Dietrich Schüller

Audiovisual documents - Between information carriers and objects of art
or:
Revisiting IASA-TC 03

2nd International Workshop
Digital Philology for the
Preservation of Multimedia Archives
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The Safeguarding of the Audio Heritage: Ethics, Principles and Preservation Strategy

Version 3, 2005, presently under review
Embedment of TC 03:

Pre 1990 - the classical preservation paradigm

Change of preservation paradigm around 1990: from carrier to content preservation

Consolidation of digital preservation in the 1990s
The challenges of audiovisual preservation

- unstable materials
- machine readable documents (except photographs) threatened by format obsolescence and unavailability of dedicated replay equipment
- replay = access implies deterioration: high for film and mechanical, less for magnetic carriers
Early concerns focused on instability on nitrate film
First study of the chemistry of audio carriers only in 1959
Format obsolescence and lack of replay equipment was originally not a major problem:
• film formats extremely stable
• cylinders 1880s - late 1920s
• coarse groove discs: late 1890s – mid 1950s
• micro groove discs: since late 1940s – presently revived
• magnetic tape: since mid 1930s/late 1940s – now rapidly vanishing

Low sophistication of early formats permitted repair, even construction of new replay equipment for historical formats - permitting better reproduction than original devices
PRESERVATION AND STORAGE
OF SOUND RECORDINGS

By A. G. Pickett and M. M. Lemcoe
Cylinder player Type IV
Design and construction: Franz Lechleitner, Vienna Phonogrammarchiv
Archeophone
Design and construction Henri Chamoux
Classical preservation paradigm: archives and museums preserve the objects placed in their care

- Archives and museums are repositories of originals
- Copies are useful working tools, indirectly assisting the preservation of originals by minimising their handling
- Copies are never fully replace originals

Audiovisual archives followed this classical preservation paradigm by

- keeping (two) “untouchable” archival masters under ideal climatic conditions
- accessing records only through working copies
Situation of the 1980s

Arrival of digital audio and video

Expectation: stable digital formats optimised for archival purposes

However, the opposite happened: life cycles of formats became ever shorter

Several new formats vanished from market soon after their introduction

Consumer market products entered professional world, e.g. R-DAT
Change of paradigm started May 1989 UNESCO meeting:

Sooner or later, **ALL carriers will decay beyond retrievability** → *optimisation of carrier preservation would ultimately be in vain*

Sooner or later, **ALL carrier formats would also become obsolete**

As **formats become obsolete, spare part production and availability of replay machines in operable condition will fade**

Because of **high sophistication, rebuilding of new equipment would be impossible, once serial production has seized**

**Even carriers in excellent condition will become useless**
Consequently:

*Long-term preservation can only be achieved by digital (= lossless) subsequent copying of contents*

*Analogue contents have to be digitised first*

*Digital preservation management (data integrity checking, refreshment, and migration to new preservation platforms) must be automated*
First public debate
Joint Technical Symposium
Ottawa 1990

(mixed perception....)
Tonmeistertagung November 1992, Karlsruhe:
Auf dem Weg zum “ewigen”, vollautomatischen Schallarchiv
Similar idea was proposed by EMT

Emphatic debate on data reduction (“compression”) for archival files: archival principles against pragmatic/commercial considerations (IASA-TC has banned data reduction for archival files in September 1992)

Issue of concern until mid-1990s, when linear, uncompressed archiving was generally accepted – supported by rapid decay of storage costs
Slogans of the early 1990s

*Preserve the file, not the carrier*
*From the “eternal” carrier to the “eternal” file*
1992/93 ARD (Südwestfunk Baden-Baden) in cooperation with IBM: first pilot project to develop a “Digital Mass Storage System” for sound archiving (Albrecht Häfner)

ARD Archiv-Arbeitsgruppe (chair Andreas Matzke) decides on the “Lineares Funkhaus”: no data reduction in production and archiving, only for transmission

“Data reduction is audio destruction” (AES Paris 1995)

EBU decides to extend the Wave format to BWF

IRT (Institut für Rundfunktechnik) designs “Quadriga”, computer aided ingest station for A/D transfer

Incentive for European national/public broadcasters: Reorganisation of radio production and using archives as assets against private broadcasters

In Europe, by the later 1990s, sound recording, archiving, and postproduction has become part of the IT world
Broadcast sound archives had taken the lead…
As IT equipment and storage costs came down towards 2000 and beyond
• national sound archives
• research archives
• video archives
followed
Digital Mass Stores: originally near-line tape robotic systems, gradually changing towards hard disk drive on-line systems

2007 storage costs (of systems >100TB) 7-9 €/GB/year
Today < 1€/GB/year
Price reduction flattening out

Subsequent digital content migration has become an undisputed principle for audio and video archiving

More recently, even film archivists joined in after some reluctance, even opposition
1996/97: birth of TC 03

Closely related to increasing role of IT specialists and their recommendation to produce data reduced archival files (MP3) IASA-TC members had to assist colleagues against recommendations from IT people TC-03 was (and still is) intended to be a quotable reference against unprofessional approaches
Archival principles:

Complete extraction of signal from original carrier

Modern equipment adapted to historical format parameters reduces replay distortions almost to zero

For damaged mechanical carriers improvement possible by optical replay

Not yet routine: extraction of

- bias signal from magnetic tape to correct w&f
- some sub-code information from digital audio originals (R-DAT)

Transfer technology may improve – keep original as long as possible

Unmodified transfer of contents

Aesthetic insufficiencies and damages are part of the document: No “improvement”, filtering, de-clicking, de-noising, etc., on digital archival masters, “Archives have to preserve, not to re-write history” (Bill Storm)

However: some corrections can only be made in the replay of the original, e.g. minimising print-through, correction for misaligned recording heads, mostly azimuth error
Archival principles cont’d

No proprietary digital target formats
.wav (BWF) international de-facto standard
Minimum resolution for analogue originals (IASA): 48kHz, 24 bit
De-facto standard for memory institutions: 96kHz, 24 bit
Noisy historical recordings: 192kHz, 24 bit
Digital originals: keep sampling rate and bit depth

No data reduction (“compression”) for analogue and linear digital originals
Compressed originals: keep encodings unmodified (if possible)
Lossless compression permissible
Archival principles cont’d

Check data integrity in regular intervals
Refresh data if needed
Migrate data to new storage systems before the old one becomes obsolete

Preservation metadata
• format and state of preservation of original carrier,
• all equipment and parameters used for replay and digitisation
• digital format and resolution
• checksum
• operator
Implicit principle of TC 03

The “essence” of the document, the object of digital preservation, is the **signal found on the carrier**, retrieved with the least possible alterations through playback distortions.
2016/17: Revision of TC 03  
Version 4 extended to cover “audiovisual” documents

Principles for video & film should closely follow audio, but:
• video far more locked to original equipment than audio - limited potential for reducing replay distortions by modern equipment  
• present routines for SD (ITU 601) reduce colour representation of composite signals  
• insufficient/missing routines to safeguard sub codes  
• specific list of corrections to be made during signal extraction from originals only (e.g. drop out compensation, wet gate scratch removal)
Extending TC 03 to video and film brings video art and historical art films in the scene and historical reproduction back into discussion.

[Bill Storm’s Types of Re-Recording of 1979 (Type I Audio History, Type II Sound of the Artist) have not been further pursued]
Objects of art *may* need historical reproduction, if features (limitations) of contemporary reproduction were influential part of the creation

Modern reproduction could possibly introduce alterations, which the artist, at the time of creation, has never seen

But: Historical reproduction will generally need a series of (fairly) subjective decisions…

…consequently: parallel to historical reproduction, standard signal extraction shall be made
Differences of historical reproduction vs modern standard signal extraction:

- high for film and audio
- lower for video

Many (most?) early video art objects would probably be faithfully reproduced by standard signal extraction combined with display on historical CRTs.
Creation of new video art objects:
• follow professional production standards
• use well calibrated professional equipment
TC 03 conclusion

Extension of IASA-TC 03 to video and film does not disrupt the principles developed for audio documents

However, for historical art objects a window must be opened for historical reproduction
References


Translations: German, French, Swedish, Italian, Spanish, Russian, and Chinese

Translations: French, Spanish, Italian, Catalan

IASA-TC 05 Handling and Storage of Audio and Video Carriers. First Edition 2014, edited by Dietrich Schüller and Albrecht Häfner
Translations (2016): Spanish, Italian

Thank you!

dietrich.schueller@oeaw.ac.at
www.phonogrammarchiv.at