

Digital Conservation

Write a paragraph giving an overview of digital conservation.

1. Display

investigate, identify and evaluate the methods used and considerations involved in the presentation, conservation and care of artworks while on display in an exhibition space

Possible considerations might involve but are not limited to the following:

Artist Intent

Examination and documentation of the 'original substance'. This includes:

- Technical composition
- Intended behaviours and functionality
- Technical dependencies

Backup

Source code analysis

Documentation

Identify vulnerabilities: its dependence on a specific operating system, a specific piece of software, or customized hardware

- List the failure points for preserving digital media, from hardware and software vulnerabilities to obsolete institutional practices and intellectual property laws.

What are the risks when displaying digital artworks and what are some strategies to mitigate them?

2. Storage, Handling and Transportation

investigate, identify and evaluate conservation and care in the handling, storage and transportation of artworks

Storage

Emulation

Migration

Reinterpretation

What are some risks and considerations when storing digital artworks? What strategies do galleries use? What strategies could you use?

Write a paragraph giving an overview of digital conservation.

What is digital conservation?

Why is it important?

What is the difference between digital and physical conservation?

What is the galleries role in digital conservation?

What are some of the current arguments or controversies when it comes to digital conservation?

1. Display

Information:

DIGITAL TECHNOLOGY IS so ephemeral that an artwork created using a G4 Mac, Flash 4.0 software and C++ coding today may no longer be viewable 10, 20 or even 200 years from now.

Film canisters are collecting dust after 75 years of nonuse, video formats from the 1980s are becoming unreadable and Web projects created just minutes ago are already becoming stale.

As the half-life of these media becomes shorter and shorter, variable media art is in a race against technological obsolescence.

While there are standards for preserving more traditional forms of art, such as photography and printmaking, those standards don't yet exist for digital art. Instead, individual institutions have developed their own digital art preservation programs.

"This is a completely different way of thinking about art," Ippolito said. "It's no longer about storage. It's about preserving intent, rather than bits or bricks.

"It's about collecting the authority and experience to recognize an artwork in a medium that hasn't existed yet. That's a pretty radical step." said the Guggenheim's associate curator Jon Ippolito

<https://www.wired.com/2002/07/how-to-preserve-digital-art/>

Artist Intent

Examination and documentation of the 'original substance'. This includes:

- Technical composition
- Intended behaviours and functionality
- Technical dependencies
- Source code analysis

Conservators must identify and secure the proper resources for the long-term preservation (such as specific hardware and peripherals, source code, executable programs, or media assets like video or audio files).

Backup

During an artwork's acquisition, conservators copy the data necessary for reexhibiting the artwork from physical storage media (such as computer hard drives, optical discs, and floppy disks) before the data becomes inaccessible. Conservators then move this data to preservation storage, where multiple copies are kept and monitored for data integrity.

<https://www.guggenheim.org/conservation/the-conserving-computer-based-art-initiative>

Identify vulnerabilities: its dependence on a specific operating system, a specific piece of software, or customized hardware

- List the failure points for preserving digital media, from hardware and software vulnerabilities to obsolete institutional practices and intellectual property laws.

<https://www.guggenheim.org/wp-content/uploads/2019/12/guggenheim-sample-acquisition-checklist-web-artwork.pdf>

Extra resources

<https://www.guggenheim.org/conservation/the-conserving-computer-based-art-initiative>

<https://blog.still-water.net/is-reinterpretation-the-new-emulation/>

https://digitalcuration.umaine.edu/dig550/dig550_syllabus.html

2. Storage, Handling and Transportation

Storage

Emulation

Migration

Reinterpretation

Storage is the default preservation strategy that comes to mind to most lay practitioners, and some professionals as well. But storing a digital file on a magnetic tape or disk drive does nothing to prevent the eventual obsolescence of its software and hardware, from video codecs and web formats to floppy disks, CDs, and USB drives. **Migration** is another strategy that can be used to preserve documents and files by moving them from one format to another. While a common standard in analog audio and video preservation, migration can be less effective for digital files, which often depend on layers of software and hardware context that are difficult to update along with the audio or video itself. **Emulation**, a third strategy mentioned in *Permanence Through Change*, describes a newer medium impersonating an older one. This is especially useful for computer programs, because an emulator can run original code for a platform that's now obsolete, such as the Atari, on contemporary

Storage

The most conservative collecting strategy-the default strategy for most museums-is to store a work physically, whether that means dedicated equipment or archiving digital files on disk. The major disadvantage of storing obsolescent materials is that the work will expire once these ephemeral materials cease to function.

How can you store your artwork? Is there a risk of dead media?

A file tends to endure longer if it:

- obeys an open standard;
- is not compressed;
- is an (uncompiled) source;
- has no patents or encryption;
- is compatible across different platforms and operating systems.

Choose the formats you might expect to encounter with your exhibited artwork, and also your own artwork. Decide which of your chosen formats merits a rating of short-, medium-, or long-term shelf life. Then list them along with their rating in increasing order of longevity and explain your reasoning

- **Text file:** ASCII Text (.txt), HTML, MS Word (.doc), Office Open XML (.docx), Open Document Format (.odt), PDF, RTF (Rich Text Format)
- **Web application:** CSS (Cascading Stylesheets), Director (Shockwave), Flash, HTML, Java, JavaScript
- **Database:** Access, Filemaker, Past Perfect, MySQL, NoSQL, Oracle, PostGresQL, TMS (The Museum System), XML (Extensible Markup Language), RDML (Relational Database Markup Language)

- **Server script:** .NET/C#, Java (servlets), PHP, Ruby, Python, JavaScript (node.js)
- **Spreadsheet:** Comma-separated values (.csv), Excel (.xls), Google Sheet, Apple Numbers, Office Open XML (.xlsx), Open Document Format (.ods)
- **Vector image:** Flash (.swf), Illustrator (.ai), PDF, SVG (Scalable Vector Graphics), CGM (Computer Graphic Metafile), EPS (Encapsulated Postscript)
- **Raster image:** Bitmap, GIF, HTML5 (canvas), JPEG, JPEG-2000, Photoshop (.psd), PNG, TIFF, HEIF
- **Audio file:** AAC, Copy-protected CD, FLAC, MP3, PCM (Pulse Code Modulation), DTS-HD, Ogg Vorbis, Windows Media Audio, WAV
- **Video file:** Motion JPEG 2000, MXF (Material Exchange Format) JPEG 2000, BluRay, Copy-protected DVD, MPEG4, Ogg Theora, QuickTime (.mov), WebM/VP9, Windows Media Video, HEVC, AV1
- **Mobile app:** iOS Native (Objective-C), iOS Native (Swift), Android native (Java), Android native (Kotlin), Web app (Cordova), Hybrid app (React Native), Hybrid app (Kotlin)

Emulation

Emulation is a powerful preservation technique in which newer platforms simulate older platforms. To emulate a work is to devise a way of imitating the original look of the piece by completely different means.

For example, every year, hundreds of retro video games are rendered unplayable as old consoles—from Super NES to PlayStation 1—stop working. Emulators allow you to play game ROMs on modern platforms.

<https://au.pcmag.com/gaming-4/68198/the-best-emulators-for-playing-retro-games-on-modern-devices>

- What are the pros and cons of emulation? What are the risks and considerations? What strategies can you use to minimise these risks?

Migration

To migrate a work involves upgrading equipment and source material. Migration is a current strategy applied in the effort to preserve media artworks. Certain technologies at risk due to obsolescence can be replaced by new technologies that are both more efficient and available. However, in some cases, conducting such migrations can be dangerous, as technologies that are too recent may present conservation risks of their own. A lack of knowledge about their maintenance, functioning and installation could lead the restorer and/or conservator to think twice before upgrading this equipment.

Migrating information from one medium to another provokes the question of what digital preservation really means.

- What happens if you make a copy of a copy of a copy (and so on) of a VHS tape? What happens if you apply MPEG-4 video compression repeatedly to a movie.
- Convert your file to the format that is closest to the one you think is the best preservation format

Reinterpretation

Reinterpreting an ephemeral or obsolete artwork means remaking it from the ground up, sacrificing fidelity to the original material in favour of fidelity to the original spirit—or, at times, to the aesthetic possibilities of a new artwork. Reinterpretation is a dangerous technique when not warranted by the artist, but it may be the only way to re-create performance, installation, or networked art designed to vary with context

Which is more important to preserve, the original recording or the original score? (Recordings include CDs, videotapes, and screencasts; scores include musical scores, scripts, performance instructions, and code).

- What are the advantages and disadvantages of reinterpretation?
- How could your gallery artwork be reinterpreted? How could your artwork be reinterpreted?

Extra resources

<https://www.docam.ca/en/21-conservation-strategies/213-from-emulation-to-migration.html>

- [Community Owned digital Preservation Tool Registry \(COPTR\)](#).
- [Tool grid](#) makes it easier to choose a tool from the COPTR list.
- [COPTR Community Owned Workflows](#) are shared digital preservation methods.
- [Content Management System feature grid](#) by Ashley Blewer.
- The [Awesome Digital Preservation list](#) is a comprehensive list of resources by Andy Jackson et al.
- [Digital Preservation Q&A](#) makes it easy to find answers to common questions.

Example Case Study 1:

From <https://variablemedia.net/e/index.html>

Mark Napier
net.flag, 2002.

Interactive networked code

Commission of the Solomon R. Guggenheim Museum, New York



Above: Artist's sketch for the project.

Mark Napier's Net Flag is a Java applet—a computer program accessed from the World Wide Web via browser, that provides an interface for the creation of a hypothetical flag for the Internet. Visitors to the Web site can combine the geometric elements of a wide assortment of international flags to create a unique, hybrid flag to serve as an emblem for the Internet's dissolution of national boundaries. The actions of each visitor are stored on the Web server, so that subsequent visitors can view the modifications made by previous visitors and thus ascertain how the flag has evolved during the course of the project.

As a Java applet that relies on the Internet to record the traces of participants, Net Flag is interactive, encoded, and networked. If the artist agrees it can be exhibited in a physical setting such as a museum, then it is installed as well. All of these behaviors are vulnerable to technological obsolescence or cultural amnesia: interactions via keyboard and mouse may be superceded by another interface; the Java programming language may be unreadable by future browsers; Web projects written for the current version of HTML may not be accessible over future versions of the Internet; and future display technologies (such as smart walls) may not offer the look and feel of an original installation context (such as a monitor on a pedestal).

Preservation strategies to explore include:

Software

Storage	How should the original digital files be stored?
Emulation	Should the original software be rendered in an algorithmic metalanguage for future emulation?
Migration	Should the original software be regularly translated into updated versions to evade obsolescence?
Reinterpretation	Can the original software be replaced by a different protocol that creates a comparable experience for the viewer—even if this results in altered appearance?

Interaction

Storage	When technological obsolescence or access restrictions prevent viewers from interacting with the work in its original version, could it still be displayed with the interactivity disabled?
Emulation	Could viewers interact with a clone or facsimile that did not save their modifications?
Migration	Should the work's medium be upgraded to enable interaction?

Reinterpretation	Should the work be reinterpreted to enable interaction?
Simultaneous exhibitions	
Storage	Should simultaneous exhibitions of work in different venues—concurrent display or access on the Guggenheim and ZKM Web sites—be forbidden?
Emulation	In the case of simultaneous exhibitions, should traces of previous visitors be erased for each new venue?
Migration	In the case of simultaneous exhibitions, should traces of previous visitors be inherited from previous venues but diverge for future venues?
Reinterpretation	In the case of simultaneous exhibitions, should all the traces of previous and current visitors be maintained for all clones via data loop?
Resolution	
Storage	[no options]
Emulation	Should the original screen resolution be maintained even if the image becomes diminutive relative to contemporary standards?
Migration	Should the resolution be increased to match contemporary standards even if the image becomes pixilated as a result?
Reinterpretation	Should resolution be improved to match current standards by interpolating or re-creating the image?
Browser display	
Storage	Should the work be displayed with browser navigation bars but no reference to exhibition context?
Emulation	Should the work be displayed without browser navigation bars?
Migration	Should the work be displayed with navigation bars provided by the institution exhibiting the work?
Reinterpretation	Can the work's appearance be completely reconfigured to fit each new exhibition context?

Real-world
references

Storage [no options]

Emulation Should the flags of defunct countries be removed; the flags of newly formed nations be added; or modified flags be updated?

Migration Should re-creations account for geopolitical changes by deleting obsolete flags and modifying any flags that have changed?

Reinterpretation Should re-creations account for geopolitical changes by choosing a new selection of current flags based on the artist's criteria? What would those criteria be? Could *Net Flag* utilize contemporary geopolitical emblems other than flags in future re-creations?

Example Case Study 2:

Nam June Paik
TV Garden, 1974.

One- or two-channel video installation with live plants and monitors; color, sound; dimensions variable.

Pending acquisition, Solomon R. Guggenheim Museum, New York



Above: Installation view at *The Worlds of Nam June Paik* at the Guggenheim, New York, 2000. Photo by Ellen Labenski.

To enter Paik's *TV Garden* is to experience an uncanny fusion of the natural and technological. Hidden amidst a dark undergrowth of live shrubs and trees are video monitors of varying sizes playing the artist's *Global Groove*, a signature videotape that montages performers from around the world into a gyrating visual mix. The musical and spoken soundtrack for the video serves as ambient counterpoint to the indirect flicker of light from the monitors.

Vulnerable aspects of this work include its reproducible source medium (video); its duplicable display mechanism (monitors), and its site-variability of the installation.

Preservation issues to explore include:

Video source

Storage	The original videotape of <i>Global Groove</i> is 3/4 inch NTSC. In addition, Paik authorized a second channel for an installation of <i>TV Garden</i> in Wellington, New Zealand. What is the best way to conserve the source material?
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Emulation	If the source is ported to future formats, such as DVD or digital video, should re-mastering emphasize the exact re-creation of the viewer's original experience rather than bringing the work's medium up-to-date?
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Migration	If the source is ported to formats (DVD, digital video, etc.), are changes in the viewer's original experience acceptable as consequences of bringing the work's medium up-to-date? How would the number of channels vary with the size of the installation?
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Reinterpretation	Is the size of the installation or number of channels meant to vary according to subjective criteria determined by the artist? If so, what is the best way to convey those criteria to future generations?
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Video equipment

Storage	Should dedicated monitors/casings be stored?
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Emulation	If and when cathode ray tubes are no longer manufactured, should the museum emulate a video monitor by embedding a flat screen into an obsolete monitor casing?
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Migration	Can the choice of monitor brands and types vary according to local availability?
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Reinterpretation	Were the technology available, could the video be projected in two or three dimensions?
Installation	
Storage	[no options]
Emulation	Are there any foreseeable installation contexts in which it would be appropriate to custom-build a space to fit the work? If so, which past installation of <i>TV Garden</i> should this re-creation attempt to emulate?
Migration	Can the choice of plants vary according to local availability? Should the scale of the installation be expanded to fit each new exhibition context? What are the limits of such expansion, if any?
Reinterpretation	<i>TV Garden</i> has been installed on bases of mulch, gravel, or dirt. It has also been installed with and without a platform for visitors to walk on. What should determine the substrate and viewing area used for each context?