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The Straw that Broke the Museum's Back?: Collecting and Preserving Digital Media Art Works for the Next Century

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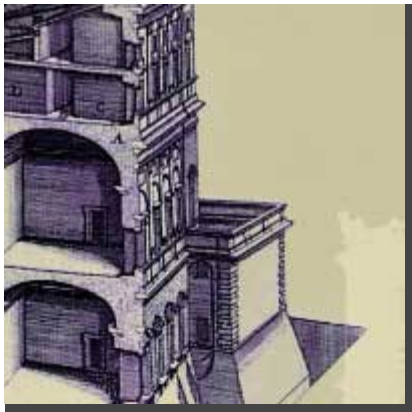

The Straw that Broke the Museum's Back?

Collecting and Preserving Digital Media Art Works for the Next Century

Richard Rinehart on Jun 14 2000 **issue 14**

Digital media-based art works immediately raise issues of long-term preservation. As these works are increasingly being collected by museums which have a strong preservation mission, these issues warrant exploration by artists, museums, academics, and information scientists. Such issues have a special urgency because these 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 formats. The art community also cannot rely entirely on the computer industry to solve this problem as digital art implies specific problems distinct from many other types of digital information. This paper raises some theoretical issues to help outline the problem, suggests possible new ways to think about collecting and preservation in relation to digital art, and considers the impact of these new methods on the art and museum community.

Introduction

Digital art, from CD-ROM-based multimedia projects to net.art, have been created for years. However, we are now in a noteworthy phase in the development of these new media in that a critical mass of such projects are entering the mainstream art world, and raising a host of questions as they enter the big tent. Milestone exhibitions such as the Whitney Biennial are including net.art for the first time in 2000; university art departments around the nation are formalizing digital media programs; conferences around art and technology are booming; and most salient to the topic of this paper, museums are beginning to accession works in digital media into their art collections.

Digital media-based art works immediately raise issues of long-term preservation. As these works are increasingly being collected by museums which have a strong preservation mission, these issues warrant exploration by artists, museums, academics, and information scientists. Such issues have a special urgency because these 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 formats. The art community also cannot rely entirely on the computer industry or information science field to solve this problem as digital art implies specific problems distinct from many other types of digital information.

Here I will introduce some ideas from the archival and information science fields that pertain to the preservation of digital information, include ideas from within the art community, break down the issues in collecting and preserving digital art, and finally suggest some steps we may take in the near term as well as a longer term research agenda.

Borrowing some Ideas from Archives and Information Science

It is useful to start out with some basic requirements for the long-term preservation of digital information. Don Waters, Associate University Librarian at Yale came up with the following list:

* Authors and publishers must be able to register publicly the existence and location of their intellectual property;
* Parties to the exchange of information must have confidence that their transactions are secure and confidential;
* Readers must have the ability to verify that the attribution of authorship in a document is true and that the copy at which he or she is looking has the same content as the version that the author originally created; and
* Authors and readers must have access to an accumulated store of knowledge that is preserved from the past and will be preserved into the future. (1)

The aspects of public registry, authentication of the original, and continued access are all roles the museum has developed to fill. The question is, can they fill those roles with regards to digital art, and if so, how?

Steven Robertson of the United States Air Force Institute of Technology proposes an interesting model that should resonate with the museum community on a metaphoric level alone:

To prevent the loss of our digital history, I propose that digital knowledge be preserved in a manner that I call the Digital Rosetta Stone (DRS). The data so preserved would be a collection of the knowledge and processes necessary to recover and reconstruct digital documents maintained in their original file formats. The data would be used to create or emulate the hardware and software necessary to recover data from obsolete storage media and reconstruct the digital documents. (2)

Jeff Rothenberg of the Rand Corporation objects to the translation metaphor because it implies an endless series of translations (migrations) in which the original meaning may become subtly altered. However, he has taken the spirit of the Digital Rosetta Stone even further in offering the most promising information preservation strategy applicable to the art community; emulation.

Rothenberg has suggested building software emulators that would mimic the behavior of obsolete hardware platforms. This would involve encapsulating digital documents, the original application software used to create it, and the operating system used to run both in a software wrapper which describes the required hardware environment. Standard hardware emulator software running on some future computer platform would then interpret the hardware request, select the appropriate hardware emulator (say for a PowerPC 601 chip in a Mac), then emulate it so that one could run the original software to open the document. Rothenberg goes on to explain why it is more feasible to emulate at the hardware rather than operating system or application level, but one obvious advantage would seem to be that since hardware is at the bottom of the hardware/operatingsystem/application/document ladder, it comprises the smallest set of variables, and thus requires the least number of different emulators. To further facilitate future use, Rothenberg suggests attaching additional 'annotation metadata' to the surface of each encapsulation which would both "explain how to decode the obsolete records contained inside the encapsulation and to provide whatever contextual information is desired about these records" (3). This surface metadata, which could also contain resource discovery information, would be kept in a standard 'bootstrap' format so that it could be converted to new formats as part of the preservation refresh cycle, thus filling the requirement for continual access outlined by Waters.

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Closer to Home

Coming at the problem from within an art context, Jon Ippolito, net artist and Associate Curator at the Guggenheim Museum, offers several ideas which further this conversation considerably, as well as having the 'side-effect' of challenging some of the more ingrained notions about collecting and exhibiting held by the museum community (4). One key point is that when preserving and re-presenting media-based works of art, we should give up the notion of a single, authentic object and view these works as sets of instructions rather than precious originals. Ippolito applies this to a broader range of works than digital art; including installation and performance art as well. This shifts the focus on media art works from physical object to information object; a shift very useful when considering how to collect and preserve digital art.

To echo this point, we can go back to the archivists for a moment, where Abby Smith says in "Preservation in the Future Tense":

When all data are recorded as 0s and 1s, there is, essentially, no object that exists outside the act of retrieval. The demand for access creates the 'object', that is, the act of retrieval precipitates the temporary reassembling of 0s and 1s into a meaningful sequence that can be decoded by software and hardware. (5)

In the Variable Media initiative, Ippolito outlines what types of information museums must gather to enable this new means of collecting, including interviewing the artist for intellectual property and aesthetic guidance and collecting all relevant documentation surrounding a work. This list could provide a very helpful basis for museums faced with developing contracts with artists when collecting digital works. Taken in the context of preservation, Ippolito's list suggests the kinds of metadata that could accompany digital art, were it encapsulated in the emulated form articulated by Rothenberg.

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Breaking it Down

At this point, it may be helpful to break down the issues involved in collecting and preserving digital art into overlapping but still manageable areas that address the preservation agenda offered by Waters above. These areas are: preservation strategies, context, collecting and intellectual property, and access.

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Preservation Strategies

There are three main approaches to preserving digital information; static preservation, migration, and emulation.

Static Preservation proposes to keep all the original objects and preserve them in their original form for as long as possible. Static Preservation offers to preserve the most authentic historical evidence in preserving the original object. This is the method museums use to preserve most physical collections, so it makes sense that it would come to mind first when thinking about preserving digital art. So, for digital art this would mean preserving the hard disk the artist used to develop the art (though one could substitute the CD-ROM or server that the public version finally was delivered on, though this is already one copy away from the original). In addition to preserving the original storage media, one would have to preserve the original software and hardware necessary to access that media, and then open and play the original art/document.

Static Preservation falls short for digital art on several fronts. First, it assumes that a copy of the original is altered in subtle ways, which is true of most media (including film and photography), but is not true of digital information, which if copied correctly, is exactly the same as the original. Second, digital information is created and displayed on a very large number of possible hardware and software configurations. The number of possible hardware platforms, software applications, and environmental variables such as operating system type, version, and possible extensions and plugins dwarfs the number of possible formats for other reproducible media such as video, film, and photography. Any museum collecting digital art on an even semi-serious basis would quickly be devoting far more resources to preserving chips, boards, CD's, laptops, pocket devices, monitors and custom-program support than to any other type of collection they may have; so much that this model is not scalable and thus not feasible as a long-term solution. Rothenberg cites the idea of a few "computer museums" which would preserve all possible software and hardware for the rest of us. He then dismisses the idea because it so severely limits any kind of real access to local data as to fail the last requirement on Waters' list of continual access. This solution would also fail to serve the need of museums to locally re-present digital art collections for exhibition or research.

Migration is currently used by many types of organizations, and may be a sound preservation strategy for certain kinds of digital information, or may play a part in a broader preservation strategy. Migration means simply to copy digital information from outdated media (storage media and software formats) to new, fresh, current media and formats. When you open an old document you had created in Word 5.1, edit it, and save it using Word98, you are practicing migration. Standards can greatly aid a migration strategy because standards (such as XML) are designed to be independent of any one application and thus require far fewer migrations in a given time period than quickly changing proprietary formats (such as MS Word documents). Migration may work well for digital art "metadata" such as records in a museum collection management database and other external data, but migration makes one key sacrifice that bleeds it of long-term use for digital art. Since migration is a series of translations

dependent on currently available technology, it attempts to retain raw data over the look and feel or specific behavior of that data. So, opening a digital art work in an application several versions removed from the original, one might find that the current version has different functions built in, or uses slightly different algorithms, all of which could alter the behavior of the art in subtle or major ways. There is no promise that the future will provide software with exactly the same functionality and implementation as the original, which might have provided for the total re-creation of the art, and this would be very costly in any case, requiring heroic efforts at many migration stages. This prioritization of data over look and feel might be fine when talking about the text and structure in a museum database record, but is an unacceptable loss when talking about a multimedia digital art work.

Emulation, outlined above, proposes a layer of software that emulates a given computer platform, and serves as the foundation on which to run the original software and application, thus giving a working solution for highest fidelity in reproducing the original work of digital art. In fact, emulation software already exists in the form of software allowing us to run Windows on a Mac, or run pre-PowerPC Mac applications on a PowerPC G4. Emulation is also not quite the stretch it seems at first in application to digital art. After all, much digital art is created on one machine, and then viewed on a host of other machines (think about a net.art project viewed on a multitude of other machines with different color calibration, operating systems, etc.). Even a CD-ROM is rarely exhibited on the same computer used to create it. In effect, the work is "reproduced" each time it is viewed. This is not a circumvention of the work; it's inherent in the work - there is no more 'object'. There is bound to be some amount of variation in presentation as technology undergoes major changes (for instance if computers of the future use holography rather than photons and cathode-ray boxes for viewing). Emulation however gives us the broadest range of choices when balancing fidelity vs. reproducibility for any given art work.

All preservation strategies include one or more of the above approaches, whether explicitly or implicitly. At first, the two most interesting approaches offered so far, coming from Rothenberg and Ippolito, would seem to be at odds - one proposing emulation, the other remaking. However, these views are readily reconciled when you consider that both actually propose re-creation of the original digital art work according to a set of instructions. The difference lay in the amount of automation or human touch applied to the process. Automation guarantees fidelity, efficiency, scalability and ultimately feasibility, but even Rothenberg admits that human touch and judgment will be required for emulation too. This is part of why human-readable metadata is required as part of the emulation package. Retrieving or re-presenting the digital art work then becomes a continuum of options facilitated by emulation and automation at one end and human intervention on the other.
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Context

One might say that providing context is the third mission of all museums, standing right between preservation and access. Context is often a combination of preserving documentation about a given work, and producing new educational and scholarly materials which facilitate access and understanding. Context provides connections between the art work and either it's original environment or it's current one. Context is especially essential in preserving works which are distributed, multi-part, ephemeral, or interactive such as digital art. With regards to digital art, context is needed on both the human and technical levels.

Museums can learn a lesson from preservation of older intermedial art forms such as conceptual art, installations, actions, and correspondence works. Since these works are often ephemeral, and there is no monolithic 'object' left to collect; it has proved invaluable to preserve as many of the original artifacts alongside original documentation as possible. This allows for some amount of "recreation" and interpretation of the work in lieu of having an absolute object to consult.

Digital art often exists in a dynamic, networked environment which includes human-to-machine, human-to-human, and machine-to-machine interactions (the Internet is a prime example). When we collect a work of digital art it is often necessary to carve the work out if this environment for preservation. Again, this is not unusual for museums, which collect a variety of objects ripped from their cultural moorings in churches, temples, palaces and other social environments. With digital art, the environment often has an even more direct relation to the appearance and behavior of the work itself. So, it is important for us to recognize that we are often not going to be capable of collecting the "complete" art work, but we must be satisfied with a snapshot of it. As we snip the digital art work from it's technical and social environment, we should find ways to describe that environment in ways that allows future viewers to better understand the work itself (and what it lacks). By analogy we can think of a city, which some alien civilization has come to carve out of the Earth's crust and collect. It would

be advisable for them to record which roads came and went out of this city. For instance, the city may have a large number of warehouses on the eastern side, and a large number of hotels and shops on the western. Possibly this is because the highway on the east side once stretched into the agricultural countryside and carried farmer's produce. The freeway on the western side may have carried salesmen and tourists. The best way to explain the configuration of the newly-isolated city is to record some essential facts about the original environment.

This effort will require a mixture of curatorial and information science skills to determine just where the collector has defined the "boundaries" of the work are, and then describe, and perhaps even minimally reproduce, what used to exist outside the preserved fragment.

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Collecting and Intellectual Property

One common method of ensuring the preservation of digital information is data redundancy- otherwise known as backing up. Data redundancy proposes that since digital information can be copied without loss of information; that it behooves us to make multiple copies of important digital information. The more copies, and the more geographically distributed they are, the more effective for preservation.

This method could be applied to digital art to great effect, not just by having one museum create copies of digital art in its collection, but by allowing multiple museums to collect the same digital work of art. Allowing multiple instances of a given work of art, geographically distributed and preserved by different museums would spread the responsibility and ensure preservation in case of either natural disaster or neglect (willful or not). Multiple copies could also be used for comparison and verification. After generations of migration or emulation; any instances which deviated from the others in significant ways might be identified as having been corrupted sometime in the preservation process. This would be more difficult, though not impossible, within a single institution which would likely use the same software and media storage and methods for all of it's digital art, in which case any glitch in the system could affect all instances and be hard to detect. Multiple collected instances also increases the availability of the work for access purposes.

Many museums however derive their pride and distinction based on the value of their collections, almost always unique collections of which no other institution can boast, and some museums are even now devising contracts for accessioning digital art which grants them exclusive rights and ownership. This is a natural extension of the tradition of collecting, but the easy reproducibility of digital media allows museums to do what they cannot with their other works. It is still possible to have multiple authorized and legal instances of an art work in a few museums, without having to give the work away to everyone. In the case of digital art then, museums will have to weigh blunting their competitive edge against being able to better accomplish their mission of preservation and access by working together.

The legal and intellectual property framework developed for digital information has a direct impact on museums attempting to preserve works of digital art, and should allow for this function within the larger social and economic environment. For instance, the Digital Millennium Copyright Act (6) passed by the United States Congress allows museums, archives and other non-profit agencies to circumvent data-protection or encryption schemes on a temporary basis to allow them to evaluate whether or not to collect a digital document. However, the Act does not currently allow these same agencies to bypass protection schemes (as would almost certainly be necessary) in order to preserve this document once it is collected. The evaluation clause recognizes that it may not always be possible to gain the appropriate permissions in a timely and cost-effective manner before evaluating a document and allows this important social function to occur in a way that does not compete with the owners rights to use the value of the document. The same law should recognize that legal problems may tie up rights and permissions of even legally acquired digital works of art for periods of time long enough to directly threaten the longevity of these ephemeral digital documents. Therefore, it may be in society's best interest to allow museums and archives to take early preservation steps even with works with unknown or undecided intellectual property status, obviously within limits and perhaps on a conditional basis. Whatever the solution for a specific problem, intellectual property law needs to remember that museums, libraries, and other cultural agencies may require the right to conduct somewhat specialized functions in regard to digital information such as long-term preservation.

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Access

As implied by Don Waters' list above, access is a key component in the preservation of digital information. It is not enough to lock away information, or digital art, in formats which may be safe and long-lived, but which impede access. In fact we preserve information and artifacts exactly so they can be accessed in the future. The museum and arts communities have been working on models and standards for providing intellectual access to traditional works of art via digital media (museum websites with searchable collections for instance). However, since digital art is often multi-part, ephemeral, documentary, time-based, and interactive, it may have special requirements of description, record format, and navigation that are significantly different from modes of access developed for other collections.

For instance, terms used to describe traditional collections in museum cataloging (and conversely used to search such collections in databases or online) focus on the nature of the object, whereas terms appropriate for digital art may need to focus more on behavior than object-ness. Navigational schemes for traditional collections often assume the single, discrete object, whereas navigational schemes for collections of digital art may need to focus on grouping and relationships.

While it is important to expand these layers of access for use with digital art; it is also important to integrate them with broader arts information resources and with institutional practice. For instance Rothenberg suggests that "metadata" (data about the digital art itself) be included in the emulated package. In an art organization or museum, this metadata may also have to live external to the emulation package, in the form of a collection management database record for instance. This record must accurately describe the digital art work, and yet at the same time, adhere to a generic structure which allows other records in the same database to describe other areas of the art collection. Terms used to classify and identify digital works of art should fit into the larger controlled vocabularies (such as the Art and Architecture Thesaurus) used by the arts community to describe other works of art so that all can be searched in an integrated manner. To provide truly meaningful access, it is not enough to develop means of describing, searching, and navigating collections of digital art alone, we must do this in relation to other works of art, other cultural activities and productions. This is work the information science community cannot do alone; work the arts community must lead.

One project undertaking this work is Conceptual and Intermedia Arts Online (7), an international consortium of 11 museums, archives, and arts organizations exploring means of describing, presenting, and accessing intermedia art forms from conceptual art to net.art. The reasons for grouping together such seemingly disparate art forms are twofold; first, because they share some core qualities as information objects which may mutually inform discussions around each, and second, so that methods can be developed which integrate rather than segregate digital art, in appropriate ways, into the larger art information universe.

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Next Steps

While it is too early to announce absolute answers to the many issues surrounding the collecting and long-term preservation of digital art, museums need to take steps now to ensure that the works currently being collected are on the road to preservation. Documents on acidic paper are as granite compared to a work of digital art sitting on an obsolete disk format in some unknown software in a museum collection storage area. Other types of art may sometimes be collected and then, by necessity more than neglect, sit in storage for years awaiting proper conservation. With the incredible obsolescence rate built into the computer industry, digital art left in it's original media and format will rapidly become impossible, or impossibly expensive, to recover. With this in mind, I'd like to suggest some near-term steps, as well as a longer-term research agenda for the field.

All of the preservation models to date, though they may differ in technical approach, seem to agree on one tactic; collect as much original documentation as you can. Original documentation and information gathered should include intellectual property rights assigned by the artist or donor, in as much detail as possible, even if gathered in strictly prose narrative form rather than forms, because many of the laws which will govern such information in the future have not yet been cemented. The method for re-presenting the digital work has also not been decided, requiring advance guidance from the artist on what might be allowed. Most artists creating digital art are still living, and should be considered a primary resource. Artists should be asked to donate any original documentation surrounding the work, such as personal notes, email between collaborators, early prototype versions, letters of acceptance, etc. Technical specifications of the work should be obtained either from the work itself or the artist, and recorded. A collection catalog record should be created as soon as possible, and all the information (metadata) outlined above should be explicitly recorded in that record,

external to the digital art object, in unstructured text fields for now if need be.

While emulation has been implemented in specific instances to emulate operating systems for instance, generic emulation software as described by Rothenberg is not yet available for purchase. In the meantime, museums may want to implement both of the other preservation strategies, static and migration. The first is accomplished by retaining all the original storage media and files related to the art work, and in addition, storing copies of all software needed to author or display the work. I would recommend migration at this point too. This would entail migrating the art work's digital files into the next, nearest, current version of the software used to author and/or display it. So, if the work was authored in Adobe Premiere 2.0 and stored on a CD-ROM, the museum would keep a version in that format, and also keep a version which has been opened and saved into the Premiere 4.0 format onto a DVD.

A longer-term preservation strategy could actually include all 3 preservation strategies, deployed in layers. Static preservation could be used to maintain any physical components to the digital art work - gallery installation objects for instance. Static preservation would also apply to any original documentation in hard form such as artist notebooks, etc. Migration may well be a sound preservation strategy for records in the museum collection database, media used to store the emulated object on, as well as other forms of "bootstrap" data such as metadata attached to the surface of the emulated document, and of course the emulation software itself. Emulation would then be applied to the core layer including the art work itself, including the operating system and application needed to retrieve it.

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Research Agenda

Even within the general directions suggested here for a long-term solution for preserving digital art, there are a number of unanswered questions which require further research by artists, museum professionals, and information scientists.

The first concerns the emulation method itself. Rothenberg outlines the specific research related to the technical development of standardized emulation software, but there are a couple of additional areas ripe for exploration as well. For instance, we have yet to define the market which could drive the development of emulation software. The larger this market will be, the more assurance we have of a speedy and affordable solutions. If the conversation surrounding long-term digital preservation (and thus possible market) are restricted to the cultural heritage community alone, software solutions will be slow in development and probably expensive, as is the case with other specialized software such as MARC cataloging systems used in libraries (and that's among the best cases).

Another question about emulation is how it would be implemented in a heterogeneous network environment such as the Internet. Such would almost certainly be a requirement for artists or museums wanting to provide broad access to their digital art collections (some of which themselves require a network). How would emulation work on a network, short of having to download the emulation software and entire art work? This problem has been tackled in the realm of multimedia in recent years and perhaps lessons can be gleaned. Would the specific hardware emulator needed to run one art work become a plugin which could be easily downloaded to the client computer? Then the emulated artwork itself streamed in parts across the network, each portion transmitting only when access was requested from the client end?

The art community would need to define what types of metadata it would need to store inside the emulation package. For instance, what should "bootstrap" information about a digital art work say about that art work on the surface level? Would the museum catalog record simply be exported from the museum database and "wrapped" around the art work inside the emulation package? What sorts of intellectual property information should be visible at an early stage?

Lastly, the art community itself needs to undertake the work of developing methods for intellectual access to digital art. For instance, what type of record format and terms should we use to provide integrated access and navigation to the several different layers which may comprise one work - such as physical components and original documentation, descriptive metadata, and then the emulated art work itself?

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Concluding Thoughts

Conceptual artists in the 60s-80s worked with intentionally anti-hierarchical forms and ephemeral media specifically to challenge traditional relations of art and object, yet

were not able to stop museums and others from attempting to collect and preserve their productions. Nor are contemporary net.artists, working in undeniably ephemeral and center-less spaces, preventing the grand urge to collect, classify, and preserve. Perhaps this is simply one of the many dances of our culture, a friendly ritual war aimed at keeping each party alert and ready.

Still, in creating works which prompt museums to consider classification terms that describe events rather than objects, record structures that allow relationships rather than segregation, emulation as a form of preservation, and the fecund nature of information wanting to impregnate as many organizations as possible, artists may be nudging museums on more levels toward the dynamic rather than static aspects of art.

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Footnotes

(1) "Some Considerations on the Archiving of Digital Information ", January 1995, Don Waters, Associate University Librarian, Yale University Library http://www.oclc.org:5046/oclc/research/links/archtf/waters_dig_arch.html

(2) Steven B. Robertson, 1996, http://www.ukoln.ac.uk/metadata/cedars/AIW01.html

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(7) Conceptual and Intermedia Arts Online, http://www.bampfa.berkeley.edu/ciao/ with a commerK?

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