Gees (b. 1960), *The Helloworld Project* (2003), a network-based installation for mobile phones and web services with synchronized public-space projections in Bombay, Geneva, Rio de Janeiro, and New York.

Even though current conservation projects demonstrate that it is feasible to migrate single artworks through time and technology, many artworks with a technological component remain conceptually related to the time of their occurrence. Hervé Graumann’s (b. 1963) *Raoul Pictor cherche son style...* (1993, estate of the artist), might be mentioned as an example of a work that has convincingly progressed through a series of metamorphoses. The piece was developed in the paint-box era as an Adobe Director application on a Macintosh SE computer and was later migrated by the artist, first to an Adobe Flash application, then to the Internet (available at [www.raoulpictor.com](http://www.raoulpictor.com)), then into public space (as the installation *Collectivepainting* (1999) at the Swiss Federal Office of Statistics) and finally as an Apple iPhone application.

Thus computer-based art is not only semantically ambivalent, falling somewhere between euphoria and criticism, enchantment, and disenchantment. It often comments on the potential for conflict inherent in the computer itself. Further, it sways between youthfulness and topicality on the one hand and the ephemeral, aging, (self-)destruction, and disappearance on the other. Beyond the accidental loss of artworks, some artists have deliberately destroyed some of their earlier work or subjected it to self-censorship. Frieder Nake (b. 1938) has, for example, destroyed the punch cards with the program code of early computer graphics, to say nothing of Jodi’s (Joan Heemskerk (b. 1968) and Dirk Paesmans (b. 1965)) intention to let operating systems crash by using their hacked browser (1996/1997). At the time, this was understood to be the logical consequence of

disbanding the work concept. And as Alexej Shulgin emphasizes, even the birth of the term “net.art” relates to the subject of destruction: the term emerged as the only readable fragment of a disrupted mail, sent by Igor Markovic, editor of the journal *Arkzin* in Zagreb, in 1996 to Alexej Shulgin.

Whereas it has gone virtually unnoticed that computer-based art has developed a new type of originality, this new principle of uniqueness is currently adding to the value of artworks (Lurk 2010a). This appreciation is clear in connection with graphic computer art of the first generation (mid-1960s to late-1980s) and especially with particular derivatives of early generation software-based artworks, which survived in one way or another or unexpectedly reappeared (i.e., Herbert Franke, *Mondrian* (1979/1981/2007), artistic application for home computer, artist’s estate Gesellschaft für Computergrafik und Computerkunst e.V., Munich).

Many artists have developed their own ways of dealing with this. They continually or sporadically update their artwork or at least its appearance (i.e., Reinhard Storz (b. 1955) et al., *The Ram Show* (1999/2004), [www.X-cult.org](http://www.X-cult.org) and Olia Lialina (b. 1971), *Agatha Appears* (1997/2009), [www.c3.hu/collection/agatha](http://www.c3.hu/collection/agatha)). Other artists select works from their existing portfolio and adapt them using recent forms, formats, and strategies of communication (i.e., Marc Lee (b. 1969) *TV Bot* (2004/2010), [www.lgo1.net/index.php/Main/TV-BOT](http://www.lgo1.net/index.php/Main/TV-BOT)). Artists expand their repertoire—sometimes applying conservation strategies.

Though computer-based art was—as a matter of course—always committed to technical conventions that change continuously, one might nevertheless ask whether we are sometimes too fast in leaping to the conclusion that computer-based artworks need to be up-dated and kept seamless as both time and technology move on. They are then subjected to a process, the pace of which is set by that of technological development itself. Instead

of ironing out creases we need to think about how much flexibility computer-based artworks can bear prior to dissolving figuratively and literally.

### APPLIED CONSERVATION STRATEGIES

By bug-fixing and updating their own pieces, many artists unwittingly abandon historic information and connotations. Even though Blank and Jeron formulated as early as 2001 the (self-)critical thesis that conserved net.art, it is a bit less “net.art” than a conserved painting is a painting (Blank and Jeron 2001). Still, many artists continue adapting their artworks to changing conditions and not only are the artists themselves involved in rejuvenation (diminution). Those involved in remarkable conservation programs, like the Variable Media Network (1999–2004), Inside Installations (2004–2007), Forging the Future (2005–2009), Matters in Media Art (2004–2010), and others, felt impelled to recommend migration and substitution strategies in order to maintain certain components of computer-based artworks.

The aging of digital components or elements in the system environment has little in common with the classical phenomena of the deterioration of real-world (analog) artworks. Basically, there are two key principles of conservation: the maintenance of functionality and the preservation of substance. Maintaining the functionality of an artwork rather than the original components is achieved through migration or reinterpretation, a practice that is considered ethically sound where artworks need to be executed within a changing or already changed environment.

In contrast to this, in our context, preserving the substance offers a modularized treatment and is premised on the theory of encapsulation (Lee et al. 2002). Specific components are transferred to an emulated or virtual entity and are sustained as such. While the code stays untouched, the surrounding might change over time. It is not the intention to play both strategies off against each other. Both modes of application engage with each

other. Furthermore facility treatment depends anyway on the collections policy.

Nevertheless, both strategies are reminiscent of experiences in the field of video- and especially computer-based games, where the issues discussed seem familiar. As Henry Lowood has accurately related, “Thus, games exist in a media space somewhere between the text, the experience and the performance, confounding preservation strategies that rely on notions of content fixity taken from other media.” The author asks if computer games are better understood as “artifact” or as “activity.” By way of conclusion, Lowood states, “Hardware and software objects alone cannot document the medium of the computer game” (Lowood 2004).

### DIGITAL PRESERVATION

Until now, it is above all within the archival sector that preservation strategies have been promoted. Beside advanced digitizing and imaging technologies (CoOL 2010), there has been significant research on storage media or life-cycle management, including archival ingest processes (Consultative Committee 2002), definitions for sustainable file formats (BAR 2009; Nestor 2009), including risk management (Lawrence et al. 2000) and monitoring procedures (InterPARES 2001; InterPARES 2 2007; Folk and Barkstrom 2002; Christensen 2004; Rog and Wijk 2005) as well as control mechanisms (TRAC 2010; Schmidt 2008), recently increasing interest in emulation technologies (DRAMBORA 2007; PROTAGE 2010; KEEP 2009; PLANETS 2007). Furthermore, it seems as if the conservation of computer-based art becomes more and more challenging for the archival sector (Gollins et al. 2009), especially because of its complexity. Specific kinds of fixity can be challenging, particularly where the so-called “look and feel” of the artwork is concerned, such as velocity, interactivity and behavior of navigation, visual integrity of the display, availability of sound, and authenticity of the system environment (i.e., platform, services, etc.). As our recently finished research project—Compare—shows, these features are

hardly considered in the field of current emulation and virtualization tools (Lurk 2010b).

### DELIMITATION OF LONG-TERM ARCHIVING

When distinguishing specific concerns in the art context from those relating to long-term archiving, the focus shifts from file to platform. Beyond the definition of sustainable file formats—which are projected linearly during the interpretation (display)—computer- and internet-based artworks, as well as dynamic media objects, require process information. This information enables grabbing and generating dynamic actions, often defined as executable script within the source code or programming.

With regard to software, one could argue that on the one hand the code-based components might be modified (migrated, adapted, etc.). On the other hand, unlike most other software applications, many computer-based artworks are usually packaged together with specific versions or even platform-based software (e.g., Adobe Flash, Max/MSP, etc.) and software libraries (e.g., ImageMAGICK), rather than existing separately as documents or files. This raises the fixity of the artwork to the current platform or installation and diminishes its portability. In terms of maintenance, portability is one of the major criteria of robustness.

From a technical point of view, computer-based artworks can be understood as being segmented; the work exists as an interlinked set of multiple, encoded framesets that are filled with accidental parameters or content—often generated at random. Some artworks exist as nothing but specific code, on the basis of which they react to changing content, such as cybernetic video feedback (e.g. Hans Diebner, see above). Other artworks require additional data. They use predefined audio-visual content (e.g., record as “asset” by the condition report guidelines of Media Matters 2007). Sustainable operations for preserving computer-based art and dynamic media objects should take into account the internal dynamics of the artwork,

as determined by the coding, the artistic concept and the historical anchorage of the software components.

### EXAMPLE

Marc Lee's internet-based installation, *Breaking the News. Be A News-Jockey* (2006), serves as an interesting example in connection with which the importance of process as opposed to static file requirements can be illustrated.

This artwork provides a dynamic information space, four screens wide, where the user can operate. An interactive Flash movie on a client computer grabs all kinds of audiovisual content from 13 different web-services and displays it according to the user's requests. Sixteen different instruction sets, called templates, display instructions. In addition, the templates communicate with so called "key-services," which are installed as scripts

on a web-server. These key-services direct the requests to specific web services and then receive results with specific URL web addresses. After being loaded from the client into the Flash movie, the content of these URLs is displayed according to the instructions of the formerly recalled template.

The artist has provided a unified modeling language (UML) diagram (fig. 1) which helps define the work logic and answer questions like "What is the artwork" or better "what belongs to the artwork?" Also, "What kinds of belonging have to be differentiated?" and "Where is the artwork located?" And can one even understand that though the piece seems timeless (because the content itself is continually updated from the internet) there are historic aspects inscribed in part by the technological components. It suggests what abstract terms like "dynamic content," "real-time processing," "user-interac-

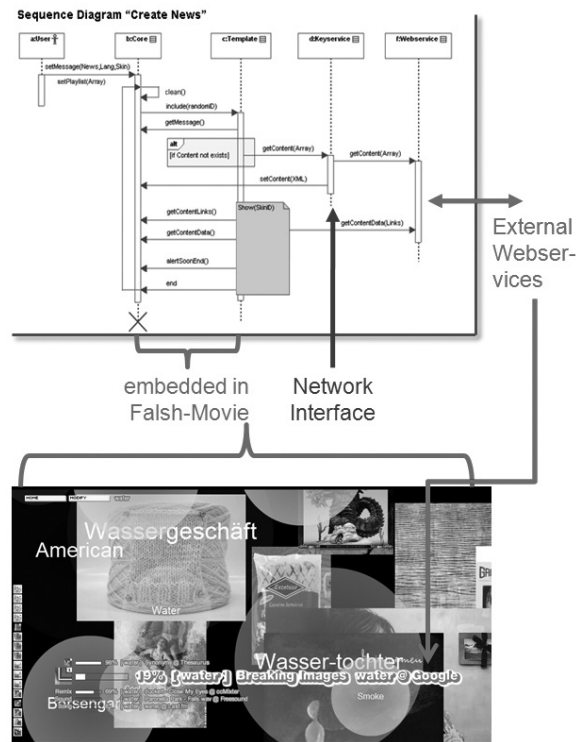


Fig. 1. Marc Lee, *Breaking the News. Be a News-Jockey*, 2006, web-based installation with four screens, ZKM Center for Art and Media, Karlsruhe, acc. no. BtN\_2009\_MM0225. The figure shows above a UML-diagram, provided by the artist, as mapped (beneath) to template display.

tion,” “openness,” etc. might mean in terms of Internet or code-based art forms.

### WORK LOGIC

Once the idea of the artwork as monolithic entity is replaced by a modular conception of the artwork’s core or essence, new possibilities for treatment present themselves. In order to chart the structure of the artwork, the term “work logic” is used. The work logic identifies the core components of the artwork and describes the interlocking of the digital modules involved. It can be used to define the fixity of software components, libraries, or system environments and the relation of these to the overall artistic and aesthetic concept. In addition to classical documentation, hierarchies are introduced that support the classification of the required components according to function and origin.

Thus identifying the work logic of the artwork helps to sustain accuracy through time. Digital components proven to be important should not simply be replaced by others. The altered elements may contain important cultural information. They derive from a specific technological era and demonstrate specific technical developments. The original coding and display not only suggests aesthetic enunciations but also provides important information about a certain technological and historical environment; the original setting has influenced in one way or another artistic formulation. Besides dating the artwork iconographically, media-archeological aspects are also at play here.

### CONJUNCTION OF WORK LOGIC AND POLICY

In conjunction with the collection policy, the work logic contributes to developing specific procedures within the facility treatment. By way of example, the treatment for sustaining an artistic website shall be examined.

In order to keep the website alive the artist continually updates and modifies his work. This is a legitimate procedure in as far as he or she has a user-centric policy,

which concentrates on the core components of the work and the display in continually changing browsers. As an example, one might imagine a participatory, web-based artwork that enables the user to upload pictures on the artist’s website and contribute to the collaborative site.

If the artwork belonged to an art museum, the museum might support the same updating strategy, but in addition and in parallel, the museum would try to retain specific historic sequences of the work. In order to document the process that ensues as the artwork evolves, the museum would try to keep the original coding, as sustained in an artificial surrounding (e.g., an offline virtual machine with a vintage browser for display). In addition, certain snapshots would be provided once a month, in order to track changes. Those snapshots of time and status might help to capture the historic quality of the work later.

Even though the user-centric policy of the artist and the historic and scientific interest—here represented from a museum’s point of view—finally lead to different conservation strategies and maintenance, they do not necessarily conflict with one another, neither are they mutually exclusive. The museum, as an institution of higher cultural change, “objectifies” the artwork, whereby it is observed in its entirety, but also within the context of a specific time, culture and value.

### CONCLUSION

It seems that up until now we have been rather disinclined to learn from our daily experience of aging and loss. The paradigm of migration, as originated in life-cycle management with its focus on sustaining linear information, needs to be reconsidered in terms of dynamic artistic media objects and process-oriented content. Even though there is a lot to consider, we can learn through combining approaches in the conservation of complex objects. This is suggested by the following sequence, deriving from a dialog between the artist Katharina Fritsch (b. 1956) and the conservator and restorer Erich Gantzert-Castrillo. When the conservator

asks the artist whether the tablecloth in the installation *Company at Table* (1998, multiple installation, polyester, wood, cotton, paint, Museum für Moderne Kunst Frankfurt, Germany) should be replaced or not when disturbing signs of aging occur, Fritsch answered:

Of course things are beautiful when they are brand new; and of course I want the work to look new, radiating newness. I am torn on this issue, but I must accept the aging process, just as people must accept that they grow old. I really do not know how the tablecloth could be renewed, or what impact that would have on the overall appearance of the work. We cannot continually conduct cosmetic surgery to ensure that it looks like a woman after countless facelifts. We cannot deny that things age. What is important is how they are treated, [if] . . . there [has] been due care and diligence: the atmospheric conditions must be guaranteed in which the artwork does not sustain damage. (Gantzert-Castrillo 1999, 130)

Applying these thoughts to the conservation of computer-based art, it seems the encapsulation of an artwork is particularly suited to preserving historic accuracy in computer-based art forms. Embedded within a technological biotope (i.e., a virtual machine or emulation shell) the artwork can be sustained as a dynamic object, living or breathing in a way, but frozen as historic sequence, un-touched and under controlled conditions.

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