

Preservation strategies for mixed music: the long tail and the short tail

by Guillaume Boutard

Introduction

I have recently argued (Boutard 2019) that preservation of digital technology in mixed music should build upon the work done for the past ten years in digital preservation in relation to cultural heritage institutions, namely libraries, archives and museums (LAMs). From this premise, I have discussed several hypothetical directions based on a broad and widely discussed distinction between three levels of preservation: bit-level preservation; logical-level preservation; and conceptual-level preservation. The goal of such a paper was to emphasize the similarities in the management of digital objects among various cultural heritage institutions at each one of these levels, whether these institutions manage complex objects (e.g. museums), research data (e.g. academic libraries), or more generic digital artefacts (e.g. archives).

The promotion of Findability, Accessibility, Interoperability, and Reusability (FAIR) as well as Transparency,

Responsibility, User focus, Sustainability and Technology (TRUST) is now a fairly widespread theme in research data management and digital archiving (Wilkinson et al. 2016; Lin et al. 2020). These notions provide an overarching frame for best practices in each domain.

Discussing these notions may entail shifting the discussion from similarities to differences between the preservation of mixed music and the preservation of digital collections, archives and new media art pieces. In this paper, I would like to point at these differences and to continue the discussion about the conceptual level of preservation in relation to documentation methods.

Repositories

Tools

Across institutions, a focus has emerged on the analysis of ingest and pre-ingest phases of curation lifecycles, leading to the development of complex digital forensics software distributions such as BitCurator. Molenda (2020), in her recent survey of practices among twenty-seven dutch heritage organizations with a digital repository, reviews sources

including “archive creators (such as governmental institutions, other institutional or private actors), suppliers (for example publishers, broadcasting organizations or radio stations), makers (artists, researchers)” (p. 12). The survey focuses on the use of tools during pre-ingest and ingest because it is not part of ‘end-to-end’ digital preservation solutions and it is underspecified within the Open Archival Information System (OAIS) model (pre-ingest being completely outside the model). Pre-ingest emphasizes the lack of standardization among producers in terms of file formats, complex objects aggregates, and metadata production: “only about a third of the interviewed heritage organizations can set requirements and therefore has influence on how the collections they receive are prepared and delivered” (Molenda 2020, 13). These issues are well-known in our context of creative practices with digital technologies where the breadth of technology-laden practices may seem overwhelming (arguably less than in the context of digital artefacts collected by museums). The link between repositories and producers is thus critical and relates to the ability to foster best practices.

Molenda (2020), continues: “[...] as much as 64 percent of the respondents reported that they only have partial influence and cannot set hard requirements, and 9 percent reported that they are not in the position to set any requirements at all” (p. 13). To my knowledge, no digital preservation tools – that is to say, within the set currently provided by the digital preservation community and used by LAMs, whether at the ‘end to end’ digital preservation system (DPS) level or in relation to the broad range of phase-related tools documented in projects such as Community Owned Digital Preservation Tool Registry (COPTR) and Preserving digital Objects With Restricted Resources (POWRR) – are used in relation to mixed music preservation (at any level of preservation). Arguably and to a certain extent, this absence of digital preservation tools in current preservation and curation practice for mixed music relates to the inability to set hard requirements.

Contributors

In a less recent publication (Boutard 2018), I advocated for the broadening of stakeholders in digital preservation of mixed music – building on a previ-

ous study (Plessas and Boutard 2015) – including live electronics musicians (LEMs) in relation with participative repositories. This idea comes from the acknowledgement that we have seen many preservation initiatives coming directly from practitioners (often from performers) during the last twenty years in terms of, primarily, migration of contemporary works which do not make it to any kind of repository and thus disappear from the scope of cultural heritage and best practice in digital preservation. It also builds upon Plessas and Boutard's (2015) definition of interpretation by LEMs of a work, which includes practices relating to adaptation to performance context, debugging, or updating to state-of-the-art technological environment. The academic history of mixed music preservation is built upon use cases and yet these use cases also fail to be part of the sustainable technological trajectory of mixed music.

The inclusion of multiple contributors or stakeholders in the production of digital expressions (according to the definition of expression in the Functional Requirements for Bibliographic Records - FRBR model) of a mixed music work brings a complexi-

fication of preservation management. The relevance of version control systems (VCS) for digital preservation has gained research attention in relation to software heritage, but also limitations: "[...] the task of long term preservation cannot be assumed by entities that do not make it a stated priority: for a while, preservation may be a side effect of other missions, but in the long term it won't be" (Di Cosmo and Zacchioli 2017, 3).

In their comparative analysis, Barok et al. (2019) show the use of CVS for complex artworks preservation along four categories, which they relate more or less precisely to the OAIS model, namely

- 1) file and storage management,
- 2) metadata and provenance,
- 3) context, presentation, curation, and
- 4) collaboration and usability.

They further discuss the elements lacking in CVS environments, in relation to their four categories, for digital preservation best practice. As Barok et al. (2019) bring up, as a premise, "[...] it is generally acknowledged that existing digital archiving and documentation systems used by many museums are not suitable for complex digital artworks" (p. 94). Still, current practice in notable institutions such as the

MOMA or the Tate Gallery show how museum are able to connect digital preservation best practice and tools and the management of complex digital artworks. Merging these approaches with VCS principles (which are already part of collection management systems for new media arts to some extent, this should come as no surprise) seems inevitable as far as mixed music (re-)production is concerned. The emphasis, I would argue, should be on provenance, context, and usability.

Strategies

Short tail or long tail

Not all works face the same preservation risks. Lemouton (2012) exposed it clearly:

"[...] si l'on veut qu'un répertoire puisse se constituer et faire histoire, il faut avant tout qu'il puisse être conservé dans un temps assez long avec la possibilité d'être rejoué sans trop de difficulté, [...] et comme on ne peut pas prédire quelles seront les oeuvres qui 'feront répertoire', soit il faut tout préserver et c'est trop coûteux, soit on ne fait rien, et alors il n'y a plus aucune chance que cela devienne un répertoire" (p. 77).

If preservation needs to build upon its communities of practice and be grounded in production workflows, then we need to make a distinction between the short tail and the long tail of performance distributions for mixed music works. Plessas and Boutard's (2015) study of the historical performance trajectory of Philippe Leroux' *Voi(Rex)* is one of the few longitudinal studies of mixed music performance (another one would be Akkermann 2017). They tracked about forty concerts from 2003 to 2015, with four versions of the software (see Boutard 2018) that are registered in the repository at Institut de Recherche et Coordination Acoustique/Musique (IRCAM). *Voi(Rex)* is part of the short tail, that is to say these pieces that are already part of the repertoire, pieces that are played on a regular basis and therefore are migrated to up-to-date software environments. However, not all mixed music pieces are as successful in terms of performance rate for multiple reasons, for example the complexity of the production process or the reputation of the piece.

The second part of the performance rate distribution is the most at risk, that is to say the long tail, those

pieces that are not played at a sufficient rate. When the rate of production and performance falls below the schedule for major version update of software development environments, technological obsolescence becomes more prevalent to the point where migration becomes a more difficult strategy to apply (putting aside the supplementary question of expertise) without the preservation of the original technological environment. At this point, the strategy changes from the preservation of the work's implementation to broader software preservation strategies.

The growing interest in software preservation led to several initiatives, such as the ones already mentioned (see Di Cosmo and Zacchiroli 2017) as well as more global strategies like the software preservation network (Meyerson et al. 2017). Software is now collected either for digital forensics, digital archeology or digital preservation – for example, the National Software Reference Library (NSRL) at the US National Institute of Standards and Technology (NIST). The question of fair use in relation to software preservation is a core element of these strategies, as emphasized by the US association of research libraries:

“one of the most persistent challenges to software preservation has been legal uncertainty. Practitioners fear that legal structures developed to regulate software in the commercial marketplace (like restrictive licenses and so-called ‘anti-circumvention’ rules) somehow may impinge on their work. They also know that core preservation activities almost inevitably do trigger copyright concerns” (Aufderheide et al. 2019, 2). Legal battles around circumvention for software preservation are exemplified in the US by the temporary exemptions to the Digital Millennium Copyright Act (DMCA) provision by the Library of Congress.

With the advent of software libraries and the maturing of emulation on demand, we may also have applicable strategies for the long tail. Indeed, we can now think about emulation (not virtualization) as an access strategy, which can support migration when funds or human resources are available. Rather than migration triggered by the monitoring of technological obsolescence, the more realistic idea of migration on request could support the long tail. This strategy requires a participation

of the music technology community in the development of current and future software libraries (These software libraries are about software environments required for running the pieces and must include commercial solutions. They are independent from the repositories needed for the archiving of the pieces themselves). The preservation of the long tail is also, primarily and the most directly, the part of the repertoire requiring the broadening of contributors that we emphasized in the previous section. Institutions holding digital repositories do not have additional resources for complex pre-ingest in relation to this part of the repertoire but they may support semi-automatic ingest and archiving with minimum costs and expertise needed.

Documentation

As Escobar Varela and Lee (2018) put it, in the context of performance archives : “however, there are still relatively few archives and many of them are not yet equipped to realize the full potential of digital documentation; they have been slow to adopt standards for data reusability, findability and interoperability” (p. 17). Several proposals have been made for

documentation of mixed music, either at the conceptual level or the logical level (e.g. Boutard 2019), most of them discussing methodological propositions to capture knowledge of human agents relating to the creative processes, whether from a compositional or interpretational perspective. In parallel, proposals for software-related preservation exacerbate context : “ideally, one might want to archive software source code ‘in context’, with as much information about its broader ecosystem: project websites, issues filed in bug tracking systems, mailing lists, wikis, design notes, as well as executables built for various platforms and the physical machines and network environment on which the software was run, [...]” (Di Cosmo and Zacchiroli 2017, 4). A significant part of these elements may be automated during pre-ingest/ ingest (I think specifically about automatic analysis of patches and, in parallel, a significant part could rely on generic functionalities of the CVS) and the remaining elements should be included in future hard requirements.

On the other hand, it is worth noting that museums have recently put

specific efforts in the documentation of immersive media artworks. One example of these projects is Preserving Immersive Media at Tate Gallery, which started in 2018. I would argue that these projects and their outcomes are relevant for mixed music preservation. Based on this idea, in 2020, we started the project Sound Art Documentation: Spatial Audio and Significant Knowledge (SAD-SASK), funded by the Canadian Social Sciences and Humanities Research Council (SSHRC), in collaboration with museum conservators and academics specializing in sound art and/or spatial audio in North America and Europe. SAD-SASK aims at investigating the relevance of state-of-the-art spatial audio capture and virtual environment rendering technologies for the documentation of sound art. The goals are to:

- 1) identify significant knowledge associated with sound art installations with an emphasis on sensory experience;
- 2) specify best practices for documentation of sound art beyond technical specifications; and
- 3) acknowledge the relevance and benefits of cross-fertilization of expertise to conservation processes

for sound-art installations.

SAD-SASK builds on the work of Boutard on tacit knowledge documentation and Guastavino's work on sensory experience of complex auditory scenes and perceptual evaluations of spatial audio (Boutard and Guastavino 2012; Guastavino and Katz 2004; Tarlao, Steele, and Guastavino 2019). In terms of stakeholders, the project targets not only sound artists but also time-based media conservators and curators, and sound engineers. Building a documentation framework for sound art may benefit installation and curation processes but also analysis as well as dissemination to a larger public.

The methods coming from such projects may be injected back in the preservation of mixed music which faces similar questions of documentation in relation to technologies and room acoustics as well as performance. Building relevant methods for documenting mixed music works should complement the technology-driven and the creative process-oriented documentation with performance knowledge relating to the sensory experience of a piece. Documenting immersive environments is yet another direction of

collaboration with various cultural heritage organizations.

Discussion

With these propositions in the background, I would like to come back to the organizational level of preservation. The principle of trust for digital repositories entails organizational infrastructure and sustainability for these organizations. In my previous paper, I emphasized the need to have trained professionals in digital preservation, similarly to LAMs, to manage repositories, which, of course, requires institutions and funding. Promoting FAIR and TRUST principles relies on relevant frameworks, in terms of repositories and in terms of workflows. But organizations involved in mixed music production and dissemination are not LAMs and while some LAMs have clear mission statements in relation to digital preservation, organizations and institutions involved, at some level, in mixed music do not, especially in relation to the long tail. It has sometimes been argued that digital preservation is more of an economic problem rather than a technical one, which may be a little bit too extreme a statement, especially in the context of complex

artworks. Still, without dedicated funding, there will be no proper preservation for mixed music.

I would argue that the question of preservation of mixed music has to become a large-scale project – the idea of a consortium of some sort with various types of institutions – in order to reach for organizational sustainability as well as having enough impact to be able to propose and build upon existing software libraries, to define processing workflows (especially in relation to pre-ingest/ingest phases), and to define and enforce hard requirements.

I believe that without hard requirements the long tail is bound to disappear (it is difficult to quantify how much has already disappeared). If we have to accept a wide range of contributors – as opposed to most situations in LAMs – then we must be able to ask for best practices in terms of, as stated previously, file formats, complex objects aggregates, and metadata production. The subsequent aspect of the discussion on best practices relates more directly to preservation at the conceptual level and requires documentation protocols relating to sensory experience

and performance knowledge whose outputs may be evaluated at ingest.

Conclusion

Going back to FAIR and TRUST, we may think about the impact of our propositions. Findability, Accessibility, and Interoperability will be greatly improved by the coordination of efforts at the inter-organizational level. Reusability will be greatly improved by the subsequent ability to establish hard requirements and processing workflows, and participate in the building of software libraries.

The U of TRUST is User Focus, that is to say, “to ensure that the data management norms and expectations of target user communities are met” (Lin et al. 2020). It is not doing a U-turn to say that U is bidirectional. Specifying what is expected is also meeting the expectations of the target user community (a question that emerges regularly in discussion with practitioners in mixed music production), especially since we want to achieve Responsibility “[...] for ensuring the authenticity [in the archival sense of the term] and integrity of data holdings and for the reliability and

persistence of its service” (Lin et al. 2020).

Transparency, “about specific repository services and data holdings that are verifiable by publicly accessible evidence” (Lin et al. 2020), should be targeted, especially in relation to the long tail. And finally, Sustainability is our main goal, supported by relevant Technology and documented workflows.

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