Preservation of Art in the Digital Realm

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Abstract

This paper discusses the challenges of preserving art in the digital context. It provides an overview of the broader digital preservation challenge, and then considers new media art within that context. Through several case studies, it illustrates and discusses problems, issues and proposed solutions to digital art preservation. We will see that while work has been done towards digital preservation, significant issues remain.

Preservation of Art in the Digital Realm

The preservation of information is the cornerstone of human progress – by passing knowledge from one generation to the next using a multitude of symbols, devices, tools and approaches, civilization has been able advance. Throughout history, art has played an important role in this transmission with artistic depictions being more than representations of the world but reinterpretations for the sake of communicating what is deemed important. It is critical to note that these reinterpretations reflect not just the material culture but how society understood its place in the universe. Their understanding of the world comes to us largely from surviving artifacts including many art objects. Cultural heritage institutions like museums, archives and libraries have taken custodianship of these artifacts for the sake of the preservation of knowledge. In doing so, the exercise has become institutionalized with both the practices and the policies for collecting becoming formalized. At the same time, the institutionalization has led to a smaller number of individuals able to engage in a discourse on the values, implications and impact of choices made in knowledge preservation, to the point where the domain is primarily composed of specialists.

Recently, the transformation of society into a networked digital culture with millions of creator-publishers is eroding the underpinnings of institutionalized knowledge preservation and creating a challenging environment to preserve modern culture. This paper will explore the issues in the preservation of art in the digital realm both from the context of institutions and creators. It will begin by examining the broader digital preservation context before narrowing to the preservation of art.

The Broader Context of Digital Preservation

Introducing Digital Preservation

In one of the seminal works on digital preservation, Preserving Digital Information (Waters & Garrett, 1996), the authors observe that "the first electronic mail message was sent from either the Massachusetts Institute of Technology, the Carnegie Institute of Technology or Cambridge University. The message does not survive, however, and so there is no documentary record to determine which group sent the pathbreaking message." Such events are all too frequent in the history of digital information and reflect its ephemeral nature. This also emphasizes that it is not simply a technical problem but "[r]ather, it is a grander problem of organizing ourselves over time and as a society to maneuver effectively in a digital landscape."

Much as cultural heritage institutions hold physical artifacts, the report identifies the basic unit of preservation in the digital context (the information object) and notes at least five aspects that impact the integrity of the information object: content, fixity, reference, provenance and context. The type of *content* the information object is can determine the kinds of activity necessary to preserve the information object. The *fixity* of an information object identifies issues related to the dynamic nature of digital information and how to address incremental versions. How one *references* an information object impacts its integrity in terms of locating it. One particular challenge here is that information objects can be located in many places leading to the question of the authoritative version of the object. The issue of authority and authenticity of the object directly ties to the issue of *provenance*. Where the chain of custody for a physical object must be singular, it is not so for digital objects. This is important because when the object is changed, it becomes much harder to determine whether the change is an authentic change (as coming from a source with the authority to make the change) or a spurious change (coming either from malicious intent or inadvertent corruption). Finally the *context* of an information object has impact on its preservation and includes the technical context for viewing as well as related and supporting objects.

Why is Digital Preservation Harder?

All of the above apply to physical as well as digital objects. This raises the question for the difference between the physical and the digital and particularly why digital is more difficult. The Digital Preservation Coalition (Jones and Beagrie, 2002) note a number of factors for why digital preservation is harder. Machine dependency, speed of change, fragility of media, ease of making changes and the need to make changes, the need for active preservation and the nature of technology all play into making digital preservation harder than traditional preservation.

In terms of *machine dependency*, the fact that one requires an intermediary means that preservation work can only be assessed in the context of the original viewing environment. If that viewing environment is unavailable, then there can be no certainty that what one is currently viewing is reflective of the original. The *speed of changes* is also significantly greater than in traditional media. Where the shift from stone to paper reflects a shift over thousands of years, the shift from punch cards to optical media reflects a matter of decades. Similarly, digital media is physically *fragile* and requires a supporting technology infrastructure. *Ease of change* coupled with the need for *active preservation* raise the spectre of repeated inadvertent changes over the life of an object – changes that can corrupt and alter meaning. The need for active preservation is directly related to the speed of change and the fragility of the material where the tradition of benign neglect that for the most part worked effectively with traditional preservation will not work with digital.

The final reason why digital preservation is harder is simply that it is unknown at this point. While the conservation of analog materials is a well-known exercise, digital preservation practises are still largely untested. Recommendations are not necessarily supported by evidence and can be costly to implement.

Problems with Digital Preservation

Moving beyond the basic enunciation of the problem of preserving digital information objects to exploring the specific challenges associated with digital preservation, Besser (Besser, 2000) notes that there are five specific problems related to the preservation of digital information. The first problem is the *viewing problem*, which relates to the technical context noted above. The naked human eye can view physical artifacts but digital objects require technology to be viewed. A second problem is that of *scrambling* where the digital object may have an additional layer of complexity added to it through compression to save space or through encryption either due to security concerns or because of copyright management issues. The third problem in Besser's ontology is the problem of *inter-relation*. With traditional media, the object tends to be a singular, discrete item. With digital objects, it can be a conceptual construct composed of many individual digital files. The fourth problem is the *custodial problem* – this being directly related to provenance above. Where institutions have divided the landscape of preserving analog material on a well-organized basis, no such divisions exist in the digital realm with organizations holding only part of what should be a coherent whole. Finally, there is the problem of *translation* where rapid obsolescence of file formats and digital standards results in digital objects being moved from one format to another to avoid obsolescence. However, the transformation from one format to another can cause the loss of information.

Approaches to Digital Preservation

While there are many subtle variations on a theme, there are typically six methods identified to address the problems of digital preservation listed above (NINCH, 2002). The first method is *technology preservation* and involves trying to save the actual environment required to view a digital object. This may involve saving the actual hardware and software and placing it in the environment where it can be maintained, often at a substantial cost. A second method is *technology emulation* where a substitute is developed for the original viewing technology. There have been questions about the practicality (Besser, 2000) but experiments have successfully demonstrated emulation (Seeing Double, 2004). *Data migration* is seen as an alternative to emulation, where the digital object is updated to run with modern software and hardware. However migration may not produce a perfect translation of the original and requires validation. Efforts like the Global Digital Format Registry attempt to make the validation process more efficient by providing a resource for centralizing knowledge on formats and best practises.

The first three methods are often seen as mutually exclusive but the next three are more supplementary, required regardless of overall strategy. First is *enduring care*, a catch all for activities necessary for good stewardship including recording keeping, safe storage and periodic checks. The second is *refreshing*, where new media periodically replaces the current medium to ensure the survival of the bits. Finally, the *digital archaeology* method involves reverse engineering to recover data from outdated and/or corrupted files and media.

Elements of a Digital Preservation Strategy

Regardless of the specific methodology used to preserve the digital objects, there are a number of elements of an overall digital preservation strategy that are consistently identified. Good metadata, trusted repositories, persistent identification, standards and best practices for handling, redundant storage and careful selection are all elements of a preservation strategy (Grout et al, 2000, RLG, 2002).

In the area of metadata and particularly *preservation metadata*, the institutional community has come out strongly for the need for metadata in preservation efforts. The belief is that metadata is necessary for the management and control of digital objects and the interpretation of the structure and content of the digital objects (Cedars, 2002). In specific, the PREMIS working

group refers to preservation metadata as "the information a repository uses to support the digital preservation process" (PREMIS, 2005). In fact PREMIS is the standard most cultural heritage institutions use as their preservation metadata standard. However, unclear best practices, a lack of support at the software level and uncertainty in the value of metadata impede adoption.

Similarly there has been a push towards *standardization of practices and formats* to simplify the problem. The belief is that if we use fewer formats and implementations, better tools and more unified techniques can be employed. This belief has spawned a number of best practice guidelines (NINCH, 2002, Grout et al, 2000, Jones and Beagrie, 2002) and projects like the Harvard Global Digital Format Registry and PRONOM. However creators tend to be unaware of these practices, requiring repositories to do the standardization (DeMulder, 2005). This approach adds to the cost of accepting materials and may result in repositories not accepting materials due to cost.

One goal of standardization and common practices is *distributed digital preservation*. In the simplest form this is redundant storage with most guides recommending two copies using different media. A more complex form of the idea is true distributed storage through a system like LOCKSS (Reich and Rosenthal, 2001) where organizations cooperate to store multiple copies.

Beyond secure storage there is the idea of defining the exact role of a repository to identify the characteristics of a digital institution that would reflect what a library, museum or archive represent with physical holdings. The formal definition of a *trusted digital repository* is "one whose mission is to provide reliable, long-term access to managed digital resources to its designated community, now and in the future" (RLG, 2002). This definition implies a number of things: that the institution goes beyond simply storing to managing the digital objects in its care and that the institution is situated within a community from which it draws its mandate and the specific means by which it preserves its objects. Most importantly, the goal is to provide access – this meaning that part of the mandate involves creating the tools by which viewers are able to interact with the digital object within future contexts.

Discussion of trusted digital repositories goes hand in hand with a discussion of the Open Archival Information System (OAIS, 2002). This reference model, originating from NASA, has been broadly adopted by the digital preservation community as a way of identifying the key characteristics of a preservation system. One of the most important aspects of the OAIS model is that it provides a common language and a common framework to discuss issues related to digital preservation.

The final element that is often emphasized is the issue of *selection*. Most best practice guides emphasize that the foundation for establishing a good digital collections rests on policies of selection and collection development. As one guide notes: "collection management policies that address digital materials, present the most critical challenge libraries or archives have ever had to face as custodians of our scholarly and cultural heritage" (Cedars, 2002). While this is applicable to physical collections, the speed of change and loss has altered the nature of the role of the curator. From being passive receivers of cultural heritage, they have shifted to an increasingly active role where Eastwood observes that "[the] archival experience suggests that anyone responsible to select and preserve digital objects as records will have to seek materials actively in the here and now and be prepared to educate creators of them about the needs of long-term preservation" (Eastwood, 2004).

Digital Preservation in the Context of Art

Introducing the Art Problem

To open the discussion of the challenges facing the preservation of digital art, consider two largely positivist views of new media art conservation. Baker's discussion on the symposium in January 2008 at the Getty Center titled "The Object in Transition" holds the role of conservators in a highly positive light. Baker outlines the extraordinary measures allocated to preserving the work "Indigo Blue" by Ann Hamilton (Baker, 2008), a work that crosses the line between sculpture, performance and process art. In both the work of the San Francisco Museum of Modern Art and in the discussions from the symposium, Baker reflects on the great efforts conservators expend on preserving works of art (like those of Eva Hesse) and their devotion to ensuring the survival of these pieces to future generations. A subtext one can take away from this discussion is that museum conservators would likely expend the same effort on the preservation of digital art.

Rinehart's provocatively titled piece "The Straw that Broke the Museum's Back?" echoes similar positivist views on the preservation of art, despite the title. His conclusion implies museums will succeed in preserving at least some digital art when he suggests that "[n]or are contemporary net.artists, working in undeniably ephemeral and center-less spaces, preventing the grand urge to collect, classify, and preserve" (Rinehart, 2000). In Rinehart's vision of the future, museums and artists will collaborate in intimate fashion from the inception of the piece to its final form, documenting and making joint decisions on how the piece will continue to materialize in the future. Rinehart suggests the existence of solutions to the problem of preserving digital art is not risible but in fact entirely tractable through concerted effort and careful but early steps. It is worth noting that while these positivist views imbue the conservator with a great deal of credit (and resources), the reality is rarely so. As noted in Baker, the Berkeley museum did not have the resources to conserve Hesse's "Auguht" and in fact few museums have the resources. A more pragmatic view comes from Besser (Besser, 2001). Returning to the digital preservation problem taxonomy, there are two problems specifically germane to electronic art – the problems of inter-relation and translation. Regarding inter-relation, web art is

challenging because the work often include references to web pages and sites central to the work but may not part of the work itself. If these pages change, the work itself may change in undesirable ways. In direct contrast to Rinehart's positivist take on the challenge, Besser fears that the "task may prove to be huge (and possibly intractable)".

Secondly, translation is problematic in that while digital art can be portable to different devices and contexts, these new contexts may alter the meaning. For example, consider Gary Hill's work where the work is meant for CRT displays and Hill's insistence that displaying the work on LCD flat-panel displays would be an alteration in violation to the spirit of the original work.

Besser goes on to identify characteristics of electronic art that make the problem different from the problem of analog or physical art works without electronic elements. In contrast to physical art, electronic art:

1. Lacks fixity
2. Can be dynamic
3. May have boundaries that are difficult to discern
4. May have critical format elements that make them challenging to work with but by changing them alter the work itself
5. May have difficulties guaranteeing authenticity
6. Can be malleable
7. Most importantly, can be difficult to define the precise nature of the work.

Besser poses the last characteristic in the form of the question "[w]hat really is the work?" and points to a 1980 piece "Hole in Space" that was simply a video feed between New York City and Los Angeles. If recreated, would this represent the work accurately? Would replaying the feeds from the time the installation stood from both NYC and LA be a sufficient representation of the work?

In placing digital preservation into the context of art, it is important to recap three trends evidenced by the broader digital preservation community.

1. The emphasis of digital preservation efforts has primarily been at the organizational level. In essence, digital preservation is an institutional effort that reflects institution priorities and resources. Selection and management policies are based on the challenges and goals of the institution.
2. The focus has been on the idea of the object – that it is possible to identify a discrete item. Discussions of information packages and bit-streams emphasize portability and manageability. The idea that it is possible to manage an object through its lifecycle also assumes discrete and concrete stages through which an object moves.
3. The goal has been towards standardization. The digital preservation community is heavily rooted in standards and best practices. Guides on best practices emphasize careful consideration to the kinds of material included in a repository and experimental work and prototypes often reflect the goal of moving incoming material into "archival" formats that can be more easily handled, as they are better known.

These trends have a significant impact at the intersection of art and digital preservation and need to be explored to understand the particular challenges of preserving art in digital form.

The Notion of the Object in Digital Art

The question of the amorphousness of digital art raised by Besser is passionately argued by Jon Ippolito (Ippolito, 2004). He suggests that the fixity of the object endangers digital art itself, that "[w]hile the reductionism of the wall label enfeebles conceptual and single-performance art, it threatens to obliterate digital culture completely." Instead, he argues "new media artwork must keep moving to survive". Ippolito points to a number of dimensions where new media art breaks out the traditional bounds that conservators would like to place on the work. He suggests that unlike traditional art, new media art has variable authorship, titles, dates, media, dimensions and even collections.

For instance Winget (Winget, 2005) describes the piece "Loops", a portrait of Merce Cunningham by Paul Kaiser, Shelly Eshkar and Marc Downie. The piece combines sensors on Cunningham's hands to record the movement from Cunningham's "Solo Dance for Hands and Fingers", which is then interpreted by an artificial intelligence algorithm to display the sensor nodes in conjunction with recorded narration and music. However, not only do these work in conjunction with one another but the piece also changes in the presence of viewers. As with the piece "Hole in Space", it raises the question of what to preserve. As Winget notes, videotaping any given instance is incomplete and unlikely to capture the essence of the piece, but if you have to restage the piece, one is left with questions as to what are the essential features of the piece that need to be restaged and what features can be altered to reflect the changes in the technical environment.

The Institutionalization of Art

Issues surrounding of the institutional nature of art and in particular art conservation and preservation are not endemic to digital art. This is a challenge across all genres of art. In particular, the co-mingling of artists and conservators at earlier and earlier stages of the work raises questions as to the nature of that institutionalization. So when Rinehart (Rinehart, 2000) calls on the art community to define the types of metadata required and to develop methods for intellectual access to digital art, to which community is the question addressed to? Is there actually a cohesive organization that can speak for artists across all genres and types to answer these kinds of questions? Clearly this is a rhetorical question as there is indeed no singular entity that can address issues for all artists – there are both many organizations and there are no organizations where independent artists are concerned. Yet unless artists undertake the role of preservation themselves, the

decisions as to what to collect and how to preserve will rest in the hands of institutions and organizations potentially without regard to the sensitivities of the artists.

In particular, new media and digital art tends to be subversive in nature, bucking the general paradigm espoused by the prevailing institutions that reflect normative identity and majority views. As Lloyd notes (Lloyd, 2007), this is problematic as "[d]ecision makers do not have the resources to preserve everything. Therefore, decisions have to be made about what is significant, and, consequently, whose interests are to be acknowledged, what documented history is to be privileged, and whose history is to be marginalized or silenced." While Lloyd is speaking towards cultural heritage materials, this idea of significance can certainly be extended to art. This is especially so in the case of digital art where intervention must occur early and often. In such cases, conservators and decision makers may not have the benefit of hindsight to identify works of cultural significance and the act of collection and preservation may pick winners and losers in the game as it were.

This, however, assumes the hegemony of the institution in the preservation of digital art. Gracy (Gracy, 2007) would argue that another possibility is a more likely reality: that "the curatorial or archival authority with which cultural heritage institutions are invested may diminish to the point where society may question the need for such entities to perform such work" as technologies of disintermediation become more widely available. With websites like Flickr and YouTube, individual viewers have the ability to curate their own collections and act in ways necessary to preserve the work. This comes as little surprise to new media artists as the community has been outside of the mainstream for some time and has experimented with alternative approaches to curating work. Grubinger's experiment with C@C (Grubinger, 2006) was ground breaking in allowing artists to curate other artists' work as part of the overall interaction process. While the experiment was ultimately abandoned, it can be argued that the idea was simply before its time. Later projects like low-fi and turbulence have taken up the banner of independent curation. Paul notes that "even though it may not be their explicit goal, these projects implicitly challenge the structures of legitimation created by the museum system and traditional art world" (Paul, 2006). Instead Paul sees the reconfiguration of the traditional roles of the curator, artist, audience and museum due to the transformative nature of the technology, technology that allows distributed curation, automated filtering by software and wider dissemination of works than at any other prior time.

Here then is the contradictory challenge of institutions in the context of digital preservation. On one hand, institutions may act in a pre-emptive manner selecting out some for wide dissemination and preservation while leaving others out not through the benefit of broader discourse on the value and meaning of the works but due to pragmatic matters reflective of individual institutions and policies, policies which may be out of date or incomplete. On the other hand, the power of digital dissemination may reduce the legitimating role of institutions to the point where their value as entities comes into question. Yet, without institutions, preservation for the common good becomes problematic. If YouTube and Flickr are cited as the type of democratizing forces that allows greater numbers access to artists disenfranchised by the traditional art institution, then what are we to make of the fact that they are commercial entities whose sole goal is the enrichment of their shareholders and not beholden to any notion of public good or enduring value?

Standard Art?

The issue of standards in the context of art is an especially interesting discussion. As Grubinger notes, "[a]rtists often embrace new technologies as a means in itself rather than a means to an end; they tend to fool themselves by the seemingly limitless possibilities of new techniques" (Grubinger, 2006). Artists who have embraced new media and digital art are likely pushing the leading edge of technology where standards have yet to form and practises either do not exist or are untested. This is problematic as museums are unlikely to be equipped to address the new and potentially complex formats that the artists are using. As such, museums may be reluctant to work with the piece compared to a work whose components are better known, leading to artists pushing the envelope being marginalized.
What may be somewhat more troubling for artists though is the idea that their work should be constructed with preservation in mind. In the preservation study of Ars Electronica (Becker et al, 2006), some of the work was intended to be ephemeral in nature and therefore the choice of technologies and formats reflected an insistence on the transient. If museums and art galleries begin to insist that works be done to standards of preservation in order to be accepted by the institution, it may preclude artists who either are unable to work with the standards for technical reasons or who have made a conscious decision to make the work ephemeral in nature.

Case Studies in Preservation of Art in the Digital Realm

While the theories and strategies for digital preservation and art are still evolving, it is important to note that the community has not stood still. There have been a number of projects related to the preservation of new media and digital. Below are highlighted two projects, each representing a prototype for a specific approach to digital preservation and art.

Seeing Double

One of the most interesting exercises in digital preservation experimentation was an exhibition hosted by the Guggenheim Museum in spring of 2004 titled "Seeing Double" (Seeing Double, 2004). The goal of the exhibition was to bring together the original new media works and try to use emulation (see Rothenberg, 1998 for a fuller discussion of emulation approaches) to reproduce and re-

interpret the work. It was hoped that presenting the two together would allow both experts and the layperson to "decide for themselves whether the re-creations capture the spirit of the originals". The range of techniques used varied from the simple storage and redisplay in Cory Arcangel's "I Shot Andy Warhol" piece (where the hacked hardware limited the options to the restaging and filming of Robert Morris's "Site"), to the creation of a software emulator to recreate the environment for the code in Grahame Weinbren and Roberta Friedman's "The Erl King".

The interviews with the artists reflecting on the emulation effort of the exhibition were particularly intersting, where the range of opinions spanned the spectrum of responses. Weinbren and Friedman viewed the new emulation hardware and environment as merely the carrier. In essence the "apparatus is no more than what makes the interactivity possible, so a digital version of the piece, whatever equipment it runs on, will be exactly the same piece." This differed from John F. Simon Jr. ("Color Panel") who felt variations are simply part of the process. Morris, in reflecting on the filming of the restaging of his piece, felt the recreation was more about the director than it was about himself as an artist. Finally, Arcangel felt that the piece would lose meaning without the corresponding hardware. If it were redone in fifty years, he'd want the original hardware, but failing that, not to have the museum try to recreate the hardware but rather to give away the software so that individual viewers could play with the code in their own context.

Ars Electronica

While the Seeing Double project is more about experimenting, the Ars Electronica project focuses on information gathering. Ars Electronica is one of the world's largest collections of digital art in the world (Becker et al, 2007) and comprises over 30,000 works with 3,000 new works per year. A joint effort between the Vienna University of Technology and the Ludwig Boltzmann Institute Media.Art.Research undertook a pilot project to preserve a portion of the collection by trying to capture both the intentions of the artist as well as the experience of the viewer. The PLANETS digital preservation planning process was used to assess the essential characteristics of the works to determine the best course of action within the preservation context. By using workshops with interested parties like curators, art historians, computer scientists, specialists and management, the characteristics of the works are identified. The next phase of the pilot project is to use the information to implement a preservation strategy and evaluate the results.

Strategies and Solutions for Art Preservation

The majority of the strategies for preserving digital art fall within the rubric of solutions proposed by the broader digital preservation community. However, there also exists work specifically focusing on digital art preservation.

As Depocas suggests (Depocas, 2002), without documentation we would be unaware of the majority of the panoramas from the 19th century and in particular, their influence on the public. He then draws the parallel with new media art. For digital art, greater viewership and access increase the likelihood of the work being preserved for the future. As a result, documentation is critical to the survival of digital art as it increases the opportunities for access. One challenge is to update the principles of documentation to reflect new media works where measures like dimensions no longer apply. As Depocas suggests, digital art in particular lies at the intersection of physical art objects and art events where they have an instantiation that changes over time. One important argument for good documentation rests in the need to reinterpret the work from its original context to the current context so that the viewer is aware of how the work was intended to be.

An extension of the idea of documentation is the Media Art Notation System proposed by Richard Rinehart (Rinehart, 2007). Rinehart suggests that digital and media art forms have greater similarity to music than traditional visual art forms and suggests that how music is preserved and passed on can provide inspiration for how to document new media and digital art. What Rinehart proposes is a systematic approach for documenting media art so that it can be "played" back in different technical contexts but with end results as intended from the artist – in essence, a score for any performance of a new media piece. However, unlike musical scores which have a specific language that one must learn, Rinehart proposes couching the MANS system in an existing notation system, in this case XML, to reduce complexity and increase adoption.

Complex Media Art: An Example

While many new media projects involve some degree of technology, the issues of experiential pieces, emergent technologies and complex interaction are often most fully realized in projects developed between computer scientists and artists. One such case is a course co-jointly taught by the University of Calgary and the Alberta College of Art and Design. In this course, students drawn from computer science and art are given the task of jointly developing a piece that explores issues in both disciplines. The resultant pieces produced typically include software to control the piece, physical interaction and reactivity to the viewer.

In the most current iteration of the course (2008), pieces included: a video booth where the reactions of the viewer to pre-selected videos were recorded as a means of influencing the next viewer; a meditative piece involving projecting Persian patterns into a reflecting pool where the drawing of the pattern is influenced by the viewers around the pool accompanied by audio recordings of spoken Persian poetry; a large screen projection with 3D animations where the animations are determined by the presence and location of sculpted figures on a chess-like board; another 3D projection where the viewer can alter the perspective of the projection through a large button; and an interactive piece where viewers can draw using large virtual crayons onto a projected surface with the movement of the crayons generating tones.

Consider, for instance, the video reaction booth. The work consists of a telephone booth sized wooden box. On the side is a single computer monitor. Inside is a second monitor with a set of three buttons, a chair with a sensor mounted to it and a web camera. The monitor on the outside continuously loops still images of the recorded reactions of previous viewers. When a viewer enters the booth and sits down at the chair, their presence is signaled to the system where it starts recording (through the web camera) just the head of the viewer from a frontal perspective. This recording now also starts displaying as still images on the external monitor alongside the previously recorded streams. The viewer inside the booth is presented with an interface consisting of a gallery of pre-recorded video streams of the reactions of viewers to videos that range from extreme topics including car crashes and self-immolation videos to videos of laughing babies.

To analyze this work from Besser's typology, we have a number of issues. From the standpoint of the viewing problem, two research technology frameworks were used to create the display: *Phidgets* to provide physical user interfaces and *Processing* to handle video / on screen user interfaces. As each framework is based heavily in research activities, they lack the stability of commercial products. More importantly they have the potential for changing over time or being abandoned when the research value is no longer there. Since both frameworks are independent of the artwork, substantive changes to either framework could impact heavily the ability to restage or migrate the software driving the work. From the standpoint of inter-relation issues, consider the dynamic nature of the work. As viewer reactions are recorded, the experience of the work changes for any subsequent viewer. A viewer encountering the work devoid of any recorded reactions will have a very different sense of the work compared to a viewer coming into the work with a large quantity of reactions recorded. Equally important, we have two viewer contexts to how the work is experienced – the outside experience and the inside experience. Scrambling is also an issue as video formats are invariably compressed to save space and improve performance. From a custodial perspective, the work represents a challenge in terms of the rights of those being recorded. Would transferring the work from one institution to another allow for the transferring of the recorded reactions? If not, those experiencing the work in the new location would be engaged in a new experience. Finally, the issue of translation would be problematic as there are two technical frameworks in additional to the base computer system and specialized hardware that would have to be translated from one instantiation of the work to another. Documentation would be critical to restaging the work but this is a case where even the documentation is complex. Because the work is the product of two people with very different aims (the artist and the computer scientist), assessing the aspects of the work that would be critical for restaging the work would depend entirely on whom you asked. All of this raises the question on whether the work could be preserved in a way that future viewers could experience as intended or whether the documentation would exist solely to record the experience as it occurred.

Conclusion

While this paper does not provide any definitive answers as to how art and digital preservation will play out in the next twenty years, this is because that future is still quite murky. Programs like the NDIIPP in the US and PLANETS in the EU are attempting to address issues at a very broad level. Museums are still trying to shake the idiosyncratic nature of their heritage and collaborate in a networked fashion in ways that their library and archives brethren have long since adopted. Artists are just starting to explore the limits of digital technology. These are not questions that will be answered in the near future. However, what has been presented is a broad overview of possible directions. While work has been done to classify and identify the digital preservation issues, things like Besser's taxonomy are not substantively supported by empirical findings but reflect anecdotal observations. Solutions like migration and emulation still have to be tested against a large corpus of material beyond that of the current test sets. Even the durability of the physical carrier media is still in doubt with only good longevity tests having been done on magnetic tapes for data. The impact of the network and democratizing means of publishing have not been fully realized in the context of art nor have new economic models fully taken hold yet in the art world. This leaves in question where the resources for the preservation of digital and new media art will come from given that current institutions are stretched thin with existing challenges. Thus the lack of a definitive conclusion is a reflection of a field at a very early stage where much remains in flux.

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