Netherlands Media art Institute, Montevideo/Time Based Arts

presents

Pilot Project Preservation Video Art

a summary

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Pilot Project Preservation Video Art

a summary

How to preserve video art? Is digitization a legitimate solution to this problem; what factors play a role in the preservation and digitization of video art and how should we go about it? These are only a few of the questions to which a number of museums and other institutions, under the supervision of the Netherlands Media Art Institute, MonteVideo/Time Based Arts, have tried to find an answer through the Pilot Project Preservation Video Art.

Objective of the Pilot Project: To gain an insight into the procedures, technique and costs involved in the digitization of video art.
Result: Preservation criteria, preservation plan and cost calculation for the digitization of the participating video-art collections. The criteria formulated can be used as a guideline for the preservation of video art.

Starting points

- the currently known carriers of the video signal have a very limited life span;
- the loss of quality involved in the transfer from analogue to digital is negligible, in contrast to that which inevitably occurs during conversion from analogue to analogue;
- none of the carriers is durable; the solution for definitive preservation will have to be sought in the sphere of storage in an encoded form, so that it is possible at all times to transfer the information to another material environment without loss of quality;
- digitization generates new possibilities for editing, restoration, availability, and, for example, links with text-database files;
- since the specific technical elements are subject to deterioration, it is essential that, whatever happens, the original character of the work of art, the artist's intention, the message and its effect, can be guaranteed.

In 1998, a work group consisting of Christianne Berndes (Stedelijk Van Abbemuseum, Eindhoven), Mathilde Heyns (De Appel, Amsterdam), Poul ter Hofstede (Groninger Museum, Groningen), Andree van de Kerkhove (Museum Kröller Müller, Otterlo), Heiner Holtappels (Netherlands Media Art Institute, MonteVideo/Time Based Arts, Amsterdam), Pieter van Oordt (Rijksakademie van Beeldende Kunsten, Amsterdam), Dorine Mignot (Stedelijk Museum, Amsterdam), Jacqueline Rapmund (Museum Boymans-van Beuningen, Rotterdam), Christine de Baan (Rotterdamse Kunststichting, Rotterdam) and Ton van Vliet (World Wide Video Center, Amsterdam) met several times under the chairmanship of Evert Rodrigo (Instituut Collectie Nederland) to discuss preservation guidelines and procedures. Nadine Bors (trainee Reinwardt), in collaboration with the Netherlands Media Art Institute, MonteVideo/Time Based Arts, carried out a fact-finding study on state-of-the-art technology.[1] A separate work group, consisting of Gaby Wijers, Dorine Mignot and Christianne Berndes, focused on performing rights and copyright, and formulated contractual starting points. Ramon Coelho and others (Netherlands Media Art Institue, MonteVideo/Time Based Arts) were in charge of the set-up and (external) realization of digitization trials. The project, commissioned by t/TBA, was coordinated by Gaby Wijers (Toxus). An intensive exchange of information and know-how took place with the Theater Instituut Nederland (Mickery collection).

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Summary and framework

The greater part of video works in various collections was originally recorded on outdated, now no longer playable, formats and systems. In the early 1990s, within the framework of the "Deltaplan Cultuurbehoud" (Delta Plan Culture Conservation), the most important tapes, which were threatened by total erosion, were transferred to the very high-quality Betacam SP system. However, in order to ensure adequate preservation of an analogue system, the contents of the tapes need to be transferred to another carrier every seven to ten years. Moreover, copying leads to loss of quality. The same problems arise with the preservation of newer works. Now that it is technically and financially possible, the works from the 'first phase' and recent video works from museum collections and those of other institutions should be spared from fast deterioration by conversion to digital carriers. In this way, loss of quality would be avoided, and the works could be stored on (presumably) more durable carriers. Moreover, as well as new possibilities for editing and restoration, digitization also offers new channels for presentation and distribution, whereby this part of our cultural heritage can be made accessible to interested institutions and private parties. Within the Pilot Project Preservation Video Art, firstly the conditions to be met by technology were formulated, and subsequently a choice was made for a specific preservation technique, and the financial consequences were mapped out.

The preservation of video art

The preservation of modern art, and specifically that of a relatively new medium such as video art, is in fact virgin territory with no clear definitions. Forms of expression, formats, and (im)possibilities of new systems come and go at great speed. Standards simply do not exist. There is no insight into the ageing process, there are no preservation criteria, and expertise on the composition of this medium is hardly accessible. This makes preservation even more complicated.

On the one hand, at a museological level, the preservation of video art has some common ground with the preservation of, for example, installations. Indeed, such a work of art can only be experienced in its entirety when the installation is 'running', that is, when software and hardware are active. On the other hand, there are similarities with the highly topical preservation of film, and of audiovisual (broadcasting) archives, with a comparable carrier (video). Furthermore, there are parallels to be drawn with other reproducible media, such as photography and graphic art. Material studies, projects on public accessibility, experiences with conversion to different carriers, etc., yield much that can be used in the preservation of video art. However, the differences are fundamental. Film, photography and graphic art are different media, with different components and different means of presentation and distribution. Art(ists') films are only a fraction of film as a whole. Audiovisual archives centre on the information stored on tape.[V] In video art, video is the carrier of the work of art.

Video art and visual art

In the Pilot Project Preservation Video Art, the accent lies on expressions of visual art whereby video is used as a medium, both during the production process and in the presentation. However, video recordings of artistic work (for example, performances) are also important, because, in many cases, the video tapes are the only form of registration of such works. Characteristic of video art is that there is a carrier of the signal (the software), which can only be made visible with the help of playback equipment (the hardware) in a manner of presentation that is either specific or not. Time lapse (time-based art) and interactivity could play a role in this. Information on the works, the manner of presentation and the artist's intention are crucial to the preservation of modern art.

Whether or not the playback equipment and manner of presentation are essential to the meaning and perception of the video work is, in many cases, unknown. Whether replacement of the current equipment will affect the authenticity of the work of art is questionable. By definition, digitization of video art means changing the carrier and playback equipment of the work of art. Therefore, the artist should be asked this same question with regard to conversion to a digital format. In video art, the accumulation and registration of such information is still in its infancy.

The traditional codes for the visual arts, such as the uniqueness of the manifestation, do not apply to video art. Video is a technologically reproducible medium. As with negatives in photography, video has a master tape, of which the necessary copies are made. This means that the participating institutes could have not only originals and various generations or types of duplicates, but also the same work in their possession. Due to the technical capacities of the medium at its moment of creation, a video work gives an image of its time, but in view of the essence (reproducibility) of the medium, it is not the specific technology, but rather the original character of the work as registered on the carrier, that is adopted as the starting point of the Pilot project.

Preservation techniques for video art

The preservation of video art is internationally felt to be a very complex problem. In 1995, a symposium on this issue was organized in Wolfsburg. During the Bay Area Video Coalition Playback Conference in 1996, video preservation was one of the most discussed topics. Various aspects were mapped out, and guidelines were formulated. Internationally, video art is being digitized in different formats for presentation and distribution. Only on a very small scale is digitization happening with a view to preservation, but again, in different formats. There are vast differences of opinion, from transfer to film or digital formats with or without compression, to conversion to both analogue and digital formats. The ideal (preservation) format does not exist. The choice of a particular preservation technique primarily depends on the preservation criteria.

If digitization does not affect the concept of the work, and is based on the earliest possible generation; if the quality of the new carrier ensures a reproduction signal which is so close to that of the original that there is no visible difference; then digitization of this important part of our cultural heritage is certainly justified. Indeed, without conversion to a different carrier, video works would soon lose the capacity to be presented in their original form, due to ongoing deterioration. Without digitization of such works, this loss of quality will keep recurring.

In view of recent developments, Digital Betacam is the most suitable option for archival storage. The signal is compressed 2:1, which is optically invisible; in contrast to Mpeg 2, where the compression is clearly visible. Compared to other options, the cost/performance relationship is positive. Moreover, Digital Betacam is an accepted standard. Digital Betacam means storage on tape; if stored in the right conditions and treated correctly, the works on tape could be transferred to a new carrier within ten years, without loss of quality.

The optimal format for accessibility depends on the requirements for future use. Further analysis of this is beyond the scope of this pilot project. This also applies to the format for registration. In order to be able to realize, apart from digital storage, the digital accessibility of collections in the near future, a collective list of names, types, genres, and key words, should be drawn up. A collective trial with selected educational digital material would be a desirable follow-up.

Copyright Aspects

The preservation and digitization of video art presupposes a whole range of copyright-related and contractual aspects and problems. Museums and other institutions make use of various copies of the same video work, often in different formats. There are copies for the archives, for presentation, and for viewing purposes. The 'master tape' is stored in the archives, in a high-grade, durable format to preserve it for posterity. This is copied for presentations. Videotapes are subject to wear and tear, and have to be replaced regularly for presentation. Special viewing copies are often used for educational purposes or selection by curators. Moreover, stills and fragments are extracted from video works, to be used for promotional purposes and (Internet) catalogues. However, copying a tape (even for reasons of security) could be seen as an infringement of the artist's right of exploitation. The current contracts between the participants in the Pilot project and artists do not generally cover the use of copies, preservation/digitization and restoration. Digitization as a new form of exploitation is such a novel development that, as yet, nothing has been agreed on this. Agreement between artist and owner is essential, not only in retrospect for the material already acquired, but also for future purchases, loans and donations.

Recommendations for the Preservation of Video Art

1. The participating institutions will draw up a list of works to be digitized, providing title, artist, year of creation, playing time, format, as well as status of the material.
2. The status of duplicate copies will be investigated centrally.
3. The individual participants should approach the artists on the basis of a centrally drawn-up checklist, with regard to:
    - Intention: Will digitization change the meaning of the work, and/or the artist's intention?
    - Preservation: What is the artist's attitude towards preservation etc.? Permission for digitization; yes/no.
    - Master tape: Where is the master tape, and can this be used for digitization, or does a digitized copy already exist, in the right format?
4. There are various options when it comes to the actual execution; from fully decentralized to fully centralized, and variations thereof. Decentralized digitization, by the individual artists, would cloud insight into costs, coherence, and quality. In view of the experience and expertise available, centralized digitization by the Netherlands Media Art Institute, MonteVideo/Time Based Arts would seem preferable. Contracting out would ultimately be cheaper; it would reduce the investment in equipment and manpower, but processing, editing and registration would be virtually impossible, and moreover, strict monitoring would be essential.
    - Digitization should be based on the master tape; if this is not possible, the submaster should be used, or with recent material, the earliest generation
    - Artists should be invited to become involved in the process
    - For each institution, the mounted works are to be preceded by a colour bar and followed by a black bar, by which the inpoint and outpoint times will be registered. In the case of 'first-phase' works, the 10% overlap has to be edited, and the black-and-white contrast and audio adjusted.
5. The works and the treatment thereof should be registered in detail. A list of names, types, genres, and key words should be drawn up collectively.
6. The preserved works should preferably be stored centrally at the Netherlands Media Art Institute, MonteVideo/Time Based Arts, under optimal conditions.
7. The overheads for the preservation will amount to at least NLG 250,000, and will be financed centrally by the Netherlands Media Art Institute, MonteVideo/Time Based Arts. The variable costs, including carriers, personnel and chargeable overheads, will be charged per hour of video work to each institution.

Summary of the technical report

Video has been registered on more than 50 different carrier systems, the oldest of which dates back to 1965. Some ten of these systems are still in use.

The video signal is written onto the tape via a magnetic process. During this process, the video signal can be split up into a luminance and a colour signal (component). In these cases, there are two tracks for colour (Cr/Cb) and one for luminance (Y). This yields a higher quality than composite signals. With composite video signals, colour and luminance are combined (Y/Cr/Cb). This leads to the loss of certain frequencies. Moreover, the colour definition is less sharp than with component systems.

Digitization and compression

All the digital video recorders currently in use make use of data reduction (compression) in order to reduce the large quantities of data to workable proportions. The system of data reduction determines the quality of the eventual signal. The best quality can be achieved with a reduction system which is effective within a video field or frame. The manner in which the signal is sampled is another important factor in the prevention of loss of quality. Whether or not, and to what degree, loss of information will occur, depends on the method used. However, it should be mentioned that the human eye is not (always) able to perceive the changes in quality.

The conversion of an analogue signal into a digital one is not as simple as it sounds. The former is continuous, the latter discontinuous. Therefore, the analogue signal is gauged at the highest frequency (the sampling rate) and converted into a discontinuous digital signal. This is digitization. The higher the sampling rate, the better the conversion, because the loss of information is minimized. Every analogue signal can be digitized. It can also be reconverted. But a digital signal does not show what kind of analogue signal it used to be.

Mpeg (1 and 2) and Jpeg are often used for the compression of video signals. These compression techniques include, for example, the digital writing to tape of similar pixels (picture elements) within a video frame, or a series of video frames, as one value, and vice versa. Moreover, with Mpeg 1, one field per frame (two fields) is simply thrown away. Frames are digitized whereby all information on luminance is preserved, but the chrominance is both horizontally and vertically undersampled at a ratio of 2:1 (4:2:2). The underlying idea is that, within a short time span, there is usually little difference between the images in an image sequence.

Criteria for Archive Formats

1. There should be no visible change of image compared to the original
2. There should be as much as possible compatibility with industrial standards
3. The system must be able to process Betacam SP, U-matic and VHS tapes, while preserving the best possible quality
4. Montage and editing must be possible
5. The stored material must have a long to very long life span
6. The stored material must be able to be copied onto any desired (tape) format without any appreciable loss of quality
7. The system must guarantee the possibility of transferring the preserved material to newly designed carriers, in the 21st century.

Internationally, video art is being digitized in different formats with compression for presentation and distribution purposes. Only on a very small scale is this happening with a view to preservation, but again, in different formats. There are vast differences of opinion, from transfer to film or digital formats with or without compression, to conversion to both analogue and digital formats.

The fact-finding study resulted in the following formats being eligible for consideration and comparison:

1. D1 and D2: Loss-free compression, in use at a museological level, but are in fact outdated and very expensive formats. D2 is a composite format.
2. Digital Betacam (DB): Limited compression (2:1); broadcasting standard, has also been used by the Netherlands Audiovisual Archives and the Film Museum.
3. Digital S: Less expensive spin-off from DB; compression 3,3:1, but 4:2:2 digital component signals.
4. DVCpro 50: Nominated as new standard, compression 5:1 and 4:2:2 digital component signals

Tests

A test tape was compiled with test signals and fragments of representative work. This test tape was digitized by various companies onto the formats selected. The results were reconverted to Betacam SP, and compared at the Netherlands Media Art Institute, MonteVideo/Time Based Arts/TBA. This procedure was adopted to minimize costs. The digitization, with different qualities and adjustments of recording and playback equipment, and the subsequent reconversion to Betacam SP did indeed lead to loss of quality, but did not misrepresent the image.

The selected formats were first compared optically. No significant visible differences were seen between D1 and Betacam SP. There were, however, differences between the other formats. These were barely visible with the naked eye. Only the DVCpro format showed clear deviations.

Subsequently, the results were compared on the basis of test signals. None of the readings was equivalent to the 'original', the Betacam SP 3rd generation. The D1 reading was slightly higher, that of the Digital Betacam lower. The amount of noise with either format (at Haghefilm) was almost equally low. The multiburst reading of the Digital S was significantly lower, that of the linesweep contained much more noise than the original. With D2, it went from bad to worse, reaching a scarcely perceivable reading with DVCpro. With regard to the quality of the signal, and therefore of the image, D1 scored the best, followed by Digital Betacam.

The other formats are unsuitable as archive formats. D1 is an old and expensive format. Digital Betacam is an accepted standard, with a good price/performance relationship. Our preference was therefore for the latter format. The NFGD was asked for advice, and confirmed our impression.

Afterwards, the work group compared the digital and analogue Betacam versions during a wall-sized presentation. There were no visible differences. But, once again, it became clear that colour, sound and timing adjustments are certainly controllable, in other words, are dependent on the adjustment of the recording and playback equipment.

Carriers

Current magnetic tapes consist of three different layers. The video signal is encoded into the top layer of the tape. This top layer is a binding layer of polyester polyurethane, which incorporates the magnetic particles (the video signal). Ageing can cause chemical deterioration in the form of oxidation and hydrolysis. Climatological conditions as well as dust, dirt, ultraviolet radiation, heat, and magnetic fields can affect a magnetic tape. For optimal preservation, the information stored on the tape should be transferred to another carrier within ten years. To prevent oxidation and the tapes from sticking together, they should regularly be rewound. For optimal preservation and conservation, the tapes should be stored in constant conditions; optimal temperature: 18°C ± 1°C; degree of humidity: 40% RH ± 5%.

When the archive copy of a video work is digitized, the reproduction signal should be so close to that of the original that no optical difference is visible. Therefore, it is essential for compression to be reduced to a minimum. This means storage on tape. One hour of non-compressed video in accordance with the ITU-R 601 standard requires 76 Gbytes storage space. With CD-R, CDI, etc., storage capacity is a problem. The CD-R has a capacity of only 650 Mbytes, about half a minute of non-compressed video. The DVD has the same dimensions as the CD, but has seven times as much storage capacity using single-sided, single-layer disks. However, the multi-layer DVD has four layers, and therefore a storage capacity of 4 x 7 x 650 Mb = 18 Gbytes. Nevertheless, this is only enough for about 15 minutes of non-compressed video. Moreover, as yet there is no affordable system for the self-writing of DVD disks for video applications. It is expected that this will take another three years. Compared to tapes, disks have, for example, the advantage of direct readability of the information (without (re)winding). They are less susceptible to wear and tear than tapes, and are presumed to be more durable, but this is not guaranteed. With storage on disks, compression is unavoidable. Hard work is in progress to improve carriers and compression techniques, in order eventually to provide capacity for the storage of a non-compressed video signal. Developments in this field are progressing by leaps and bounds. Apart from DVD or hard-disk systems, permanent memories (Solid State) are now being developed. Various existing systems already make use of this kind of storage. These are not yet suitable for archive purposes or lengthy recordings, but are useful for presentation purposes.

Conclusion

In view of current developments, Digital Betacam is the most suitable option for archive purposes. Existing works need to be transferred to a new carrier soon. Analogue Betacam is expensive, and leads to loss of quality in a copying run. Digital Betacam is an accepted standard. This means that, when new carriers are introduced in the future, they will be compatible with this standard. Within seven years, it will therefore be possible to transfer the Digital Betacam tapes to such new carriers, without loss of quality.