Reactivating and Preserving Interactive Multimedia Artworks: An Analog Performance from the Seventies

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Interactive multimedia art shows a complex nature as it is time- and process-based, interconnected with technology, derived by the participation of several authors (artists, technicians, performers, to name a few) and an audience, and it is strongly tied to the moment and space of the original exhibition. These characteristics make the preservation of these artworks a multifaceted process. Building on the foundations developed since the 2000s by international projects focused on preserving and restoring these new art forms, the paper proposes an original model for achieving dynamic preservation, called "the multilevel preservation model". Since it is no longer possible to guarantee physical integrity for interactive multimedia artworks, dynamic preservation involves recording all the changes that occur to display the artworks in the future. In other words, it makes it possible to record the dynamic authenticity of artworks. The model proposes two fundamental properties: multiple layering, which allows to handle different levels of information about the artwork; *multiple belongingness*, which allows to represent the dynamic authenticity of the artwork at the archival level and achieving dynamic preservation.

The paper demonstrates the high-level implementation of the model by presenting a case study: the reactivation and preservation of an analog video art performance from the 1970s. This case study proposes an interesting real scenario for testing the model, as the reactivation process involved the migration of the entire analog technological apparatus of the artwork into the digital domain.

CCS Concepts: • **Applied computing** → **Arts and humanities**; • **Information systems** → **Digital libraries and archives;**

Additional Key Words and Phrases: Preservation, reactivation, methodology, interactive multimedia art, video art, performance art, installation

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1 INTRODUCTION

Since the 1970s, the **Centro di Sonologia Computazionale (CSC)** at the University of Padua has been a leading research laboratory in the computer music field with hundreds of productions, including acousmatic music, live electronics, performances, multimedia, and interactive installations [7, 8]. Considering the substantial volume of music created on magnetic tapes [44], CSC researchers designed a preservation methodology tailored specifically for such materials, including a specific software for supporting the creation of preservation copies of analog recordings (PSKit) [17]. However, this methodology still proves to be inadequate for a significant portion of the artworks CSC deals with. In fact, since the 1990s part of the laboratory's production has focused on interactive multimedia installations and performances, which require a specific and more complex preservation process. Among these productions, we can mention Carlo De Pirro installations, such as *Il Coas delle Sfere* (1999), in which the audience playing a pinball controls the musical sequences reproduced by a Disklavier (a computational system allows communication between the pinball game and the Disklavier), and *Casetta delle Immagini* (2002), in which a system of computers, cameras, screens, and speakers creates a multimedia experience controlled by the audience's gestures. Other examples of multimedia installations curated by CSC are *Chemical free (?)* (2014) by Nicola Sani and David Ryan, and *Finito illimitato* (2014) by Ivan Fedele and Fine Tuning. Nicola Sani and Ivan Fedele are two contemporary music composers who entered the realm of the multimedia experience with live video, motion capture systems, and augmented musical instruments.[1]

In order to preserve such artworks, CSC researchers started to broaden their approach to conservation and faced the complex nature of interactive multimedia art. Interactive multimedia artworks are time- and process-based, and dependent on a specific space. They are made of heterogeneous elements (analog and digital), and performance and audience participation are at the core of the artwork [54]. In cases such as these, it is no longer acceptable to rely solely on preserving audiovisual materials; it is essential to consider hardware and software components, source codes, scores, instructions, diagrams, interviews, and every other thing relevant for the artwork reproduction. However, in addition to the amount of different media to consider, now the main challenge is to preserve the art's ephemeral and physically unstable nature. This characteristic is predominantly a result of the limited longevity of the technological apparatus in use, which requires maintenance and upgrades for further reactivations. Between 2009 and 2014, CSC researchers worked on a series of case studies focused on Carlo De Pirro installations (the project was named ***CAPIRE - Carlo de Pirro: Restoring an Experience***), which led to the development of a model for the preservation and the reactivation of interactive multimedia art. As an expansion of the audio preservation strategy, the model proposes new ways for preserving all the elements of the interactive multimedia art and the experience derived from it [5]. At the core of the model lies the concept of dynamic preservation, where artworks are considered as "dynamic systems" [32] and thus with dynamic authenticities - a concept elaborated upon in Section 2. In this case, "dynamic" concerns not only the time- and process-based experience created by the system during the manifestation of the artwork, but also the periodic changes of components that occur with each iteration of the artwork [42]. Dynamic preservation takes into account and preserves all the changes throughout all the manifestations of the artwork. In this way, the artwork is preserved as a process, rather than as a fixed, unchanging object.

This paper aims to present the new *multilevel preservation model* developed by CSC, which improves the original model presented in [5]. The model presented in Section 3 builds upon the fundamentals of time-based

[1]For a complete list of the production please refer to the following link: http://csc.dei.unipd.it/multimedia-works/ (last accessed 15 December 2023).

media art preservation (examined in Section 2) developed since the 2000s by international projects promoted by museums, archives, universities, and artists. Based on these fundamentals, the model proposes an original strategy for archiving and preserving new art forms and is intended to function both as a tool for experts (to collect, preserve, and reactivate the artwork) and as a tool for the dissemination and knowledge of the artwork. The model proposes an administrative structure to accomplish dynamic preservation at the archival level. The idea is to consider the artwork as an archival series (see Section 3), consisting of different types of documentation organized on different information levels and across different manifestations. As we will show, one of the most important properties is the *multiple belongingness* of items among different manifestations, as it makes it possible to reduce recorded items (reducing the iteration of elements that are reused in different reactivations) while establishing "changeability" (i.e., dynamic authenticity) at the archival level.

The case study is presented in Section 4. It concerns the process of reactivation and preservation of an analog video artwork from the 1970s created by Michele Sambin *Il tempo consuma* (translated as *Time Consumes*). This case study was particularly significant for testing the model, as the reactivation of the work underwent several modifications and technological migrations from its original version. Finally, the model and case study will be discussed in Section 5, showing how the model enables dynamic preservation and facilitates the interpretation of the dynamic authenticity of the work.

In summary, the contributions are:

— An original administrative model for preserving interactive multimedia art based on dynamic preservation.
— The model proposes two fundamental properties: multiple layering that allows managing different levels of information about the artwork; *multiple belongingness* that allows representing the dynamic authenticity of the artwork at the archival level and achieving dynamic preservation.
— The technological migration of a 1970s video art performance, *Il tempo consuma*. The case study shows the reactivation of an artwork for which all its original physical parts have changed from the analog to the digital domain.
— The high-level implementation of the model in the case study demonstrates how the model records the dynamic authenticity of artworks.

2 REACTIVATING AND PRESERVING INTERACTIVE MULTIMEDIA ART

Delineating the research scope in this work poses challenges. As Domenico Quaranta states in his book *Beyond New Media Art* [45], the terminological challenge associated with defining this type of art remains unresolved, and there is a lack of unanimous consensus within the academic and art communities. For this reason, the paper explicitly avoids terms like *media art*, *new media art*, and *time-based media art*, with the specific aim of not dealing with open terminological and taxonomy issues. The authors adopt the generic term *interactive multimedia art* that highlights the main peculiarities of this broad and very complex artistic field: interaction and multimedia. With "interactive" we refer to the dynamic and reciprocal exchange of information, actions, and responses between one or more entities and the artwork. By taking into account the interaction categories defined by Cornock and Edmonds in [10], we refer only to the *dynamic-interactive* and *dynamic-interactive (varying)*, in which the entities have an active role in influencing the behavior of the art object.[2] The entities can be the audience, one or more expert performers, the environment, or a combination of them. We use the term "multimedia" to refer to art that uses, involves, or encompasses multiple media to create a cohesive experience [19]. Although this term usually refers to digital, we use it in the McLuhanian sense of media to include all media, and thus to embrace the entire analog and digital domains [45].

The complexity of interactive multimedia art leads to a radical upheaval of traditional preservation practices. The deep interconnection with technology is taking its toll in terms of fast obsolescence of hardware and

[2]We do not consider the categories *static* and *dynamic-passive* in which there is no passive audience as is also well shown in Jocques Ranciére's book *The Emancipated Spectator* [46].

software, which may soon become an irreversible loss. Interactive multimedia artworks lack fixity: they are radically different from analog fixed ones, such as paintings, sculptures, and architectural works, which persist rather durably over time [3]. Interactive multimedia artworks, "whether they are film-, video-, or computer-based, have extremely diverse characteristics. Aspects including variability, reproduction, performance, interaction, and being networked are incorporated in many works. Media art is not one static, unique object, but often a collection of components, hardware, and software which together create a time- and process-based experience" [54]. Besides being based on experiments with new technologies, interactive multimedia artworks often emerge from the collaboration and co-participation of multiple artists, technicians, curators, performers, and audiences (as in the case of interactive installations) and with a strong relationship with the original surrounding environment.

When we face the preservation of this art, we can no longer regard it as *autographic* [23] and determine the authenticity of artworks based on their physical integrity. The pieces of art are physically unstable and ephemeral, and we must regard them as *allographic*, as they determine their authenticity based on the experiences they produce [50]. Thus, interactive multimedia art preservation focuses on the documentation created on the artwork. The documentation covers several levels of information:

— Instructions and score (as pointed out in [32, 33, 42, 53])[3] of the artwork include all the information inherent in the technical and realization aspects;
— Multimedia documentation (photos, audiovisual recordings, etc.) allows access to the original form of the artwork, how it was displayed, and how the public interacted with it;
— Oral history connects together testimonies of a variety of individuals who experienced it, and includes the intentions and sanctions[4] [31] of the creator(s) and statements of people who contemplated or participated in the artistic event.[5]

Documentation allows decisions to be made and action to be taken regarding the authenticity of the work, but sometimes it is the only remaining evidence of a work's existence [12]. Based on the documentation, we can reassemble, reset, restart, and thus reactivate the diverse and heterogeneous instances of the artwork. Reactivation may involve the original components of the artwork, adhering as closely as possible to its initial presentation – a "purist/original" approach. Alternatively, it might necessitate adapting or updating some or all of the components originally used, potentially resulting in alterations to the artwork's appearance – an "adapted/updated" approach [53, 54]. Regardless of the path taken, the artwork requires interpretation, analysis, and study (facilitated by its documentation) in order to be represented in a comprehensible way that promotes understanding and enables reactivation. Reactivation inherently involves a process of re-creation [38] and reinterpretation [55], even when the original author is doing it. The authenticity of interactive multimedia artworks undergoes reinterpretation through new performances or installations facilitated by performers, curators, and technicians following instructions and a score. Much like in music, this reinterpretation can vary in quality, ranging from an adept execution to a subpar one.

In this scenario, we cannot evaluate authenticity by means of a boolean flag but rather as the result of a process [16]. The time-based media art conservator Brian Castriota argues that the new forms of art define mutable and multiple authenticities rather than a single fixed one [9]. The concept of "dynamic authenticity" implies the

[3]"When working with media in the context of art, parallels to music are inevitable. An exhibition becomes a performance or a re-creation, an enactment. Active components must be assembled into a complex system to function together according to the artist's intentions. In the absence of the artist/creator, a person with previous training or experience with the piece and/or a 'score', or set of instructions, is required" [53].
[4]"The artist's sanction [...] is an outgrowth of the artist's intentional activity, though not equivalent to her or his intention, just as the configuration of colors on a painted canvas is an outgrowth of the artist's intentional activity. [...] Although the artist's section plays a crucial role in fixing certain features of the work, the artist's intention, effectively expressed or not, does not fix the proper interpretation of the work" [31].
[5]In this context, the interview becomes a fundamental tool, even comparable to the modern art manifesto [40]. The interview to the audience also acquire importance as well highlighted by the curator and researcher Lizzie Muller [41].

"variability" (as defined in the *Variable Media Initiative* [13]), or rather the "changeability" (as defined by Hanna Hölling [26])[6] of the artwork through all its manifestations. It is essential to acknowledge that we cannot guarantee original technologies forever. Instead, we must embrace the idea that these artworks are constantly evolving and require adaptation to new technologies. The authenticity of these works is an ongoing construction, with conservators actively engaged in shaping and reshaping it based on their understanding of the essence of the artwork and the current conventions and assumptions for its preservation. In time-based media art, authenticity is not an original condition, but rather a dynamic process [28, 29]. Preservation should not be focused on materiality, but rather on the experience of the artwork or, in other words, on all the information that enables its reactivation. In order to preserve the "dynamic authenticity" of interactive multimedia artworks, the proposed model is based on the concept of "dynamic preservation", which involves recording the individual manifestations of the artwork and thus tracking its "changeability" (similar to documentation models such as DOCAM and 2IDM – proposed by the DOCAM Research Alliance[7] and the Inside Installations project,[8] respectively –and the one proposed by Joanna Phillips [42]). The model considers the artwork as an archival series (as explained in Section 3) in which all documents and information about it are interrelated and arranged in different manifestations of the work. The originality of the model lies in dividing the single manifestation into different levels of information, from the several components to the scores, instructions, and multimedia documentation, which are then linked through the *multiple belongingness* property between all manifestations in order to reconstruct the dynamic authenticity of the artwork. The idea is to provide a comprehensive tool for performers, curators, and technicians who want to reactivate the artwork and improve the overall understanding of the artwork itself, which is essential for evaluating future reactivations.

3 MULTILEVEL PRESERVATION MODEL

The *multilevel preservation model* [5] was initially conceived as an expansion of the methodology for preserving audio documents defined by [4, 17, 43]. The key concept of this methodology is the preservation copy, which is an artifact designed to be stored and maintained as preservation master [39]. It consists of an organized dataset containing all the information represented by the original document, accompanied by the metadata and the documentation about the preservation process. By implication, the multilevel preservation model establishes the concept of the ***Digital Preservation Object*** **(DPO)**. The artwork's DPO is a digital file that encapsulates a set of digital and analog[9] inter-related items, organized according to a logical architecture, and with the aim to represent a single manifestation of an artwork. Consequently, the multilevel model is designed to group and connect all the DPOs of a single artwork with the aim of representing it as a process rather than a single fixed work.

The overall structure of the model is based on the ***General Instruction Standard for Archival Description*** **ISAD(G)** [27]. The model defines three levels arranged in a hierarchical structure in order to get a representation from the general to the specific. As with ISAD(G), all metadata records can be inherited from the highest to the lowest levels. The highest level of the model represents the artwork, which includes all its manifestations. It is

[6] "The term 'changeability' [...] offers an alternative to the term 'variability' established by the Variable Media Initiative and used in relation to artworks experiencing change. [...] variability, which presumes a variation within fixed parameters defined by a score or instruction. [...] Involving extrinsic and intrinsic change and going beyond the questions of judgment, changeability moves past any fixed parameters and may entail a dramatic change that finds evidence in historic practice (for instance, a shift from interactivity to relic, or from analog to digital format). Changeability, I suggest, takes place in time, and implies difference, rather than sameness – an aspect of variability" [26].

[7] The DOCAM Research Alliance website: https://www.docam.ca/ (last accessed 15 December 2023).

[8] The Inside Installations website: https://inside-installations.sbmk.nl/ (last accessed 15 December 2023).

[9] Analog items are recorded in the DPO through descriptions and digitized processes (photo, 3-dimensional reproduction, etc.). For example, a video screen is recorded in detail through a series of metadata with which we can define characteristics (inch, resolution, etc.) and information (brand, model, year of production, etc.) about the hardware. The record can be complemented with photos and 3D reproductions (especially in cases of less common or build-on-purpose devices) and its physical location, if any.

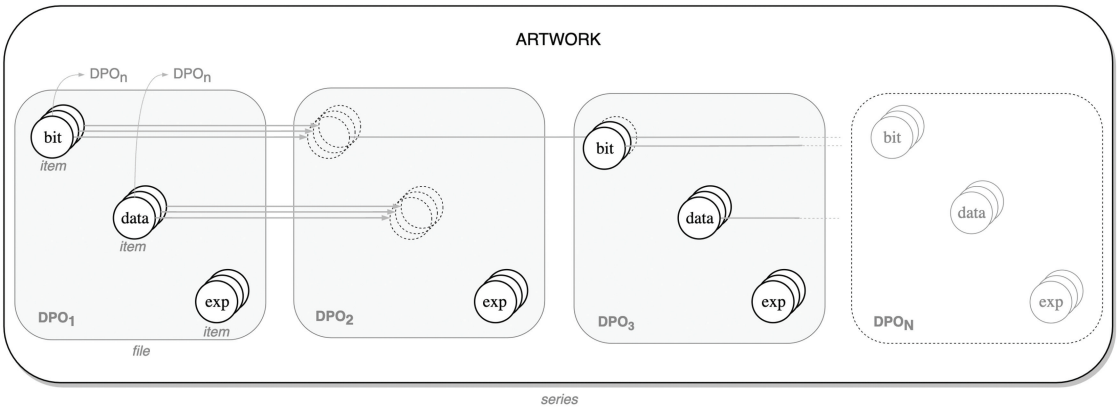

Fig. 1. Graphical representation of the multilevel preservation model.

possible to consider an artwork as a *series* in the ISAD(G). Each manifestation is a single presentation of the authenticity of the artwork. The overall set of manifestations, i.e., the *series*, preserves the dynamic authenticity. The intermediate level, then, represents a single manifestation, named DPO. DPO is a container - or a *folder*, to use the analogy with the *file* in the ISAD(G) - in which all the items of an artwork's manifestation can be grouped together. Finally, the lowest degree represents the single item of an individual artwork's manifestation. The items are all the analog and digital elements that make up the artwork, the distinct elements of its score, and any other kind of documentation that witnesses the experience of each manifestation. The *item* level in the ISAD(G) is the "smallest intellectually indivisible archival unit". However, we define three different kinds of items with distinct functions for the artwork and thus different roles within the preservation model:

— **Bits** are all those parts of an artwork that can be directly preserved, consisting of analog and digital items (hardware and software, installation and performative objects, fixed-media files such as video or audio parts used in the manifestation, etc.). The DPO allows for digital storage of all the useful information about each object with an organized set of metadata and further documentation (e.g., produced by the digitized processes).
— **Data** are all the useful pieces of information on the artwork realization. Together they make up the score and the instructions. Data can be represented by operating instructions, scores (in the case of music), scripts, technical notes, comments about the artwork and high-level descriptions of algorithms, and models.
— **Experience** comprises all the documents that witness any aspect of the installation. They include interviews, audio/video recordings (as the interviews are often multichannels, they poses problems in format recognizing and preserving [48]), usability tests of the original system, as well as information about people (artists, performers, technicians) involved in the artwork and their roles. The experience document type also includes any documentation about reactivation and preservation processes (description of approaches, used methodologies, used software, etc.).

A graphical representation of the model is shown in Figure 1. As we can see, bit and data type items can belong to multiple DPOs. If some parts (or even all parts) of the original or previous manifestation are reused in an ongoing reactivation, those will also be registered as elements of the new DPO. The *multiple belongingness* of items is an important property of the presented model, which differs from the general structure of the ISAD(G) in which each archival unit (*item*) only belongs to a unique *file*. The *multiple belongingness* can be applied only to bit or data type items since experience-type ones are designed to document the ongoing manifestation and

thus must belong to a unique DPO. This property allows the artwork to be represented not as a mere group of delimited records but rather as a process or a dynamic object.

DPOs order is not given (e.g., chronological order). While presenting a well-defined vertical structure, the model avoids defining any type of association between DPOs in order to prevent pre-established discursive formulation and interpretation. For instance, the physical integrity and the definition of a fixed object are not denied by this model. From the delineation of a process, it is possible to deduce the physical persistence of artwork when several manifestations define the same physical properties. The model aims at promoting a high degree of freedom in the search and arrangement of information. It allows filtering information and arranging narrative paths for different users.

4 CASE STUDY: *IL TEMPO CONSUMA* BY MICHELE SAMBIN

The model was initially conceived for preserving a selection of interactive multimedia installations by Carlo De Pirro. Subsequently, it was applied and improved for the *Medea*, an "opera-video" by Adriano Guarnieri, which was then reactivated as a multimedia installation by Alvise Vidolin during *Visioni del suono* (2012), a temporary exhibition at the University of Padua [56]. In the following paragraphs we report a recent work focused on preserving and reactivating Michele Sambin's *Il tempo consuma*, an audio-video performance from the Seventies. Such a peculiar case study allowed the revision and improvement of the model while maintaining its fundamental properties.

4.1 Michele Sambin and the *Videoloop* Technique

Michele Sambin is a versatile Italian artist who has been involved with painting, film, video art, music, and theatre since the 1960s. Technology has always been part of his work as an artistic instrument. Experimentation with simple and already well-known technologies (instead of advanced ones) is a peculiar characteristic of Sambin. With experimentation, the artist brings these technologies to the boundaries of their possibilities, generating original forms of artistic use. Alongside his intense work with experimental multimedia theatre since the 1980s, experimentations with sound-video performance represent a significant part of his artistic production. The most relevant technique in his 1970s artistic production is the *videoloop*, which has affected all his subsequent work, as the artist himself stated (as reported in [47] and in the interview specifically recorded during the reactivation [18]). The *videoloop* is a circular system created by two video recorders in which there is a closed ring tape. The closed ring tape is created through the conjunction of tape extremities. The artist explains the technique as follows: "the closed ring tape scrolls between two video recorders which are placed at a specific distance to keep the tape under tension. The tape is dragged by the video recorders' engines and it spins. The first video recorder works as a recorder, while the second works as a player. The camera placed in front of the monitor is attached to the first video recorder, and the second video recorder is attached to the monitor"[10] [37]. A graphical representation of the system can be seen in Figure 2. With this technique, Sambin finds a way to overlap and accumulate video and sound material endlessly. The artist records himself at regular intervals and interacts with the playback material, becoming the interlocutor of his electronic self [1].

Besides, *Il tempo consuma*, many other works have derived from this technique, such as *Sax* (1979), *Anche le mani invecchiano* (1979), *Autointervista* (1980), *Ne..no..* (1980), and so on.

Il tempo consuma first live performance took place at Fondazione Bevilacqua La Masa in Venice in 1978. It was then shown in the *Camere Incantate* exhibition at Palazzo Reale in Milan in 1980. At the end of the seventies, the excitement for new forms of live performance was slightly declining. The same thing happened to pioneering video art, which was considered no longer of interest. For these reasons, *Il tempo consuma* didn't obtain significant feedback for many years, and Sambin was considered mainly for his theatrical works. Later, from the 1990s onward, performance and video art regained importance, and consequently scholars and art experts started to

[10]Translated into English by one of the authors.

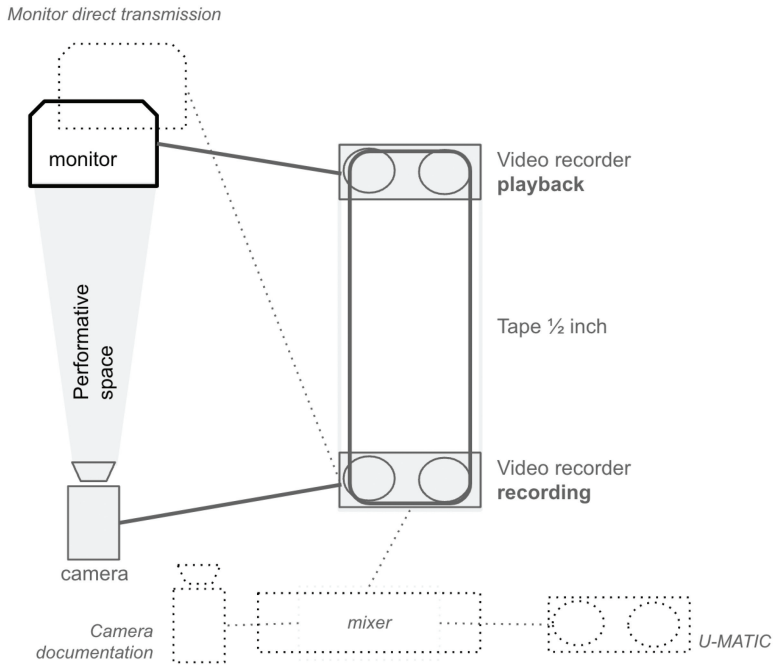

Fig. 2. Graphical representation of the original *videoloop*. The dotted shapes represent further tools used for the performance (*Monitor direct transmission* placed above the main *monitor*) to show the direct image captured by the camera, and other tools to record the performance (*camera documentation*, *mixer*, U-MATIC).

contemplate Sambin's video art of the 1970s with particular interest. Today, the *videoloop* technique and Sambin's video art performances are considered a significant series of works in Italian video art history, as we can read in many sources (a monographic book [37]; many papers about Sambin's multimedia art [15, 21, 34] among others; a project about Italian video art, REWIND*Italia* [35]; a monographic exhibition [14]; and a national video art exhibition [51]). The reason to reactivate such a performance is to restore value to Sambin's experimentations in video art and, in doing so, returning a concrete live aspect to a pioneering performance of Italian video art history. A further motivation came from the artist himself, who personally requested the reactivation to CSC with the wish to perform one of his most influential works again.

4.2 Reactivation and Preservation of *Il Tempo Consuma*

The preservation and reactivation processes took place between May 2021 and May 2022. The first step was to assemble the first two performances DPOs (1979 and 1980) by collecting bits, data, and experience documents.

The definition of the first type of item (bit) was the primary problem faced during preservation, as the original system for the first performance had not been conserved at that time The original technological tools involved – such as analog video recorders, cameras, cathode-ray tube monitors, and the tape itself – were missing as they were not owned by the artist. Now, however, it is difficult to find such tools, because of their obsolescence (and it will be increasingly difficult in the future): a central and usual problem that always arises in the reenactment of analog video works.[11] In the presented case, the DPO bit set remains partially incomplete. On the other hand, the collection of both the data and experience documents was straightforward: Sambin has always paid attention to

[11] Many projects deal with this problem in detail, such the ZKM's *40jahrevideokunst.de* [20] and REWIND [11, 36].

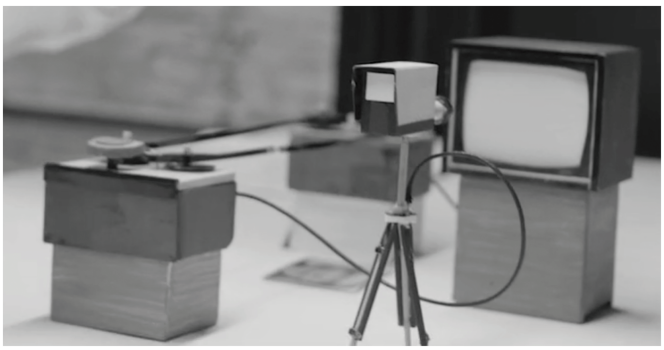

Fig. 3. Three-dimensional paper model of the original *videoloop* shown in the film *Più de la vita* [47] and exposed in *Il video rende felici* exhibition [51].

Fig. 4. A screenshot of the audio-visual recording of the original performance (1979).

the documentation of his works by drawing up sketches and scores (sometimes even three-dimensional paper models, such as the one presented in Figure 3) with appropriate comments and instructions. All these documents are considered DPO data and even the experience documentation is rich. The artist also created audio/video recordings (a screenshot of the video[12] can be seen in Figure 4) and photos of the performance that report both the original appearance, the actions that occurred during the performance, the positioning of the tools, and the use of technologies. In the case of this performance, we can count on many interviews and studies regarding the *videoloop* as well.

The process of reactivation was conducted by the authors alongside the artist. Each choice was made through an interdisciplinary comparison between the aesthetic aspects emphasized by the artist and the development approaches presented by the research group. In addition to the reactivation itself, we have recorded other materials, such as a new interview with Sambin about the reactivation meaning [18].

In the first step of the reactivation, the performative system's rehabilitation has been questioned, fielding the issues of the technological migration and recovery of analog tools. As mentioned above, the recovery of original technologies was not possible due to obsolescence, which is particularly noticeable for the video recorder, tape, and analog camera. Although monitors from that time were easier to find, they wouldn't be enough to revive the analog aspect of the performance by themselves. Therefore, we transferred the entire performative system into the digital domain by implementing a migration approach. After a demonstrative test, this approach was accepted by the artist. The artist's most important wish was to recover the performative space between the camera and the screen, which is the "real space" [18] in which all the performative actions take place.

The whole hardware apparatus that formed the original system has been replaced with new devices: the cathode-ray tube screen has been replaced by a new 32" Ultra HD LED screen; the old camera based on the cathode-ray tube has been replaced by a modern portable 4K camera; the audio system of the original performance – camera's built-in microphone and monitor's speakers – has been now replaced by a pair of dedicated speakers and a single cardioid condenser microphone; the entire system composed by video-recorders and a tape has been replaced by a computer with sound and graphic cards. The *videoloop* technique has been reactivated through the development of original software, developed with Max/MSP, a visual programming language for multimedia applications. The overall structure of the new system is visible in Figure 5.

These new hardware and software items represent the bits of a new DPO record. With them, we have the collection of data (relationship between hardware and software, elements' role, operating instructions, etc.) and

[12] YouTube video URL: https://www.youtube.com/watch?v=Fgr2-K75Cfs (last accessed 16 August 2023).

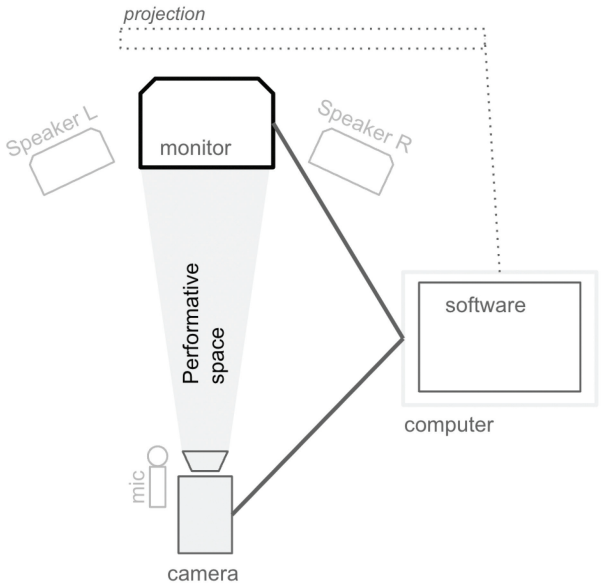

Fig. 5. Graphical representation of the reactivated *videoloop*. Even the *monitor direct transmission* in Figure 2 has been replaced by a *projection* system behind the performance space.

experience documents (audio/video recordings of performance in the digital domain, new interviews, etc.). In the case of bit-type items, it was not possible to apply the *multiple belongingness* property because we implemented a migration approach. We also replace some parts of the data, such as the general representation of the system and instructions for its activation. However, we can apply the *multiple belongingness* at the performative actions (still data type), as they remain the same both in the digital and in the analog version. The ultimate goal of the digital migration, in fact, was to reactivate the properties and qualities of the real space between the camera and the screen.

The digital reactivation has been performed three times in 2022: in Sambin's monographic exhibition at Castromediano Museum in Lecce on February, 19th 2022 (Figures 6 and 7 show the entire installation and a frame of the video created during the exhibition); during the 800th anniversary of the University of Padua at Sala Dei Giganti (Palazzo Liviano, Padua) from May 16th to 18th 2022;[13] during the 2022 edition of *Science4All*, a scientific dissemination festival at the University of Padua held every year on September, 30th. In the latest reactivation, the *videoloop* has been presented as an interactive installation (in Figure 8), with some technological changes (e.g., the usage of the smartphone camera's signal transmitted via Wi-Fi). The live performances have seen the participation of hundreds of people, and almost one thousand people visited the installation.

4.3 Comparison between Analog and Digital Versions

The digital migration of the *videoloop* has inevitable differences compared with the original. The first differentiation regards the composition of the whole system. As shown in Figure 5, digital technologies allow for significant hardware streamlining, consequently lightening the system. So, even the required actions undergo a relevant transformation and simplification. The original version required a coordinated and delicate operation to activate the loop. At the beginning of every performance, two people had to turn the two video recorders on

[13]During the second day a seminar on Sambin's art was held with the participation of eight speakers (including art scholars and engineers).

Fig. 6. The *videoloop* performance setup at Castromediano Museum in Lecce, on February, 19th 2022. This is the first time the *videoloop* has been reactivated for a live performance.

Fig. 7. Frame from the documentation video recorded during the performance at Castromediano Museum in Lecce, on February, 19th 2022. Michele Sambin is performing *Mi chiamo Michele* with the reactivated *videoloop*.

Fig. 8. Children interacting with the *videoloop* at the Science4all 2022 festival.

simultaneously. In doing so, the likelihood of errors was large, and if something went wrong, they had to restart the system all over again by rewinding the tape. With the build-on-purpose software we developed, activating the loop requires only one person. The software provides an OSC system and can be operated by different control devices connected wirelessly to it. Potentially, the performer can even control the system by himself, using an

Fig. 9. Comparison between analog (a) and digital (b) image degradation.

OSC application for mobile devices. Although these digital transformations appear highly advantageous, they directly result in an appearance transformation of the artwork. The produced effect of this *videoloop* technique is the video and sound feedback that leads to the degradation of both components. The side effect of digital migration is particularly noticeable in the video domain. For each loop cycle, areas above a certain brightness threshold shift toward white, while those below towards black. Screen and camera settings as well as the brightness of the performance space, define the brightness threshold, which is particularly difficult to control. In the digital version, the same variables determine the number of cycles the system takes to reach a saturation stage. The saturation state is due to the nature of the pixels, which are the components of the digital system. The degradation process is an aesthetic element that we can define as "image error" [22], an effect that was particularly popular in video art in the 1970s. Since the "image error" results from the "wrong" use of a specific device, the effect is specifically related to that device. Consequently, technological migration leads to consistent changes in the production of the error. Therefore, we obtain an unavoidable transformation of the visual degradation process in comparison with the original artwork. Figure 9 shows a comparison between the analog and digital versions. As we can see, in both cases, the degradation process highlights the generative nature of the image: the scan lines of the cathode-ray tube and the LCD screen pixels (that cause the saturation effect).

5 DISCUSSIONS

Since we have altered some aspects of the artwork –inevitable in such a digital migration – we might ask ourselves if we have authentically reactivated it. To discuss the authenticity of this case study, we can mention the paradox of Theseus Ship, a Greek legend often used to discuss problems such as these [24, 49, 52]. The paradox expresses the metaphysical issue of identity for entities whose parts change over time. At the paradox core is the question of whether an object that had all of its components replaced remains fundamentally the same object. During their long journey from Crete, Theseus and the Athenians had to progressively replace the pieces of the wooden ship on which they were travelling as it gradually deteriorated. By the time they arrived in Athens, all parts of the ship had been substituted. The paradox asks a logical question that applies to anything that changes: is the ship that reached the shore the same one that left Crete? We could answer "yes" regarding Theseus' ship, since its function determines its identity [24]. This legend demonstrates that identity based on authenticity is one that exhibits the essential nature of the object: not just how something looks – surface appearance -, but also how it is made, and what is the purpose or "final cause" of an object [2, 6].

Taking such ideas into account does not solve the problem of reactivation, but it certainly highlights a significant factor for multimedia artworks: physical and technological authenticity is not always an essential quality required by the identity of an artwork. The way authenticity affects identity principles depends on the identity itself. Many multimedia artworks are strictly defined by the technology and media used (e.g., internet art can only exist within the internet [30]). But many of them, especially those based on performance, define a more complex connection with the original technology and thus with the original materiality. We can take back the concept of *allography* and make a comparison between interactive multimedia artworks and "score-based" artworks, such as music and theater. When we listen to Bach or Beethoven played on a piano, we don't question the identity of their works, even if we know that both of the composers have never written for this instrument. In these cases, we do not have the feeling of having lost these pieces of music forever. At most, we can evaluate the quality and authenticity of the performance. This logic can be extended to many new interactive multimedia artworks. Their identity resides more accurately in the properties and qualities of the experience activated.

The philosopher and art critic Boris Groys introduced the term "art rheology" [25]. In the context of art in its performative and participatory culture, we should move away from traditional principles of relating to it, both in terms of contemplation, but especially in terms of preservation, and relating to it as a fluid (hence the term rheology, from the science that studies fluids). As we saw, we can not preserve the object anymore: if the traditional art produced objects, the contemporary art produces information about artistic events. The digital archive ignores the object, but preserves the "aura" with all the information pieces on its *hic et nunc*.[14] Such information allows for a re-interpretation of the art events within the transformation process of authenticity (through the flow of time), and thus with a new *hic et nunc* of the artwork's identity.

The *videoloop*'s authenticity resides in the performative space between the camera and the screen, which allows the creation of a specific experience with particular properties (e.g., interaction between the performer and its audiovisual reproduction in delay) and qualities (e.g., the audiovisual degradation) that determines its identity. The dynamic authenticity can be found in the "changeability" between the reactivations, e.g., the analog-to-digital migration reported in this article. The presented model does not aim at preserving the materiality of the artwork (e.g., in the case study presented, we could not even find the original materials), but rather save the information on performances or installations (through different layers of information). This allows us to reinterpret and reactivate (adequately or poorly) the authenticity of the artwork with a new *hic et nunc* of its identity.

Moreover, going back to Theseus' paradox, if we were to record the ship through the multilevel preservation model, we would not record the ship in Crete or the ship in Athens as authentic, but rather we would record the transformation process between two different states. The same is true for the *videoloop*: we recorded the transformation process from the analog work in 1978 to the digital reactivation in 2022 (Figure 10 shows an approximate representation of *Il tempo consuma* through the multilevel preservation model). It is precisely from the interpretation of this process that we can naturally infer the dynamic authenticity of Sambin's *videoloop*.

6 CONCLUSION

This paper focuses on the development of a model for the preservation and reactivation of interactive multimedia artworks. The model relies upon CSC solid experience in the audio preservation field and was developed to embrace the complex and unstable nature of new art forms.

In the article, we addressed the main practical and theoretical problems of preserving interactive multimedia artworks, providing the fundamentals of the proposed model. We consider artworks as *allographic* and evaluate their authenticity based on the experience produced. Hence, the concept of dynamic authenticity of an artwork, as its physical properties change over the course of manifestations, while the experience is reinterpreted (based

[14]In contrast to the traditional museum in which the object is preserved by depriving it of its "aura", that is, its original temporal and spatial location.

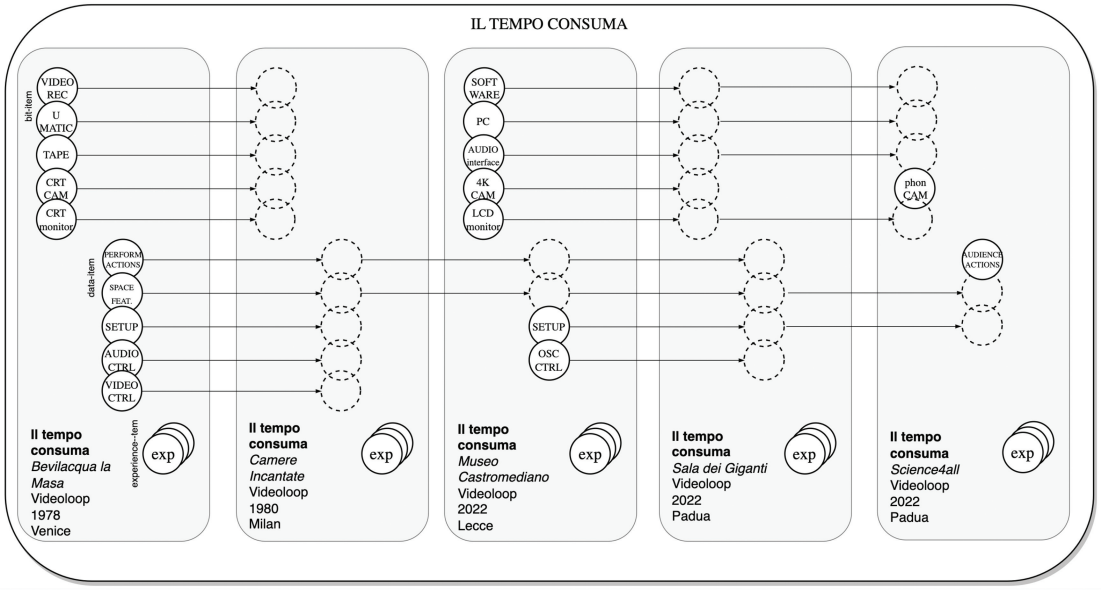

Fig. 10. Approximate chronological representation of *Il tempo consuma* through the multilevel preservation model. The chronological representation helps to show how the "real space features" (performative and interactive functions) remained unchanged from 1978 to the present.

on documentation) and reactivated through a new performance or installation. Dynamic preservation, therefore, means recording all manifestations of an artwork and enabling both its reactivation and the interpretation of its dynamic authenticity.

The main contribution of the proposed model lies in its original structure, which allows for the implementation of dynamic preservation. Through a two-dimensional layering, we horizontally record the dynamic authenticity (with the *multiple belongingness* property), while we vertically define both a macroscopic representation of the artwork (as a network of relations between manifestations) and a microscopic view of its details (representation of a single manifestation with all of its elements). The model considers the artwork as an archival series. This serves as a tool both for specialists (conservators, curators, performers, technicians, etc.) and the general public. Ensuring these different levels of information is one of the main goals of our model. Since each reactivation is a new interpretation of the artwork's authenticity, the audience should be enabled to evaluate it and thus have a general knowledge of the artwork. Documentation of the experience – such as interviews and audiovisual recordings – can serve two purposes. On one hand, the documentation provides important details that specialists can combine with more technical details (the bits and pieces of data) to improve the interpretation of the work. On the other hand, the documentation (different from a more technical one) serves as a dissemination tool for the general public.

We have reported a case study to show the high-level implementation of the model and the delineation of the dynamic authenticity of the work at the archival level. The case study, Michele Sambin's videoloop system, was a particular scenario in which the original tools (monitor, camera, video recorder, and tape) were missing. For this reason, we discussed the digital migration of technologies and the problems and advantages of such approach. Finally, in the discussion section, we saw how the model allows us to record the transformation process of the artwork from the analog version of the 1970s to the digital reactivation of 2022. This transformation process defines the artwork's dynamic authenticity.

The model continues to be tested and improved through new case studies. After including installations and performances based on music and video, the model is now focusing on other common technologies used in interactive multimedia art, such as artificial intelligence. These technologies are raising new questions and discussions need to be addressed.

As mentioned above, the model aims at reaching a wide variety of users involved in the arts, from artists, performers, curators, technicians, and conservators to the general public. An important goal is to have artists using the model at the production stage to facilitate the preservation and collection of the artwork by specialists.

To achieve these goals, CSC researchers are developing a public web archive based on the presented model. In addition to a system to facilitate the input of artwork records in the form proposed by the model, the main feature of the archive will be an original system for displaying and searching information according to the main properties presented: multiple layering and *multiple belongingness*.

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