IMMERSION, INTERACTIVITY, AND THREE-DIMENSIONALITY:
VIRTUAL REALITY DOCUMENTATION OF MEDIA ART INSTALLATIONS, MRP

by

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Abstract

Immersion, Interactivity and Three-Dimensionality:
Virtual Reality Documentation of Media Art Installations
Master of Arts, 2019

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Film and Photography Preservation and Collections Management

This research paper explores the possibilities for virtual reality (VR) documentation of media art installations. Based on an analysis of the characteristics of media art, and a survey of current documentation strategies, this paper investigates the viability of three-dimensional documentation. Four cross-disciplinary case studies are presented and analysed to demonstrate that VR documentation provides an immersive and richer reconstruction of a media art installation in three dimensions. In addition, the interactive components can be simulated within the VR environment, offering the possibility for curators and visitors to virtually re-experience the artwork. The case studies show that, although the creation of VR documentation can be costly and time-consuming, and currently requires a high-level of expertise, it can be a useful addition to established documentation strategies by providing essential information about the visual aspects of the artwork, its environment and the user's multi-sensory experience.

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Table of contents

Abstract	iii
List of Appendices	vi
Preamble	vii
Introduction	1
1. Media Art Documentation: Terminology	5
2. Media Art Documentation: Literature Review	13
3. Virtual Reality Documentation	29
4. Methodology	39
5. Case Studies	43
5.1 <i>e-Installation – Nam June Paik, Versailles Fountain (2013-2015)</i>	43
5.2 <i>Virtual Hall: Simulation of 2 David Hall Artworks (2017-2018)</i>	53
5.3 <i>VR Archive for Performance Art (2016-present)</i>	61
5.4 <i>VR Documentation of Bastardilla, Memories (2019-present)</i>	67
6. Discussion	74
Conclusion	85
Appendices	88
Bibliography	96

List of Appendices

Appendix A: Case Study Participants	88
Appendix B: Case Study Questionnaire	89
Appendix C: Additional Questions	90
Appendix D: Case Study Figures	91
Appendix E: Comparison of Technical Details	94

Preamble

This research paper is the result of a 6-month residency at LIMA (Living Media Art Platform) in Amsterdam, the Netherlands, in 2019. During this residency, I investigated the possibilities and challenges of using VR and 360-degree video for the documentation of media art installations. I consulted with the team of media art preservationists at LIMA, as well as experts from ZKM (Center for Art and Media Karlsruhe); KIT (Karlsruhe Institute of Technology); Tate, London; SAMA (Street Art Museum Amsterdam); and Live Art, Denmark, Copenhagen. This residency was one of the requirements for the Master of Arts degree in Film and Photography Preservation and Collections Management at Ryerson University in Toronto, Canada. My study was supported by the Social Sciences and Humanities Research Council of Canada.

LIMA has a longstanding interest in the documentation of media art installations. It preserves, distributes and researches media art, and represents Dutch and international artists, including Bill Viola, Nam June Paik, Nan Hoover, Gary Hill, General Idea, and Marina Abramovic. LIMA's mediatheque has over two thousand media artworks, which includes video art, performances on video, software-based and internet art, and media art installation dating back to the early 1960s. A major area of focus for LIMA is preservation through innovative means guided by research, which often turn into collaborative projects on an international scale, including *Inside Installations. Preservation and Presentation of Installation Art, 2004-2007*;¹ *Collecting the Performative*, a research network examining emerging practices for collecting and

¹ "Inside Installations," SBMK (Foundation for the Conservation of Contemporary Art), accessed July 1, 2019, https://www.sbm.nl/en/projects/Inside_Installation.

conserving performance-based art, 2012-2013;² *Future Proof Media Art*, a digital art preservation project with a case study of artist Geert Mul, 2016-2017;³ and the upcoming project *Documenting Digital Art*, a re-thinking of the histories and practices of documentation in the museum and beyond.⁴ In addition LIMA's extensive documentation on its media works, the research team at LIMA possesses significant knowledge on documenting of media art, which it disseminates through the publication of case studies, academic articles, white papers, and practical documents pertaining to the implementation of standards, such as *3D Documentation of Installations*, co-authored by Gaby Wijers, 2007;⁵ *Video Documentation of Installations*, written by Gaby Wijers, 2007 (updated in 2019);⁶ and *Guidelines for Documenting (Video) Installations on Video*, written by Sami Kallinen, 2007 (revised by José Biscaya in 2017).⁷ LIMA is currently considering VR, 360-degree video, motion tracking, and other technologies that make it possible to document the immersive experience of being within a three dimensional space of a media installation. These technologies can be used in re-creation or documentation of interactive media artworks, thereby preserving them for future access. It is my hope that this research paper is just the beginning of a larger investigation into the use of VR as a documentation tool that LIMA will undertake at a later date.

² "Collecting the Performative," LIMA, accessed July 1, 2019, <https://www.li-ma.nl/lima/nl/node/146>.

³ "Future Proof Media Art," LIMA, accessed July 1, 2019, <https://www.li-ma.nl/lima/nl/article/future-proof-media-art>.

⁴ Annet Dekker, "AHRC research grant: Documenting digital art. Re-thinking histories and practices of documentation in the museum and beyond," AAAN, last modified March 27, 2019, <http://aaaan.net/ahrc-research-grant-documenting-digital-art-re-thinking-histories-and-practices-of-documentation-in-the-museum-and-beyond/>.

⁵ Gaby Wijers, *3D Documentation of Installations* (Amsterdam: NIMk/Montevideo, 2007) <https://web.archive.org/web/20071019082431/http://www.inside-installations.org/OCMT/mydocs/3D%20Documentation%20of%20Installations.pdf>.

⁶ Sami Kallinen, *Guidelines for Documenting Video Installations on Video* (Amsterdam: NIMk, 2007), 2nd ed., rev. José Biscaya (Amsterdam: LIMA, 2017), https://mediakunst.net/wiki/lib/exe/fetch.php?media=guidelines_for_documenting_video_installations_on_video.pdf

⁷ Ibid.

Introduction

Creating textual and visual records of an artwork is a fundamental part of conservation practices in memory institutions and is one of the key strategies for preserving and re-exhibiting installation art.⁸ Unlike traditional fine art practices such as painting and sculpture, installations are usually dismantled after an exhibition and rely greatly on documentation for their re-installation and perpetuation. Documentation is particularly crucial in the preservation of media art installations, which owing to their dependence on complex technologies, often succumb to the effects of technological obsolescence, leading to conservation problems at a much more rapid rate than traditional fine arts.⁹

When documenting a media art installation, different aspects may be important to record including the installation's physical characteristics, its relation to and position within the architectural space, and its performative aspects, experience and users' interactions.¹⁰ One of the main decisions the preservationist must make is how to best document the installation, or more precisely, how to document the "core" of the artwork.¹¹ It is impossible to accurately exhibit a work of media art if the original equipment, and information about its components and configuration do not exist. A lack of documentation may, for instance, "lead to a faulty installation and/or an

⁸ Vivian Van Saaze, "In the Absence of Documentation. Remembering Tino Sehgal's Constructed Situations," *Revista de História da Arte*, vol. 4 (January 2015): 56, <http://revistaharte.fcsh.unl.pt/rhaw4/RHAW4.pdf>. In the introduction to her article, Van Saaze comments on the recent proliferation of documentation guidelines that emphasize the significance of documentation as a "form of materialised memory for the conservation of contemporary art."

⁹ Van Saaze, *Installation Art and the Museum: Presentation and Conservation of Changing Artworks* (Amsterdam: Amsterdam University Press, 2013), 114.

¹⁰ "Inside Installations," NIMk, accessed July 1, 2019, <http://www.nimk.nl/print.php?id=426>.

¹¹ Van Saaze, *Inside Installations*, 138; and "Time Based Media," Guggenheim, accessed July 1, 2019, <https://www.guggenheim.org/conservation/time-based-media>.

undesirable effect as a result of the incorrect playback speed, sound volume, resolution or surroundings.”¹² Furthermore, as often happens to live, performance-based art, “the documentation could be the only surviving trace of the work.”¹³

Documentation of media art installations can assume many forms, for example, written descriptions, installation instructions (for mounting and operation), sketches, photographs and videos, among others. It is largely determined on a case-by-case basis, according to the characteristics of the work and the purpose for which it is being documented. The variable, three-dimensional, ephemeral, site-specific and event-based nature of media art installations requires documentation that will reflect not just the spatial arrangement and technological components, but also the way in which the work *behaves*. In one way or another, the documentation must be capable of registering the artwork’s conceptual identity, which relates to the artist’s intention. That is to say, the documentation must accurately record the aesthetic and technical elements, essential to the artwork’s integrity and meaning, so that in the future it can be re-mounted the way the artist intended.¹⁴

A significant limitation in the documentation of media art installations is the two-dimensional nature of media currently used to document these works. Photographic documentation, for example, can provide valuable information about the exhibition space and the details of the physical objects that are arranged in the space, but it is not able to capture the spatiotemporal relationships between different elements of the installation work. Video documentation offers essential information about the relationship of the work’s components in space and time, it also captures

¹² Wijers, “Ethics and practices of media art conservation, a work-in-progress (version 0.5),” last modified August 2010, <https://www.scart.be/?q=nl/content/ethics-and-practices-media-art-conservation-work-progress-version-05>.

¹³ Ibid. See, for example, the case of Bert Schutter’s video sculpture, *Mill x Molen* (1982), discussed at the source.

¹⁴ Pip Laurenson, “Vulnerabilities and Contingencies in the Conservation of Time-based Media Works of Art,” in *Inside Installations. Theory and Practice in the Care of Complex Artworks*, eds. Tatja Scholte and Glenn Wharton (Amsterdam, Amsterdam University Press, 2011), 35-39; and Francine Couture, “Conservation, a Collaborative Act between the Artist and the Conservator,” *Espace Art Actual*, last modified December 15, 2012, <https://espaceartactuel.com/en/a-collaborative-act-between-the-artist-and-the-conservator/>.

sounds and aspects that relate to the presence of viewers/users and, to some degree, their responses to the work, but it cannot capture the viewer's/user's experience of immersion in the installation.¹⁵ Photographs, videos and written descriptions in documentation, therefore, do not offer a rich enough representation of the work's elements that can be essential in experiencing a media art installation. A three-dimensional (3D) VR representation, on the other hand, can potentially provide a fuller representation, offering insight into how the work engages the audience to move through the space and experience its various elements by capturing the work in 3D and from the audience's point of view. This paper investigates whether VR technology, at this point in time, is or can be an effective and reliable tool in the documentation of media art installations for the purpose of preservation, by virtue of its capacity to offer richer and more encompassing representations of the spatial, temporal, sensory and interactive aspects of these works of art.

This research paper begins by providing a definition and brief history of media art installations, and a definition of media art documentation. Section 1 also provides an overview of the types of documentation, their distinguishing features, and the purposes for which they were created. Section 2 outlines the challenges in documenting media art installations and the efforts to address them, by relying on examples of the most relevant and important projects, and the tools and documentation frameworks developed as a result. Section 3 introduces the history and concept of VR documentation, and section 4 outlines the research methodology. Section 5 presents four case studies, two of which are recent projects on the documentation of media art installations using VR: *e-Installation – Synesthetic Documentation of Media Art / Versailles Fountain*

¹⁵ Georgia Tzirou, "Preservation of Media Installation Art in the Posthuman Era," in *Audiovisual Posthumanism*, ed. Evi D. Sampanikou (Newcastle upon Tyne: Cambridge Scholars Publishing, 2017), 160; and Gwynne Ryan, "Variable Materials, Variable Roles: The Shifting Skills Required for Contemporary Art Conservation," *Journal of the American Institute for Conservation Objects Speciality Group Postprints*, Vol. 18 (2011): 108-9, <http://resources.conservation-us.org/osg-postprints/wp-content/uploads/sites/8/2015/02/osg018-10.pdf>.

(1993), *Nam June Paik* (2013-2015) led by Jesús Muños Morcillo, Karlsruhe Institute of Technology, which used VR to simulate the sensory experiences of media artworks in a virtual environment using 3D scanning and mapping techniques; and *Virtual Hall: Simulation of 2 David Hall Artworks in Virtual Reality* (2017-2018) lead by Adam Lockhart, Dundee University, which used VR to recreate a video installation that no longer exists based on existing documentation. The other two case studies focus on cross-disciplinary applications of VR in the documentation of performance art and street art: *Memories: Virtual Reality (360-degree video) Documentation of Memories by Bastardilla* (2019 - present), undertaken by Street Art Museum Amsterdam (SAMA), and of performance art, *VR Archive for Performance Art* (2016-present), an ongoing project by Live Art, Denmark. Section 5 discusses these case studies in great detail. Relying on interviews with experts, this section also provides an evaluation of the documentation methods, including cost, technical expertise, the decision-making process and long-term accessibility. Finally, section 6 addresses the feasibility of VR as a documentation tool, and considers its most appropriate applications, concluding with an assessment of its strengths and weaknesses, as well as the implications around the preservation of VR documentation, and by providing recommendations for future research.

1. Media Art Documentation: Terminology

1.1 Media Art Installation

The term “media art” can have many definitions but is generally understood as any kind of artwork that uses electronic and digital communication technology (film, video, radio and electronic sound, digital micro controllers and coding, etc.) as its medium, which determines its aesthetic and function. Film, video art, digital art, computer/software art, interactive art, sound art, net art, and installation art are all media art practices.¹⁶ Though the term did not appear until the 1990s, it was retroactively applied to nearly any audiovisual artwork created since the 1960s and has come to relate to works by artists like Nam June Paik (1932-2006, Korea/United States), Robert Whitman (b. 1935, United States), Steina (b.1940, Iceland/Prague) and Woody Vasulka (b.1937, Czechoslovakia/Prague), Frank Gillette (b.1941, United States) and Wolf Vostell (1932-1998, Germany).¹⁷ The term “installation art” can also be defined in various ways.¹⁸ In *Installation Art and the Museum*, Vivian Van Saaze draws on several definitions, describing installation art as “works from the 1960s and onwards which share certain key characteristics, such as the creation of an event, site-specificity, the focus on the theatrical, on process, spectatorship and temporality.”¹⁹ Media art installations (an amalgam of media art and installation art), therefore,

¹⁶ The terminology can largely depend on the institution and/or individual. Some institutions may also describe media art as “time-based art.” For example, Julia Noordegraaf (professor of Digital Heritage at the University of Amsterdam) uses the terms media art and time-based art interchangeably. Time-based art, she says, includes anything “from film- and video-based works and slide-based installations, to works based on computer technology and the Internet such as software art and net art” (Noordegraaf, “Introduction,” in *Preserving and Exhibiting Media Art: Challenges and Perspectives*, eds. Vinzenz Hediger, Saba G. Cosetta, Barbara Le Maitre and Noordegraaf (Amsterdam: Amsterdam University Press, 2013), 13). Other terms include “structural film, expanded cinema, intermedia environment, and moving-image or projected-image installation” (Kate Mondloch, *Screens: Viewing Media Installation Art* (Minneapolis: University of Minnesota Press, 2010), 1).

¹⁷ Chris Wahl, “Between Art History and Media History: A Brief Introduction to Media Art” in *Preserving and Exhibiting Media Art*, 25.

¹⁸ Finding a definition of the term ‘installation art’ (also referred to as environments) is a topic in itself and dealt with in books such as Mark Rosenthal, *Understanding Installation Art* (Munich: Prestel Publishing, 2003); Claire Bishop, *Installation Art: A Critical History* (London: Tate, 2005); *Inside Installations*; and *Installation Art and the Museum*, among others.

¹⁹ Van Saaze, *Installation Art and the Museum*, 17.

pose a great challenge for documentation, which has to accord equal attention to the physical/material and technological issues of preserving media artworks, and to the spatiotemporal and ephemeral/immaterial characteristics of installation art.

The difficulty of defining media art installations might be connected to the fact that many areas that characterize this art form are not precisely defined. For example, some conservators argue that the characteristics of installation art relate less to traditional fine art practices, and more to performance art, conceptual art, and music — art forms which emphasize art as a *process* and event rather than art as an *object*.²⁰ The origins of media art installations and the parameters of what constitutes such works have been widely debated and are perpetually negotiated.²¹ From a technological perspective, the history of media art installations is largely influenced by and parallels technological developments in video and film projection, computer software and platforms, and VR and 3D technologies.²² However, some agree that the emergence of media art installations can be traced back to the mid-1950s, when, in 1956, Nicolas Schöffer (1936-1992, Hungary/France) made what is considered to be the first cybernetic sculpture. The work, titled *CYSP 1*, created with the help of Philips engineers, comprised “an ‘electronic brain’ connected to sensors that enabled the human-scale kinetic sculpture to respond to changes in sound, light intensity and colour, and movement, including that of the audience.”²³ Indeed, a major turning

²⁰ In the introduction to *Re-Collection: Art, New Media, and Social Memory*, Richard Rinehart writes, “New media art is as performative and variable as it is visual or artifactual. That is, new media art can be seen as performing art like music or theater as it is a visual art like painting or sculpture —though it is often visual arts institutions and museums that are struggling to preserve it.” (Rinehart, “New Media and Social Memory,” in *Re-Collection: Art, New Media, and Social Memory*, eds. Rinehart and Jon Ippolito (Massachusetts: MIT Press, 2014), 27.)

²¹ In Wahl’s introduction to media art history, he discusses works as far back as the 1920s, such as the experimental multi-screen projections of film pioneer Oskar Fischinger. These shows would later be termed “expanded cinema” in the 1960s (Wahl, *Preserving and Exhibiting Media Art*, 35). In the late 1950s, art galleries began showing works incorporating film and video screens created by artists such as Carolee Schneemann, Alan Kaprow, John Cage, Robert Whitman and Robert Rauschenberg. The works were considered “happenings, performances, and expanded cinema events.” While Nam June Paik’s video sculptures from the mid-1960s, have been referred to as “screen-reliant installations.” (Mondloch, *Screens*, 2). Based on the definition given in this paper, these works could all be considered media art installations.

²² Noordegraaf, *Preserving and Exhibiting Media Art*, 11.

²³ Edward A. Shanken, “The History and Future of the Lab: Collaborative Research at the Intersections of Art, Science, and Technology” in *Future of the Lab*, eds. A. Plohm and C. Butcher (Eindhoven: Baltan Labs, 2010): 23, http://artextra.files.wordpress.com/2009/02/shanken_history_future_lab_proof.pdf.

point in fine arts occurred with the convergence of fine arts and media arts by means of electronic and mechanical technology with the help of engineers. For example, Robert Rauschenberg (1925-2008, United States) frequently worked with research-scientist Billy Klüver (1927-2004, United States) to create works such as *Oracle* (1962-65), which combines radios, metal parts, and electronic components to produce an interactive, sound-emitting sculpture.²⁴ In 1966, Rauschenberg would go on to co-found the E.A.T. (Experiments in Art and Technology) group with Klüver, engineer Fred Waldhauer, (1927-1993, United States) and artist Robert Whitman, to promote collaborations between artists and engineers. The works created within E.A.T. in the late 1960s throughout the 1970s combined installation, performance, and responsive environments that used sensors for data input from the audience, performer or participant, and would respond by a change in the environment (lights, air blowing to inflate the environment, etc.).²⁵

In the 1980s and 1990s, with the prevalence of consumer-level cybernetics, digital computers, and the Internet, artists' interest in creating environments that respond to human presence or activity came into further focus. During this time, artists like Jeffrey Shaw (b. 1944), Michel Bret (b.1941), Edmond Couchot (b.1932), and David Rokeby (b.1960) were producing installations utilizing cybernetic and computation technologies,²⁶ in addition to works such as those created within the *Art and Virtual Environments* project at the Banff Centre which explored the use of virtual reality to create three-dimensional virtual environments.²⁷ By the late 1990s - early 2000s, neither the artist nor the audience are of consequence, with generative and algorithmic art,

²⁴ "Oracle," Richard Rauschenberg Foundation, accessed August 8, 2019, <https://www.rauschenbergfoundation.org/art/artwork/oracle>.

²⁵ Julie Martin, *E.A.T.: Experiments in Art & Technology, 1960-2001*, video lecture, Donoho Colloquium, Dartmouth College, New Hampshire, 2013, <https://www.youtube.com/watch?v=B0coC9CxER4>.

²⁶ Tabea Lurk and Jürgen Enge, "Computers and Digital Reception Devices: History and Technological Characteristics," in *Preserving and Exhibiting Media Art*, 229-230.

²⁷ Mary Anne Moser and Douglas MacLeod, eds., *Immersed in Technology: Art and Virtual Environments* (Massachusetts: MIT Press, 1996).

such as Ken Rinaldo's interactive robotic installation *Autopoiesis* (2000),²⁸ or uses participation of people around the globe, such as *Electric Sheep* (1999) by Scott Draves.²⁹

More recently, 3D and VR technologies have become more common in the work of artists creating immersive installations, emphasizing once again the responsive environment and interactive experience of the user but within a virtual space,³⁰ for example Langlands (b. 1955, London) and Bell's (b. 1959, London) VR tour of Osama Bin Laden's hideout in Afghanistan, *The House of Osama bin Laden*, 2003, or Jon Rafman's (b.1981, Montreal) installations which frequently include and comment on modern social interactions within virtual realities (*Kool-Aid Man in Second Life*, 2009). The continuously emerging forms of media art installations and developments of new technologies challenge traditional documentation practices, demanding radical re-thinking of current documentation strategies and considering more imaginative and forward-looking approaches in documentation. These challenges and efforts to address them have led to a number of projects, outlined in section 2.

1.2 Media Art Documentation

While many conservators and archivists have developed theoretical frameworks around the process of media art documentation, there is no consensus regarding its definition.³¹ This term can mean different things for conservators, archivists, artists, art historians and theorists. Documentation has become an umbrella term for many types of practices and is understood as

²⁸ David M. Berry and Michael Dieter, eds., *Postdigital Aesthetics: Art, Computation and Design* (London: Palgrave Macmillan), 32.

²⁹ Scott Draves, "Evolution and Collective Intelligence of the Electric Sheep," in *The Art of Artificial Evolution: A Handbook on Evolutionary Art and Music*, Juan J. Romero, ed. (Berlin: Springer, 2008), 63-80.

³⁰ Maria Roussou, "Learning by Doing and Learning Through Play: An Exploration of Interactivity in Virtual Environments for Children," in *Museums in a Digital Age*, ed. Ross Parry (London: Routledge, 2010), 254.

³¹ E.g. Laurenson, "Authenticity, Change and Loss in the Conservation of Time-Based Media Installations," *Tate Papers*, no. 6 (Autumn 2006), <https://www.tate.org.uk/research/publications/tate-papers/06/authenticity-change-and-loss-conservation-of-time-based-media-installations>; Van Saaze, *Installation Art and the Museum*; and Dekker, *Preserving and Exhibiting Media Art*.

both the *creation of documents* and the *techniques of their management*. For example, documentation of the conservation process of an artwork comprises condition and treatment reports; technical documents created using different media (photos and videos, 3D and born-digital images, analog data, analytical results, etc); historical research data; and all documents related to inventory, insurance and loan agreements. Documentation is also a term with strong associations to information management; for example, documentation models such as 2IDM, produced in the context of the European research project *Inside Installations* (2004-2007), concern the collection, archiving, arrangement, and contextualization of records related to the documentation of installation art.³² Finally, documentation is also a conservation and preservation strategy for contemporary art, in particular performance and installation art.³³ In the latter context, documentation of media art installations is a form of representation, through production of various records that illustrate, provide instructions and information about an artwork.³⁴

The idea that documentation is a “subjective process” is widely acknowledged.³⁵ Therefore, when interpreting the documentation, it is important to identify and understand the type, format, creator, and purpose behind its creation. In *Preserving and Exhibiting Media Art*, Annet Dekker (an independent researcher, curator, and assistant professor of archival science at the University of Amsterdam) defines documentation of media art as “the process of gathering and

³² Gunnar Heydenreich, “Documentation of Change and Change of Documentation,” in *Inside Installations: Theory and Practice in the Care of Complex Artworks*, eds. Tatja Scholte and Glenn Wharton (Amsterdam: Amsterdam University Press, 2011), 165.

³³ Lucia Almeida Mato, Rita Macedo and Heydenreich, eds. “Performing Documentation in the Conservation of Contemporary Art,” *Revista de História da Arte*, no. 4 (2013): 3, https://dorotheaust.ch/assets/mediauploads/pdf/2015_Performing_Documentation_RHAW4_Irene_M%C3%BCller_only_text_IM.pdf.

³⁴ Amelia Boogen Ybarra, “Born-Digital Art: Documentation Models as a Conservation Measure,” in *Ge-Conservation*, vol. 1, no. 11 (January 2017): 166.

³⁵ Dekker, “Enjoying the Gap: Comparing Contemporary Documentation Strategies,” in *Preserving and Exhibiting Media Art*, 151. Decision-making when documenting an artwork is an inherently subjective process, for example when selecting different aspects of the work to be documented, when choosing which angle to photograph the artwork, or the choice of words used when creating textual documentation. How and why these decisions have been made and how or who is doing the actual recording are important to acknowledge. To circumvent this problem several decision-making and documentation models have been developed providing insight into this process. (Dekker, “Net Art Challenges Conservation: The Acceptance of Loss and Subjectivity,” in *Possible Futures: Art, Museums and Digital Archives*, eds. Ana Gonçalves Magalhães and Giselle Bieguelman (São Paulo: Editora Peirópolis, 2014), Kindle.)

organizing information about a work, including its condition, its content, its context, and the actions taken to preserve it.”³⁶ Within the context of media art documentation, she lists several types of documentation, which refer to the purpose for why the documentation was created. Documentation can be produced: for publicity and presentation; for purposes of reconstruction or preservation; for describing processual changes in the appearance of a work; for developing an aesthetic and/or an historical “framework” or reference; for educational purposes; for capturing audience experiences; and/or for capturing the creative or working process of the artist(s).³⁷

Documentation can be produced in several formats, depending on the type and motivations behind its creation. These formats can mainly be divided into textual or audio-visual. In addition, some media art documentation strategies take a holistic approach, combining different formats. In general, the main formats for documenting media art installations with variable media components (audio, video, kinetics and haptics) include photographs, 3D scans, videos, textual descriptions such as treatment reports, artist's interviews, and the artwork's installation protocols. In addition, documentation can be produced by different people. For example, curators, registrars, archivists and artists —and even museum visitors — sometimes produce documentation, which is different (in its motivation) from a conservator's documentation.³⁸

In most museum practices, Dekker argues, “the core of documentation strategies is focused on the preservation of the work.”³⁹ All forms of documentation, including materials often regarded as secondary documentation (exhibition photos, press releases, posters or video produced for publicity and presentation), help when re-mounting a work and can be considered valuable in

³⁶ Dekker, *Preserving and Exhibiting Media Art*, 149.

³⁷ *Ibid.*, 151.

³⁸ See, for example, Bashar Alsadik, “Crowdsourced and web-published videos for 3D documentation of cultural heritage objects,” *Journal of Cultural Heritage*, no. 21(2016): 899-903.

³⁹ Dekker, *Preserving and Exhibiting Media Art*, 151.

understanding and reconstruction of an artwork, especially when the work is no longer accessible.⁴⁰ Most documentation conducted in museums and other collecting institutions is based on frameworks and strategies developed by the international conservation community. The last two and a half decades have seen several international projects on the conservation of media art that consider documentation as the first and most important step to its preservation.⁴¹ In *Installation Art and the Museum*, Van Saaze, quoting several media art archivists, says “in the context of installation art, forms of documentation such as installation guidelines consisting of texts, plans, digital images of different presentation forms, artist’s interviews and records of working techniques are considered indispensable.”⁴² She further argues that, “documentation in contemporary art conservation is regarded as extremely important and can even come to substitute for the physical artwork.”⁴³ Documentation practices, she continues, “have an effect on the perpetuation of the artwork in the museum.”⁴⁴ Ideally, documentation should consider all distinctive features of the media artwork, aiming to improve its preservation. Some of the most important aspects of documentation include: artist’s intention and purpose (obtained through interviews); diagrams and technical details for mounting a work; details of the work’s elements; description of the work’s functioning; interaction between the work and visitors/users, if applicable; and, a description of the ideal space requirements for exhibition.⁴⁵ Specific documentation models have been developed by the Guggenheim, LIMA, Tate and other museums and archives that collect and

⁴⁰ A work might be physically inaccessible for a number of reasons, including the loss of equipment due to obsolescence (see footnote 13), or the live nature of the artwork. Dekker shows how collecting secondary documentation (in the form of data from participants) could be used to “recreate” Blast Theory’s *Uncle Roy All Around You*, 2003 (Dekker, *Preserving and Exhibiting Media Art*, 151).

⁴¹ Examples include *Modern Art: Who Cares?* (1999), DOCAM Research Alliance (2004-2007); *Inside Installations* (2004-2007), and *Digital Art Conservation* (2010). (Several more examples are provided in section 2.)

⁴² Van Saaze, *Installation Art and the Museum*, 114-115.

⁴³ *Ibid.*, 122.

⁴⁴ *Ibid.*, 140.

⁴⁵ Ybarra, *Born-digital art*, 166.

preserve media art, with the objective to gather the required information for an accurate description. (These documentation models are discussed in the next section.)

2. Media Art Documentation: A Survey of Literature

In the field of contemporary art conservation, the importance of the preservation of media art became a growing issue in the late 1990s throughout Europe and North America, as evinced by the number of international collaborative research projects, conferences and symposia, which will be outlined in this section. These initiatives have contributed to the growing literature on the preservation of media art installations and comprise most of the relevant research on the subject of their documentation.

2.1 Developments in Media Art Documentation: Practical Initiatives

Over the course of the 20th century, artworks gained an ever-increasing formal complexity.⁴⁶ Artists began working with new materials, including technology (CRT monitors, motors, computers, sensors, circuits, etc.), to create complex and variable artworks--presently known as media art and media art installations. These artworks, as a result, became more challenging to effectively document and disseminate. Furthermore, compared to works made in the more traditional artist media, for example oil paint on canvas (painting) or bronze (sculpture), these new works have a much shorter lifespan. In order to ensure these works survive, an urgent rethinking of the standard concepts and principles of preservation was required. Media art, as Cosetta G. Saba says, “presents a prevalent typology of artworks that require new and effective documentation, preservation, and dissemination methods.”⁴⁷ Several, now well-known, large-scale projects and conferences on the preservation and conservation of media art were organized in Europe and North America beginning in the late 1990s.

⁴⁶ Saba, “Media Art and the Digital Archive,” *Preserving and Exhibiting Media Art*, 103.

⁴⁷ Ibid.

In 1997, Amsterdam was host to one of the first major international initiatives devoted to issues regarding the conservation of modern and contemporary art. The three-day symposium, *Modern Art: Who Cares?*, the result of the 1996-1997 research project *Conservation of Modern Art*, included papers and seminars on key topics in the conservation of modern art: artists' materials; artist's intent; training; and, most significantly, the preservation of electronic media and installation art.⁴⁸ One of the biggest issues identified during this conference was the documentation and conservation of ephemeral and "immaterial" forms of artistic expressions, i.e., how to preserve works that use ephemeral materials⁴⁹ and whose meaning is not derived from the physical object. Conclusions of the symposium stated, "conservation of modern and contemporary art is only possible if information is available on the materials and techniques used by the artists and, not least, what they mean to the artists. The fact that these data are largely unavailable endangers the preservation of modern and contemporary art. Documentation and research in these areas should become a structural part of the conservation of modern art."⁵⁰

During the twenty years thereafter, several studies, conferences and consortia focused specifically on the preservation of media art: in 1999, a new preservation strategy by Guggenheim Museum, The Variable Media Initiative (New York); in 2003, a research project by V2_, *Capturing Unstable Media* (Rotterdam); in 2005, the founding and subsequent activities of the DOCAM Research Alliance (Montreal); in 2004-2007, a research project by INCCA, *Inside Installations: Preservation and Presentation of Installation Art*, (Amsterdam and London); as well

⁴⁸ "Symposium: Modern Art: Who Cares?" INCCA, accessed July 1, 2019, <https://www.incca.org/events/symposium-modern-art-who-cares-1997>.

⁴⁹ "Modern Art Who Cares," SBMK, accessed July 1, 2019, https://www.sbm.nl/en/projects/Modern_Art_Who_Cares. In the context of this conference, "ephemeral materials" refers to modern works using materials with a short lifespan, such as decaying fruit or flowers, light, air, smoke, and beeswax. The technologies used in media art installations can also be described as "ephemeral" due their similarly short lifespan.

⁵⁰ "Symposium: Modern Art: Who Cares?" INCCA.

as new projects on the conservation of born-digital and computer-based artworks, like the Digital Art Conservation project, organized in 2010 by ZKM | Center for Art and Media (Karlsruhe). Within these projects, preservationists developed various models for documenting media art and addressed preservation problems via case studies. These initiatives led to the understanding that the traditional “storage and minimal intervention” of the object-based preservation approach is not always adequate for the conservation of media artworks, which, due to their (technological and event-based) ephemerality⁵¹ and their “conceptual, unstable, variable, or process-like character,” require more frequent and active levels of intervention in preservation to enable continued display.⁵² For this reason, archiving institutions began to develop conservation frameworks that address the specific challenges of preserving complex, interactive media artworks.

In 2000, the Variable Media Questionnaire (VMQ) was developed by Jon Ippolito (Guggenheim Museum curator), within the context of the VMN. The VMQ is an archiving tool that emphasizes behavioral and ephemeral aspects of interactive media artworks. The VMQ is “designed to help a work's creators and users write guidelines for translating their works into new media once the original medium has expired.”⁵³ This tool is centered on the content of the work, rather than its medium or physical manifestation, representing a shift away from the traditional object-oriented documentation of an artwork in order to know something about the work's behaviour, presentation and audience experience, as well as a shift from media experts to artists/creators making decisions on how the work is meant to be seen and if it should be re-created

⁵¹ Here, the term ‘ephemerality’ refers not only to the short lifespan of the materials (technology) but the event-based or performative quality of the artwork.

⁵² As Van Saaze notes in *Installation Art and the Museum*, “for many contemporary artworks, the notion of art as a ‘fixed’ material object becomes problematic due to the use of ephemeral material or due to their conceptual, unstable, variable, or process-like character” (Van Saaze, *Installation Art and the Museum*, 23).

⁵³ “Variable Media Questionnaire,” Forging the Future, accessed August 8, 2019, <http://variablemediaquestionnaire.net/>.

in the future.⁵⁴ Based on the VMQ, the Capturing Unstable Media Conceptual Model (CMCM) was developed in 2004. It was an outcome of the Capturing Unstable Media research project on archiving and preserving of unstable media, conducted by V2_ in 2003. The CMCM is “an ontology⁵⁵ with a multi-hierarchical and object-oriented structure of interrelated concepts or classes,”⁵⁶ used for documenting and describing the complexities of media art projects in a standardized way. The focus of the CMCM is on collaboration and multiple-authorship, and therefore allows for describing/documenting the various contributors or creator roles (such as choreographer, visual designer). In addition, the model can be used to describe technical behaviours, dependencies and relationships, project component types, and user interaction.⁵⁷ In 2005, Richard Rinehart created the Media Art Notation System (MANS), a “conceptual model and an expression format that could be used to describe, investigate and utilize media art.”⁵⁸ This archival model proposes a method to create “scores” of the behaviour of interactive media artworks, similar to musical scores, and was developed out of the VMN and Archiving the Avant Garde research projects.⁵⁹ Since its creation in 2005, DOCAM (Documentation and Conservation of the Media Arts Heritage) has produced various cataloguing and preservation guides for complex media art objects, including the DOCAM Documentation Model, developed in 2010, which “brings together, organizes and makes accessible the documentation created by various contributors

⁵⁴ Jon Ippolito, “Accommodating the Unpredictable: The Variable Media Questionnaire,” in *Permanence through Change: The Variable Media Approach*, eds. Alain Depocas, Jon Ippolito, and Caitlin Jones (New York: Guggenheim Museum, 2003), 47-8.

⁵⁵ “Glossary,” CMCM, accessed August 11, 2019, <https://web.archive.org/web/20070610045259/http://capturing.projects.v2.nl/glossary.html>. An ontology, as defined in the CMCM glossary, is “an explicit formal specification of how to represent the objects, concepts, and other entities that are assumed to exist in some area of interest and the relationships among them.”

⁵⁶ “Capturing Unstable Media Conceptual Model,” V2_, accessed August 8, 2019, <https://v2.nl/archive/works/capturing-unstable-media-conceptual-model-cmcm>.

⁵⁷ Rinehart, “The Media Art Notation System: Documenting and Preserving Digital/Media Art,” *Leonardo*, vol.40, no.2 (2007): 187, http://www.coyoteyip.com/rinehart/papers_files/leonardo_mans.pdf.

⁵⁸ Ibid.

⁵⁹ Ibid., 185-87.

throughout the lifecycle of a media artwork.”⁶⁰ Finally, Matters in Media Art (MMA) was a multi-phase, “collaborative project between the New Art Trust (NAT) and its partner museums – the Museum of Modern Art (MoMA), the San Francisco Museum of Modern Art (SFMOMA) and Tate,”⁶¹ launched in 2005. It was designed to be openly accessible information resource and to provide guidelines on the care of media art including video, film, audio and software-based installation. MMA’s documentation templates can be used in the acquisition of the work, to prepare it for long-term preservation, future loans, and installation.⁶²

Research initiatives on media art and media art installations had various, sometimes overlapping interests, but often a specific focus. For example, in Europe, two important projects investigated the preservation and documentation of installation art. Between 2004 and 2007, the project Inside Installations: Preservation and Presentation of Installation Art, supported by European Commission, studied thirty artworks from the perspective of conservation.⁶³ The central aim of the project was to develop good practice and tools within five topics that were considered essential for the preservation and presentation of installation art: “1. Preservation Strategies, 2. Artists’ Participation, 3. Documentation & Archiving Strategies, 4. Theory and Semantics, 5. Knowledge Management and Information Exchange.”⁶⁴ Due to the complexity of installation art, the project required an interdisciplinary approach, drawing on a wide body of expertise from

⁶⁰ “Presentation of the Model,” DOCAM, accessed August 8, 2019, <http://www.docam.ca/en/documentation-model.html>.

⁶¹ “About,” Matters in Media Art, accessed August 12, 2019, <http://mattersinmediaart.org/about.html>.

⁶² Ibid.

⁶³ This was an important study which addressed the need for developing new standards for the conservation of installation art, described as “distinct from traditional art objects. Works incorporating time-based media, such as audio-visual & electronic media, net.art or performance are understood in terms of their behaviours as much as their component parts. These works often anticipate an active involvement by the spectator (interactivity) and evoke a multi-sensorial experience (sound, vision, touch and smell). These works are often created for site and time specific occasions and demonstrate specific vulnerabilities both in terms of the contexts and technologies on which they are dependent.” The main research question of this project was, “How can we safeguard these expressions of our contemporary visual culture so that they can be experienced by future generations?” (Both quotations from: “Inside Installations Preservation and Presentation of Installation Art,” NIMk, accessed August 13, 2019, <http://www.nimk.nl/eng/inside-installations-preservation-and-presentation-of-installation-art>.)

⁶⁴ Ibid.

more than 30 European organizations.⁶⁵ Inside Installations research project produced several documentation models and methods to document illumination, sound and movement.⁶⁶ The results of this research were published as an anthology *Inside Installations: Theory and Practice in the Care of Complex Artworks* in 2011, edited by Tatja Scholte and Glenn Wharton. In 2013, Barbara Ferriani and Marina Pugliese published the book *Ephemeral Monuments: History and Conservation of Installation Art*, the English translation of the 2009 Italian publication *Monumenti effimeri, Storia e conservazione delle installazioni*. This book is the result of the DIC – *Documentare Installazioni Complesse* (Documenting Complex Installations) initiative that focused on the conservation of installations and took place between 2006 and 2008 in Italy. The aim of this project was to document “those elements that guarantee that the artist can recognize his or her original intention in the mounting and installation of the work.”⁶⁷

Several other research projects and consortia on preservation and documentation of media art have taken place more recently. For example, Obsolete Equipment (2009-2011), a project by PACKED (*Platform voor de Archivering en Conservering van Kunst op Elektronische en Digitale Draggers* = Platform for the Archiving and Conservation of Art on Electronic and Digital Carriers) in collaboration with NIMk (Netherlands Institute for Media Art), MuhKA (Museum of Contemporary Art Antwerp) and S.M.A.K. (Stedelijk Museum voor Actuele Kunst = Municipal Museum of Contemporary Art), sought to improve the digitization and long-term preservation of audiovisual artworks threatened by the obsolescence of playback and display equipment. It fo-

⁶⁵ Ibid.

⁶⁶ For more information about these outcomes, please see “Inside Installations: Preservation and Presentation of Installation art, 2004 - 2007,” SBMK (Foundation for the Conservation of Contemporary Art), accessed July 1, 2019, https://www.sbm.nl/en/projects/Inside_Installation.

⁶⁷ Barbara Ferriani and Marina Pugliese, eds., *Ephemeral Monuments: History and Conservation of Installation Art* (Los Angeles: Getty Conservation Institute, 2013), 10.

cused on emulation and re-interpretation of media art, and on creating guidelines for the emulation of audiovisual artworks.⁶⁸ Digital Art Conservation project (2010-2012) was a project initiated by ZKM | Zentrum für Kunst und Medien (ZKM | Center for Art and Media) that concentrated on strategies for the conservation of digital art.⁶⁹ And most recently, Future Proof Media Art (2016-2018) was a large-scale investigation by LIMA (Living Media Art) Foundation that explored approaches in documentation and preservation of complex software-based and interactive media artworks for the purpose of establishing an artwork script as a guideline for future presentations.⁷⁰

2.2 Developments in Media Art Documentation – Theoretical Literature

In addition to the aforementioned projects and initiatives this research paper builds upon, there have been several publications dealing with the theoretical issues of documenting media art installation, mainly the question of what exactly needs to be preserved in order to present the work in the future. This question is based on one of the central conservation principles that “all conservation activities should be faithful to the ‘integrity’ of the authentic art object,” a guideline that was already incorporated into conservation codes of ethics since the 1960s.⁷¹ Conservation theorist, Jonathan Ashley-Smith considers ‘integrity of the artwork’ as including “evidence of its origins, its original constitution, the materials of which it is composed and information which it may embody as to its maker’s intentions and the technology used in its manufacture.”⁷² Further-

⁶⁸ “Obsolete equipment,” SCART, accessed August 8, 2019, <https://www.scart.be/?q=en/content/obsolete-equipment>.

⁶⁹ “Digital Art Conservation,” ZKM, accessed August 8, 2019, <http://www.digitalartconservation.org/>.

⁷⁰ “Future Proof!? Transformation Digital Art 2017,” LIMA, last modified December 2016, <http://www.lima.nl/lima/news/future-proof-transformation-digital-art-2017>.

⁷¹ Van Saaze, *Installation Art and the Museum*, 48.

⁷² Jonathan Ashley-Smith, “The Ethics of Conservation,” *The Conservator*, vol. 6, no.1 (1982): 2, quoted in Van Saaze, *ibid.*

more, as Van Saaze notes, conservation codes of ethics specify different kinds of integrity, including physical, aesthetic and historical. Physical integrity refers to the material components of the object; aesthetic integrity concerns the ability of an object to generate aesthetic sensations in the observer; and ‘historical integrity’ relates to the evidence that history has imprinted upon the object.⁷³ However, in the area of media art documentation, theoretical literature on the integrity of an artwork evinces some departures from the aforementioned conservationist perspective: a shift in the concept of where to locate the “the heart of the work” (artist’s intent); a move away from the belief that an object may have an intrinsically true nature (authenticity); and, a move towards the idea installation artworks possess characteristics that are closer to music, dance and performance than to traditional, object-oriented art forms.

In the 2001 article, “Toward Guidelines for Practice in the Preservation and Documentation of Technology-Based Installation Art,” William A. Real, former Chief Conservator at Carnegie Museum of Art, argues that installation art is related more to performance art than to traditional art forms. Unlike most static works of art, he argues, installations include dimensions of environment, movement, sound and time that also characterize the performing arts.⁷⁴ In this article, Real poses a series of incisive questions: “What is the ‘heart’ of the piece, and how can its survival be guaranteed?,” “What existing methodologies in the conservation of other kinds of objects can be applied to the conservation of an installation?,” and “What technical expertise outside the conventional museum community will be required both to create and maintain an installation?”⁷⁵ The idea that “time-based” and/or “technology-based” works relate to “performance-based” works was echoed by Pip Laurenson, time-based media conservator at Tate, in the 2006

⁷³ Ibid.

⁷⁴ William A. Real, “Toward Guidelines for Practice in the Preservation and Documentation of Technology-Based Installation Art,” *Journal Conservation*, no. 40 (Fall/Winter 2001): 207-25.

⁷⁵ Ibid, 210.

article, “Authenticity, Change and Loss in the Conservation of Time-Based Media Installations.” Drawing on the philosophy of music, Laurenson suggests that time-based media artworks are similar to musical pieces, for they remain dismantled until they are “performed.” She also suggests an analogy between installation art and performing arts, which lack materialisation until the moment of instantiation. She argues that, “as we shall see, the fact that these works are installations has perhaps a greater impact on the development of a conceptual framework for their conservation than the fact that they involve time-based media.”⁷⁶

More recently, in the anthology *Preserving and Exhibiting Media Art: Challenges and Perspectives*, published in 2013, the authors provide a theoretical overview and analysis of preserving and exhibiting media art, focusing on “collection, analysis, documentation, preservation, and restoration.”⁷⁷ In the introduction, Noordegraaf relates media art to established areas of visual art such as “minimalism, conceptual art, installation art, and performance art.”⁷⁸ Echoing William Real’s views about the importance of locating the “heart of the piece,” Noordegraaf states, “whereas the conservation, restoration, and exhibition of classical works like painting and sculpture generally primarily raises material problems (investigating the types of materials used, determining the best lighting conditions, etc.), the preservation and exhibition of contemporary time-based media artworks also raises the more fundamental question of exactly where to locate the work.”⁷⁹ In other words, before choosing a preservation strategy, a conservator should reflect on which material, aesthetic and conceptual components are most relevant to maintain the integrity of the work. The need to address media art installation’s materiality rather than its materials has also been identified by art conservator and theorist Hanna Hölling. In the 2015 paper, “The

⁷⁶ Laurenson, “Authenticity, Change and Loss,” 1.

⁷⁷ *Preserving and Exhibiting Media Art*, 12.

⁷⁸ *Ibid.*, 13.

⁷⁹ *Ibid.*, 123.

Technique of Conservation,” she suggests that the field of conservation is now seen as “an engagement with materiality, rather than material — that is, engagement with the many specific factors that determine how object’s identity and meaning are entangled with the aspects of time and space, [and] the environment.”⁸⁰ Hölling maintains that media art installations are “multi-media” works, and describes the materiality of sound installations and digital environments as “multifaceted, characterized by both the performance and the physical objects that constitute them.”⁸¹ The aforementioned characterizations of media art installations by conservators and theorists present a general idea of a unique form of contemporary art that is composed of both intangible and tangible elements, and thereby distinct from what can be called traditional visual art.

2.3 Documenting Interactivity and Audience Experience

As we can see, traditionally, within the theoretical and practical frameworks outlined in section 2.1 and 2.2, media art installations are documented using textual and audiovisual methods. Written descriptions, questionnaires, photos, and video recordings are used to document media art installations in museums, and primarily from the perspective of the artist (to preserve the artist’s intention). However, some media preservationists argue that these means of documentation are not always suitable for works with interactive content, since important aspects of the work can be “lost,” i.e. not “captured,” when using these conventional methods. For that reason, recently, serious consideration has been given to documentation that captures audience experiences as these are important to understanding the behaviour and meaning of an artwork.

⁸⁰ Hanna Hölling, “The Technique of Conservation, hands and minds, science, and humanities,” expanded version of a paper presented at the Max Plank Institute for the History of Science in Berlin (November 22, 2015): 1, http://www.hanna-hoelling.com/wp-content/uploads/2015/08/Hanna-Ho%CC%88lling_The-Technique-of-Conservation_draft-October-30-1.pdf.

⁸¹ Hölling, *Paik’s Virtual Archive: Time, Change, and Materiality in Media Art* (Oakland: University of California Press, 2017), 10.

In the 2006 article, “Restoration Theory Applied to Installation Art,” Cornelia Weyer, referring to four aspects in the conservation of installation art (durability, authenticity, minimal intervention and reversibility), suggests that the authenticity of installation art does not reside in its materials but in the observer’s experience.⁸² This concept is further investigated in the 2018 book *Collecting and Conserving Net Art: Moving Beyond Conventional Methods* by Annet Dekker. In the book, Dekker compares and analyses documentation models for technology-based artworks, such as the VMQ, MANS and the CMCM (described in section 2.1 of this paper). While she acknowledges the advantages of these models, she also questions their efficacy asking, “can documentation potentially become an actual experience?”⁸³ She argues that, “a description and photo can provide some insights into the work, but these are far removed from actually experiencing it.”⁸⁴ Indeed, she recounts when information scientist Piotr Adamczyk used the VMQ and CMCM models to describe human-computer interaction in media art installations, he concluded that, while these models work on the level of acquisition/accession from a collecting and cataloguing perspective, they often fail in describing the participatory aspect of the work.⁸⁵ Other information technologists, like Elizabeth Muller, have acknowledged that this audience-level of experience is important. Accounts of participants’ experiences, Muller points out, “would offer rich and varied portraits of how the artworks existed in experience and would necessarily widen our understanding of the relationship of media art to its social and cultural context.”⁸⁶ Attention

⁸² Cornelia Weyer, “Restoration Theory Applied to Installation Art.” *Beiträge zur Erhaltung von Kunst und Kulturgut, Verband der Restauratoren*, vol.2 (2006):41.

⁸³ Dekker, *Collecting and Conserving Net Art* (London: Routledge, 2018), 58.

⁸⁴ Ibid.

⁸⁵ Ibid. See also Piotr Adamczyk, “Ethnographic Methods and New Media Preservation,” Conference Paper, Museums and Web 2008, https://www.museumsandtheweb.com/biblio/ethnographic_methods_and_new_media_preservation.html; and Joanna Phillips, “Reporting Iterations: A Documentation Model for Time-Based Media,” *Revista de Historia da Arte*, no. 4 (2015): 168-179, in which she addresses the limitations of existing documentation models (TMS, MMA, DOCAM Documentation Model, and 2IDM) at the database-level.

⁸⁶ Lizzie Muller, “Oral History and the Media Art Audience,” In *Archive 2020: Sustainable Archiving of Born Digital Cultural Content*, ed. Annet Dekker (Amsterdam: Virtueel Platform, 2010), section 6.0.

to audience experience and contextual information is not included in any of these documentation models, which demonstrates their limitations in “accurately” documenting the artistic intention of complex interactive media art installations. These limitations are likely the result of the genesis of these models in traditional conservation methods. In fact, Dekker argues that one of the main problems with these documentation models (with the exception of CMCM) is that they are often “extracted from earlier dominant discourses (paintings, sculptures) and mapped onto a marginalized one (net art, performance, games), imposing a model according to which meaning is reproduced through the end result and does not emerge from the interaction of the multiple agencies that create the experience.”⁸⁷ Works like Blast Theory’s interactive mixed-reality game, *Uncle Roy All Around You* (2009), discussed in *Conserving Net Art*, require a multi-layered documentation strategy that takes into account relationships between objects in the creation and execution of the work, and also provides information related to user interaction and experience. In other words, the documentation of such interactive media artworks “requires insight into the conceptual, creative, and working process from a technical, relational, and experiential perspective,”⁸⁸ all of which are connected elements of the work and together convey its meaning. A framework of a documentation model, Dekker argues, should address “the creative process, reflect the work’s variability, relate to the context and take into account the participants’ experience.”⁸⁹

In the last four years, there have been attempts to create a documentation tool that can address this shortcoming. In the article, “Documenting the User Experience: The Cases of Blast Theory’s *Rider Spoke*, Tate’s ArtMaps, RAMM’s Moor Stories, and Placeify,” Gabriella

⁸⁷ Dekker, *Conserving Net Art*, 61.

⁸⁸ Ibid., 62.

⁸⁹ Ibid. Dekker is specifically referring to a documentation for net art, but this idea can be applied to any type of media artwork with an interactive component.

Giannachi, professor in Performance and New Media at the University of Exeter, UK, discusses the challenges of documenting highly subjective mixed-reality experiences and applies a newly-devised documentation tool CloudPad. In the first case study, documenting Blast Theory's *Rider Spoke* (2007-), a location-based game, Giannachi and her team test out a new tool for recording, replaying and annotating media experiences. In addition to collecting technical information from the work's creators, Giannachi used a range of equipment including GPS (to record location); in-game audio (to record user's response to the environment); and video (to capture the user from two key vantage points), in addition to interviews with participants after the experience.

Giannachi used CloudPad, a digital documentation, archiving and "replay" tool that integrates "cloud computing" into the annotation and synchronisation of mixed media resources. Additionally, CloudPad allows users to consult and edit documentation and record their own comments, if they have experienced a work themselves.⁹⁰ According to the study, the tool proved to be effective for replaying secondary documentation;⁹¹ however, the ability to record the participant's experience – in this case, using cloud-based software – has its limitations in how this documentation will be accessed and experienced in the future. These limitations are, in part, the result of the legal and ethical challenges, and to the volume and quality of the user-created data, as well as CloudPad's two-dimensional interface. The main limitation of using two-dimensional media like written descriptions, photographs and video in documenting variable, interactive, three-dimensional artworks is that, to some degree, the original, user-level experience of the artwork is lost (not captured). That is to say, the mechanisms of interaction and the user's *multisensory experience* cannot be documented (or represented) properly by text or video. As Jon Ippolito argues, to

⁹⁰ Gabriella Giannachi, "Documenting the User Experience: The Cases of Blast Theory's *Rider Spoke*, Tate's *Artmaps*, Ramm's *Moor Stories*, and *Placeify*," in *Revista de Historia da Arte*, no.4 (2015): 35.

⁹¹ Giannachi, *Archive Everything* (Massachusetts: MIT Press, 2016), 75.

document or recreate media art “is not to store digital files on disc or physical artifacts in a warehouse, but to create a facsimile of them in a totally different medium.”⁹² The use of a documentation models such as VMQ, CMC, and 2IDM addresses the recording of the installation space and the artwork’s components and behaviour by way of description, and the collection and sorting of the information and documents. The (user-level) experience, however, cannot be captured using these models. Indeed, in addition to the Blast Theory’s *Rider Spoke* case study, there are several recent projects where we can see that media art preservationists are acknowledging the need to explore well-developed methods of documenting the intangible in other areas of the Arts.⁹³ For example, the aforementioned Media Art Notation System, which takes inspiration from musical notation to document media art; the projects and experiments from the Inside Installation project (documentation and measuring light installations; the documentation of kinetic art using film and computer-aided 3D video analyses at the Museum Tinguely; the documentation and registration of installation art using high-resolution spherical photographs; and the documentation of the installation process using 3D models and animations)⁹⁴ as well as the current project, Documenting Digital Art: Re-Thinking Histories and Practices of Documentation in the Museum and Beyond (2019-2022), which “analyses existing documentation strategies and focuses on innovative methods, with an emphasis on capturing audience engagement.”⁹⁵

Given that there is a need for more comprehensive forms of documentation, capable of a more realistic representation of all the multisensory levels of a media art installation, i.e., a documentation that preserves the meanings and processes that might otherwise be lost along with the material work, some media preservationists have recently proposed advanced 3D modeling in

⁹² Ippolito, “Accommodating the Unpredictable,” 51.

⁹³ Ryan, “Variable Materials, Variable Roles,” 108.

⁹⁴ For an overview of all the experiments from this project see, “Inside Installations,” Inside Installations, accessed August 8, 2019, <https://web.archive.org/web/20071010145841/http://www.insideinstallations.org/home/index.php>.

⁹⁵ Dekker, “AHRC research grant: Documenting digital art.”

combination with virtual reality technologies to create virtual re-enactments or simulations. The use of VR as a proposed documentation method builds upon several existing digitization and virtualization (emulation) strategies developed in recent preservation and documentation projects. The DCA (Digitizing Contemporary Art, 2011-2013) project focused on creating high-quality digital reproductions of contemporary artworks (paintings, photographs, sculptures, installations, videos and related documentation) and on using preservation metadata for semantic enrichment and data curation. The digital reproductions were made accessible through Europeana, a digital platform for cultural heritage.⁹⁶ The Seeing Double: Emulation in Theory and Practice (2004) exhibition, organized by the Daniel Langlois Foundation and the VMN, concentrated on emulation and migration methods as conservation strategies, especially for obsolete or non-functioning works. The exhibition presented the original artworks along with their emulated or migrated versions “offering visitors a unique opportunity to judge whether the emulated works capture the spirit of the originals.”⁹⁷ And lastly, within the Inside Installations project, NIMk presented their research into 3D documentation and emulation of media art installations, resulting in the 3D modelling of Marina Abramovic installations from the collection of NIMk; a 3D instruction model (installation instructions) and emulation proposal for Jeffrey Shaw’s *Revolution, a monument for the television revolution* (1990);⁹⁸ and Ulrike Baumgart’s experiments using 360-degree panoramic photography to document site-specific installations.⁹⁹ VR documentation aims to go a step further, by not only creating a virtualization of the work (an emulation), but also by

⁹⁶ “About,” Digitising Contemporary Art, accessed August 14, 2019, <http://www.digitisingcontemporaryart.eu/about>.

⁹⁷ “Seeing Double,” Variable Media Network, accessed August 14, 2019, <http://www.digitisingcontemporaryart.eu/about>.

⁹⁸ See “Emulation Proposal,” Inside Installations, accessed August 14, 2019, https://web.archive.org/web/20071020103554/http://www.inside-installations.org/artworks/detail.php?r_id=421&ct=research; and “3D Documentation,” Inside Installations, accessed August 14, 2019, https://web.archive.org/web/20071019082021/http://www.inside-installations.org/research/detail.php?r_id=429&ct=3d_registration.

⁹⁹ Ulrike Baumgart, “Visualization and Documentation of Installation Art,” in *Inside Installations*, 173-84.

capturing or re-creating the perceptions and behaviours the user would experience in encountering the original work, thereby providing a realistic experience of the work in a virtual space. This kind of documentation, some argue, will provide an additional semantic layer of an artwork that conventional documentation methods do not provide.¹⁰⁰ Apart from the project report for the e-Installation case study (discussed in section 5),¹⁰¹ and the introduction and overview of VR (360-degree) photography related to Baumgart's experiments,¹⁰² there is a dearth of literature on the documentation of media art installations using virtual reality. The aim of this paper is to highlight some of the recent documentation projects that deploy virtual reality by discussing the project details and, thereby, to begin a conversation on this type of documentation.

¹⁰⁰ See, Jesús Muñoz Morcillo et al., *e-Installation: Synesthetic Documentation of Media Art via Telepresence Technologies* (Karlsruhe: Karlsruhe Institute of Technology, 2014), accessed August 19, 2019, <https://arxiv.org/pdf/1408.1362.pdf>, and Tzirou, "Preservation of Media Installation Art in the Posthuman Era," 159-160.

¹⁰¹ Muñoz Morcillo et al., *e-Installation: Synesthetic Documentation of Media Art via Telepresence Technologies*.

¹⁰² Lutz Schmidt and Baumgart, *What's the Meaning of VR Photography/ VR Panoramas?* (Germany: art-documentation.com, 2007), <https://web.archive.org/web/20071019164449/http://www.inside-installations.org/OCMT/mydocs/What%20is%20the%20meaning%20of%20VR%20photography-VR%20panoramas.pdf>.

3. Virtual Reality Documentation

Virtual Reality (VR) refers to display technologies that provide users with an immersive audiovisual experience within a three-dimensional (3D) model or simulation in a digital environment. The defining characteristic of VR is the sense of *presence*, or *immersion*, it allows users.¹⁰³ In particular, VR offers users an immersive experience, in which they can navigate an environment by interacting with it and with six degrees of freedom, while wearing a head-mounted display. The terms ‘VR’ and ‘360-degree video’ are often used interchangeably and, though they have distinct properties, their definitions have not yet been fully established. To put the term simply, “VR is characterized by the illusion of participation in a synthetic environment rather than external observation of such an environment.”¹⁰⁴ This immersive, multi-sensorial experience is accomplished via two primary modes of display: “the use of stereoscopic head-mounted (or head-coupled) displays¹⁰⁵, as well as large fully and semi-immersive projection-based systems such as computer-assisted virtual environments (CAVEs) and domes.”¹⁰⁶ These modes of display are often combined with motion tracking and binaural sound.¹⁰⁷ 360-degree videos, also called ‘immersive videos’ or ‘spherical videos,’ are panoramic videos that have been stitched together. They are typically recorded using a rig of multiple cameras or a dedicated camera containing multiple camera lenses. When viewed as a stereoscopic image in a head-mounted display, a 360-degree video produces a 3D effect.¹⁰⁸ In a 2016 article, “Most Virtual Reality Is Not Virtual Reality. Here’s Why,” describing the main difference between the two technologies, Eric

¹⁰³ Steve Aukstakalnis, “Computer-Generated Worlds,” in *Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR* (Boston: Addison-Wesley Professional, 2016), chap. 1, Kindle.

¹⁰⁴ Michael A. Gigante, “VR: Definitions, History and Applications,” in *Virtual Reality Systems*, eds., R. A. Earnshaw, M.A. Gigante and H. Jones (London: Academic Press Ltd, 1993), 3.

¹⁰⁵ Head-coupled displays employ a technique to show 3D imagery on 2D devices using eye tracking to simulate a 3D environment.

¹⁰⁶ Aukstakalnis, “Computer-Generated Worlds,” chap.1.

¹⁰⁷ Binaural sound refers to a 3-D stereo sound that gives the listener the sensation of actually being in the room (Gigante, “VR: Definition, History and Applications,” 3).

¹⁰⁸ Sharon Q. Yang and Lili Li, *Emerging Technologies for Librarians* (Massachusetts: Elsevier, 2016), 178.

Adams states that unlike with VR, with 360-degree videos “you can look around within the content they create, but you can’t navigate it or control anything beyond the direction you’re looking.”¹⁰⁹ In addition, ‘augmented reality’ and ‘mixed reality’ are more recent forms of virtual reality. Augmented reality (AR), which is not discussed in this research paper, differs from VR as it adds to ‘reality’ by overlaying computer-generated information onto the real world, recorded with a camera and displayed on a screen. For example smartphone AR applications have the ability to superimpose images, text or sounds on top of what can already be seen through the smartphone camera.¹¹⁰ Mixed reality (MR) combines real and virtual worlds, often using VR and AR together, to create new environments where virtual and real objects coexist—are anchored to each other—and the user can interact with them.¹¹¹ This paper presents and discusses examples of two forms of VR: VR as a total immersive experience, and VR in a 360-degree spherical video.

3.1 Virtual Reality Documentation in the Heritage Sector

VR has been widely adopted in various industries and research fields and is commonly used as a tool in cultural heritage conservation. The most common use of VR in the heritage sector is to create 3D digital reconstructions of historic buildings and monuments for conservation or restoration purposes. In addition, VR is used to provide conservators, researchers and visitors access to enter spaces that are impossible to enter or at risk of being destroyed, to interact with objects without risk of damage, and, more recently, to engage in “virtual tourism.”¹¹² Techniques

¹⁰⁹ Eric Adams, “Most Virtual Reality is Not Virtual Reality. Here’s Why,” *Gear Patrol*, July 18, 2016, <https://gearpatrol.com/2016/07/18/virtual-reality-vs-360-video/>.

¹¹⁰ Aukstakalnis, “Computer-Generated Worlds,” chap.1.

¹¹¹ Paul Milgram and Fumio Kishino, “A Taxonomy of Mixed Reality Visual Displays,” *IEICE Transactions on Information Systems*, vol. E77-D, no. 12 (December 1994), sec. 1, http://etclab.mie.utoronto.ca/people/paul_dir/IEICE94/ieice.html.

¹¹² Sabry El-Hakim et al., “Effective 3D Modeling of Heritage Sites,” (paper presented at the 4th International Conference of 3D Imaging and Modeling, Banff, Alberta, November 2003), <http://www1.cs.columbia.edu/~allen/PHOTOPAPERS/el-hakim.chapels.pdf>.

in the digital documentation of heritage sites have evolved over the last two decades from using surveying and mapping tools, such as traditional photogrammetry, to using laser scanning, or LiDAR (Light Detection and Ranging), and more automated imaging technologies. Often, a combination of many technologies is used to “virtualize” a site or an object depending on the goal of the project.¹¹³

The process of virtualizing historic objects and sites began in the 1990s when computers and VR technology became more advanced and powerful, while affordable and accessible to the public. An early application of the technology, comprising a real-time guided tour and digital reconstruction of the demolished Cluny Abbey, was presented in 1993 during the Imagina Conference in Monte Carlo, Monaco.¹¹⁴ After demonstrating its potential for heritage representation, the first conference dedicated exclusively to the use of VR in the cultural sector, Virtual Heritage, was held in 1995 at the Assembly Rooms in Bath, UK. This conference showcased numerous digital heritage projects including Virtual Pompeii, Virtual Lowry, the Caves of Lascaux, and the Palace of Ashur-nasir-pal II, among others.¹¹⁵ That same year, the Virtual Systems and Multimedia (VSMM) conference was held in Gifu, Japan, which resulted in a number of VR projects. During this period, the use of VR in the heritage sector was also the subject of many discussions at international conferences: Europe’s VAST (International Symposium on Virtual Reality, Archaeology and Cultural Heritage), IEEE VR (Institute of Electrical and Electronics Engineers Conference on Virtual Reality), ACM Siggraph (Association for Computing Machinery’s Special Interest Group on Computer Graphics and Interactive Techniques), *ISPRS* (Internation-

¹¹³ Ibid.

¹¹⁴ Harold Thwaites, “Digital Heritage: What Happens When We Digitize Everything?” *Visual Heritage in the Digital Age*, eds. Eugene Ch’ng, Vincent Gaffney and Henry Chapman (London: Springer, 2013), 330.

¹¹⁵ Ibid.

tional Society for Photogrammetry and Remote Sensing), CIPA (International Committee of Architectural Photogrammetry), ICOMOS (International Council on Monuments and Sites), FUUH (Forum UNESCO - University and Heritage), Virtual Retrospect, Museums and the Web, ICHIM (International Cultural Heritage Information Meetings) and many others.¹¹⁶

The early applications of VR as a documentation tool were promising but these projects usually lacked visual realism and detailed historical information, which failed to meet the documentation and interpretation needs.¹¹⁷ After 2000, however, when VR technology became more widely used and accepted as a tool for preservation of heritage, VR projects proliferated. One of the significant developments during this period was immersive technology, such as Computer-Aided Virtual Environments (CAVEs), to represent the historic sites in a more vivid and “virtually” realistic way.¹¹⁸ The proliferation of virtualization projects, as well as literature in this field clearly indicates that VR can facilitate heritage preservation through improved visual presentation and interpretation of a historic site’s content, tourism management, documentation technology, public participation and cross-cultural communication.¹¹⁹

Apart from the documentation of heritage sites, VR systems are also being used by museums that are interested in making their content attractive and accessible to the public. Over the last ten years, virtual museum (VM) websites, with enhanced information in the form of pictures or videos, have become increasingly common. These websites often use VR, AR and Web3D to

¹¹⁶ Ibid.

¹¹⁷ Alonzo C. Addison, “Virtual Heritage: Technology in the Service of Culture,” (proceedings of the 2001 conference on Virtual reality, archeology, and cultural heritage, Glyfada, Greece, November 28-30, 2001), <https://dl.acm.org/citation.cfm?id=584993.585055>.

¹¹⁸ El-Hakim et al., “Emerging Trends in Virtual Heritage,” 22-25.

¹¹⁹ E.g., Daniele Calisi et al., “Robotics and Virtual Reality for Cultural Heritage Digitization and Fruition,” *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, vol. XLII-5/W1 (2017): 503-508; and Daniel Pletinckx et al., “Virtual Reality Heritage Presentation at Ename,” *MultiMedia, IEEE*, vol. 7, no. 2 (2000): 45-48, <https://ieeexplore.ieee.org/document/848427>.

present their collections in order to complement or enhance the museum experience through personalization, interactivity, user experience and richness of content.¹²⁰ In 1992, Apple Computer Inc. released an educational CD_ROM entitled *The Virtual Museum*, in which several 3D-modelled scientific exhibits were displayed in a pre-rendered environment that mimicked a “typical” museum building. The user could navigate from room to room and get detailed information of the exhibits on view. In 1999, deploying Virtual Reality Modelling Language (VRML) and the World Wide Web, the Guggenheim was one of the first museums to release an interactive VM to host exhibitions of cyberart.¹²¹ Guggenheim Virtual Museum was intended as a new 3D digital space, which in no way imitated the architecture of the Guggenheim but acted as a virtual hub for all the Guggenheim venues in the world. Some more recent examples of VMs include the Corones Museum Virtual Tour, designed by Zaha Hadid in 2015,¹²² and the Virtual Museum Valentino Garavani, dedicated to this well-known fashion designer, created in 2011.¹²³ Genuine immersive applications remain an exception to common practice, in large part because developing a complex 3D model and transforming it into an interactive environment requires advanced computer technologies and specialized technical capabilities, and is extremely expensive.¹²⁴ On the other hand, the number of museums that feature virtual tours of their galleries or collections is considerable. Nearly all such virtual tours are designed as 360-degree panorama environments of

¹²⁰ Jianghai Zhao, “Designing Virtual Museum Using Web3D Technology,” *Physics Procedia*, vol. 33 (2012): 1596-1602, <https://www.sciencedirect.com/science/article/pii/S1875389212015702>. See also Krzysztof Walczak, Wojciech Cellary and Martin White, “Virtual museum exhibitions,” *Computer*, vol. 39, no.3 (April 2006): 93-95; Anastasios Lato, Vasileios Komianos and Konstantinos Oikonomou, “Interaction and Information Communication in Virtual Museums,” (paper presented at the IOP Conference Series: Materials Science and Engineering, 2018), <https://iopscience.iop.org/article/10.1088/1757-899X/364/1/012038>; and Erkki Huhtamo, “On the Origins of the Virtual Museum,” (paper presented at the Nobel Symposium (NS 120), Stockholm, Sweden, May 26-29, 2002): 1-14, <https://pdfs.semanticscholar.org/ecbb/5e532eb9ab5eb4ed7f0bf5a51309f3b89d41.pdf>.

¹²¹ Riccardo Bianchini, “When Museums Became Virtual - Part 1: The Origins,” Inexhibit, last modified August 9, 2018, <https://www.inexhibit.com/case-studies/virtual-museums-part-1-the-origins/>.

¹²² Bianchini, “Examples of Digital Communication Technology in Culture and Education,” Inexhibit, last modified April 18, 2017, <https://www.inexhibit.com/case-studies/free-3d-app-provides-virtual-visit-new-zaha-hadid-museum/>.

¹²³ “Valentino Garavani Museum,” Valentino Garavani Museum, accessed August 10, 2019, <http://www.valentinogaravanimuseum.com/>.

¹²⁴ Bianchini, “When Museums Became Virtual - Part 2: Today and Beyond,” Inexhibit, last modified August 9, 2018, <https://www.inexhibit.com/case-studies/virtual-museums-part-2-today-and-beyond/>.

a museum or exhibition. Notable examples of these include the virtual tour of Smithsonian National Museum of Natural History in Washington D.C.¹²⁵ and the virtual tour of the Louvre Museum in Paris.¹²⁶ Meanwhile, some IT companies still see a future for consumer-level VR products/technology. For example, in 2014, Google introduced Google Cardboard, a low-cost VR platform and head mount for smartphones, in order to encourage interest and development in VR applications.¹²⁷ Despite the advantages of VR for the preservation and presentation of cultural heritage material, and the introduction of cheaper options of this technology, VR has not been widely adopted for use in media art archives for conservation or documentation purposes.

3.2 Virtual Reality and the Documentation of Media Art Installations

Documentation of heritage sites and of media art installations share a common objective: to provide access to three-dimensional environments and objects that no longer exist or are at risk of deteriorating. Documentation of “at-risk” heritage sites and artworks is especially important if the objective is to replace viewing the original site or object. As discussed in section 1, detailed documentation of media art installations usually comprises installation sketches and instructions, interviews with the artists, and audio-visual material such as video recordings or photography. This documentation is the main way to ensure these works can be re-installed, disseminated, and researched. However, as previously noted, despite attempts to document the behavioral, experiential and interactive aspects of media art installations, the technologies and methods traditionally used in documentation have come short of reproducing the multi-sensory experience

¹²⁵ “Virtual Tour,” Smithsonian National Museum of Natural History, accessed August 10, 2019, <https://naturalhistory.si.edu/about/virtual-tour>.

¹²⁶ “Online Tours,” Louvre Museum, accessed August 10, 2019, <https://www.louvre.fr/en/visites-en-ligne>.

¹²⁷ David Pierce, “Google Cardboard is VR’s Gateway Drug,” *Wired Magazine*, May 28, 2015, <https://www.wired.com/2015/05/try-google-cardboard/>.

layer of media art installations, which is indivisible from their meaning. Unless the work is physically re-installed, based on the textual and audio-visual layers of documentation, curators, researchers, and users can only speculate about the full scope of aesthetic experience of an artwork, hence also its full meaning. In the near future, as media artworks will no longer be able to be repaired using their original materials, it will become increasingly important to produce documentation that can convey these multi-layered meanings in a realistic representation of all characteristics of the artwork, including interactivity and user experience. Conceivably, documentation using VR technologies can significantly enhance media art documentation practices.

The practical advantages of using VR to document media art installations have been acknowledged as early as 2001, when William A. Real suggested the use of VR as a way to document both the tangible and the intangible aspects of an installation. He argues that, “within the limits of time, money, and energy, any means possible to document both the physical and experiential qualities of the work should be used[...] although we can never know what future curators and conservators will want to know about a piece created today, we must try to imagine and use the best means at our disposal to clearly record our thoughts and observations.”¹²⁸ Depending on the installation, he says, documentation might include “floor plans, schematics, wiring diagrams, lighting diagrams and reports, artists’ preliminary notes and sketches, photographs, video, video interviews of artist, curator and others, written records of those involved with the installation, instrumental characterization of video and audio levels and quality, computer-assisted design files, and virtual reality.”¹²⁹ At the time Real made these claims, however, no museums are known to have used VR as a documentation tool.

¹²⁸ Real, “Toward Guidelines for Practice in the Preservation and Documentation of Technology-Based Installation Art,” 216.

¹²⁹ Ibid.

In the essay “Documentation of Change — Change of Documentation” in *Inside Installations*, Gunnar Heydenreich (Professor for Conservation of Modern and Contemporary Art at the Cologne Institute of Conservation Sciences) discusses various systematic approaches to document media and installation art since the 1960s, which include “artist’s questionnaires and interviews, the production of models, developing checklists, templates and workflow procedures, instrumental analysis and, more recently, the new imaging techniques like laser scanning, 3D video analysis, and virtual reality panorama photography.”¹³⁰ Although applications of VR video/simulations in documentation practices were not tested within the *Inside Installations* project, research by Ulrike Baumgart on spherical photography was part of this project and is perhaps most closely related. In her essay, “Visualization and Documentation of Installation Art,” Baumgart investigates the potential of spherical panoramic photography to document complex installations. While these installations are not technology-based, we can see how the idea behind the use of 360-degree photography for capturing the spatial arrangement could be extended to interactive media art installations, if the same considerations were applied to VR video. In discussing the potential of 360-photography, Baumgart says that a high-resolution, spherical still image (called a ‘spherical view’) can offer the ability to freely choose positions, angles and perspectives of the space, and to take a closer look at the details.¹³¹ One of the advantages of documentation using spherical view, she claims, “is its complex rendering of spatial situations from the position of the camera along 360° horizontal and 180° vertical axes, allowing the spatial shell and architectural factors as well as all parts of the installation to be captured in their entirety.”¹³² The use of VR builds upon this strategy, incorporating recording frameworks from video documentation,¹³³ to

¹³⁰ Heydenreich, “Documentation of Change and Change of Documentation” in *Inside Installations*, 159-62.

¹³¹ Baumgart, “Visualization and Documentation of Installation Art,” in *Inside Installations*, 174.

¹³² Ibid.

¹³³ Ibid. See also Kallinen, *Guidelines for Documenting Video Installations on Video* (2nd ed., rev. José Biscaya).

create a 360° environment, which is not only capable of visually reproducing the space but also the multi-sensory, interactive experience from the user's/viewer's perspective, (i.e. not just from the position of the camera), and enhanced through experience of temporality, inherent in moving image.

3.3 Applications of Virtual Reality in the Documentation of Other Arts

Media art preservationists are preoccupied with the same issues as those preserving and documenting performing arts (dance, theatre, music), performance art, and street art:¹³⁴ the ephemerality of the work, the representation of the work in space and time, and the audience experience. Documenting a performance is about “capturing a moment,” in which many things happen simultaneously, forming layers of experience, which, like media art, is intangible.¹³⁵ The connection between media art and performance art documentation has been the recent focus of projects such as *Performing Documentation in the Conservation of Contemporary Art* (2013), a jointly-organized conference by the *Documentation of Contemporary Art* research project and by the *Network for Conservation of Contemporary Art Research (NeCCAR)* in London,¹³⁶ and *Capturing a Moment: Where Net Art and Performance Meet* (2015), a forum event organized by the *Stedelijk Museum Amsterdam* and *LIMA* in Amsterdam.¹³⁷ Street art, while on the one hand is tangible and visually experienced, is on the other hand intangible due its impermanence and its

¹³⁴ Mark Westbrook, “Between Performing Arts and Performance Art,” *Acting Coach Scotland*, accessed August 19, 2019, <https://actingcoachscotland.co.uk/blog/between-performing-arts-and-performance-art/>. There is a distinction between performing arts and performance art: “Performing Artists usually belong to the acting, dancing and music world, the world of the conservatoires and traditional performance spaces. Performance Art has its roots in the world of the art school, an extension of the fine arts, and often takes place in galleries, found spaces, and in site specific locations.” Furthermore, “Performing Arts are primarily skills-based, Performance Art is primarily concept based.”

¹³⁵ “Capture a Moment. Where Net Art and Performance Meet,” *LIMA*, accessed August 8, 2019, <http://www.lima.nl/lima/article/capturing-moment-where-net-art-and-performance-meet>.

¹³⁶ “Performing Documentation in the Conservation of Contemporary Art,” *TATE*, accessed August 10, 2019, <https://www.tate.org.uk/about-us/projects/neccar-network-conservation-contemporary-art-research/performing-documentation>.

¹³⁷ Dekker, “Capturing a Moment: Where net art and performance meet,” last modified August 28, 2015, <http://aaaan.net/the-homo-documentator-expanding-documentation-in-the-arts/>.

“relational, performative, embodied and affective components.”¹³⁸ In other words, street artworks often have a strong link to a particular space (environment), and it is this dynamic relationship between the work and the environment that produces “experiential, emotional and sensory values.”¹³⁹ For this reason, those preserving performance art and street art are also looking beyond museums and other collecting and archiving institutions for information about the methods for documentation, transmission and preservation of these works.¹⁴⁰ For performing arts, projects such as *360 Video VR Project* (2016), by IMATS and the Barnard dance department at Columbia University, have demonstrated how VR (360-degree video) has “significant implications for the recording and notation of choreography.”¹⁴¹ Likewise for street art, VR and immersive technologies have been considered as a potential means to document and preserve it. In preservation of street art, it is especially crucial to capture its environment, which is constantly changing and furthermore, at risk of disappearing altogether. For these reasons, VR has been used to create VR-based digital archives and virtual recordings of street art, for instance the project *New Perspectives: Reno Street Art in Virtual Reality* (2017-2018).¹⁴²

¹³⁸ Laima Nomeikate, “Street art, heritage and embodiment,” *SAUC*, vol.3, no.1 (2017): 43, https://www.urbancreativity.org/uploads/1/0/7/2/10727553/43_53_laima.pdf. See also: Maria Bonn, Lori Kendall, and Jerome McDonough, “Preserving Intangible Heritage: defining a research agenda,” *Proceedings of the Association of Information Science and Technology*, vol. 53, no.1 (December 2016): 1-5, <https://onlinelibrary.wiley.com/doi/full/10.1002/pa2.2016.14505301009>.

¹³⁹ Nomeikate, *ibid.*, 52.

¹⁴⁰ LIMA, “Capturing a Moment: Where Net Art and Performance Meet.”

¹⁴¹ “360 Degree Video VR Project,” IMATS, accessed August 15, 2019, <http://imatsdance.com/360vr/>.

¹⁴² Amy J. Hunsaker and Laura Rocke, “New Perspectives: Reno Street Art in Virtual Reality,” (paper presented at the Digital Initiatives Symposium, April 24, 2018), <https://digital.sandiego.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1178&context=symposium>.

4. Methodology

One of the biggest limitations when conducting this research at LIMA in Amsterdam was access to virtual reality equipment. As such, it was not possible, given the prohibitive cost of equipment and lack of technical expertise, to conduct an in-house case study at LIMA. For that reason, a number of experts who have explored the use of VR and 360-degree video to document media art installations and related art forms were consulted in this research. Interviews with these experts, regarding their projects and the use of VR as a documentation tool, form the basis of this research paper. Time was another major constraint of the project. A chance to personally experience the VR projects, which are the subject of the case studies, was not possible in the time frame, but would have made this research much richer. In this case, time-based media curators and conservators who had the opportunity to experience the projects were interviewed regarding the outcomes of these projects.

To develop a better understanding of the possibilities and limitations of VR, I attended several conferences and workshops. In March 2019, I attended the VRLab, a six-day workshop coordinated by Cinedans in collaboration with BeamSystems' BeamLab in Amsterdam. The workshop offered artists with backgrounds in film, media art and dance to research the meaning and value of virtual reality for their personal projects. Thanks to organizer, Nienke Rooijackers, I was able to interview the participants and the technologists during several stages of the workshop about the creative and technical process. I produced a report for Cinedans summarizing and reflecting on the outcomes of the VRLab workshop. Additionally, between February and May 2019, I visited Street Art Museum Amsterdam on several occasions to sit-in on their project meetings. During one meeting, I participated in a test shoot of the VR documentation of several

murals in Amsterdam Nieuw-West, during which I learned about the recording and editing processes.

To understand how VR can be used as a documentation tool for media art installations, two recent projects that employed VR technology in documentation of media art installations are among the four case studies discussed in section 5 of this paper. These two projects are: *e-Installation – Synesthetic Documentation of Media Art / Versailles Fountain (1993)*, *Nam June Paik (2013-2015)* lead by Jesús Muños Morcillo, Karlsruhe Institute of Technology, which uses VR to simulate the sensory experiences of technology-based artworks in a virtual environment using 3D scanning and mapping techniques; and *Virtual Hall: Simulation of 2 David Hall artworks in Virtual Reality (2017-2018)* lead by Adam Lockhart, Dundee University, which uses VR to recreate this video installation that no longer exists based on existing documentation. While the results of *e-Installation* and *Virtual Hall* were promising, more examples are necessary to draw conclusions about the capacity of VR technology to be an effective tool for the documentation of media art installations. It was therefore useful to look at several case studies and to supplement research in this area with two cross-disciplinary applications of VR in documentation: of performance art, *VR Archive for Performance Art (2016-present)*, an ongoing project by Live Art, Denmark. Section 5 discusses these case studies in great detail, and of street art, *Memories: Virtual Reality (360-degree video) Documentation of Memories by Bastardilla (2019 - present)*, undertaken by Street Art Museum Amsterdam

4.1 Case Study Selection

The projects for the four case studies were selected based on their relevance to my research question, i.e., whether VR can be an effective documentation tool in preservation of media art, and specifically media art installations. They provided me with an opportunity to explore

the currently used technologies and techniques, and to inquire about the experiences that participants of these case studies had with VR documentation so far. Because VR documentation as an art conservation strategy is an emerging practice, there are only two known examples of it being deployed in documentation of media art installations. Therefore, two additional VR documentation projects in related art forms (performance art and street art) were also included to stimulate discussion and compare experiences. The decision to study these projects was not solely motivated by the dearth of such projects in media art installations; stepping outside of one's discipline often holds the potential to provide a different perspective, stimulate new discussions, and raise new questions, which otherwise would not be possible. The case studies presented in section 5 go beyond the qualitative data published about these projects, in order to explain the practical aspects of creating VR documentation in terms of cost and technical expertise. The case studies also address issues such as: What level of detail needs to be documented in VR in order to preserve the work's levels of meaning? Who makes the decisions about an artwork when the artist is no longer alive? And how will collecting institutions ensure the long-term access to a VR document?

4.2 Participants

Interview participants (Appendix A) were selected based on their level of involvement in the case study projects and also their availability. Each participant could speak to different aspects of the project, including practical, logistical and technical information, and theoretical implications.

4.3 Case Study Questions

A questionnaire with twelve questions (Appendix B) was sent to the project leader of each case study. The questionnaire was sent via e-mail and responses were received via email and/or Skype. The questionnaire addressed both practical and theoretical concerns to begin a line of enquiry around the documentation of media art installations using VR, in terms of costs, technical expertise, and the decision-making process. The questions were posed in the same order to each participant to compare and contrast different answers to the same questions. Follow-up questions were asked to those whose answers were limited in scope to clarify and/or further expand on certain issues. In addition, to gain a better sense of the use of the use of VR as a documentation tool from a conservation perspective, specific questions were asked to the curators and conservators at Tate and ZKM (Appendix C). In both cases, I also asked the conservators how the work is currently documented and represented in their database, collection, and archive. Both museums were not willing or able to provide me access to the documentation, but could describe the type of documentation they have, and how a work with similar characteristics is typically documented.

5. Case Studies

5.1 *e-Installation – Synesthetic Documentation of Media Art / Versailles Fountain (1993), Nam June Paik (2013-2015)*

Between 2013 and 2015, students and researchers from ZAK | Centre for Cultural and General Studies at Karlsruhe Institute of Technology (KIT), in co-operation with the Intelligent Sensor-Actuator Systems Laboratory (ISAS), carried out the 3D reconstruction and VR-based visualization of Nam June Paik's 1993 video art installation *Versailles Fountain*. The installation was virtualized and “re-enacted”¹⁴³ using a telepresence system, so that the user could experience *Versailles Fountain* using a head-mounted display (HMD) and navigate its virtual space by walking and looking around in the physical space. According to Jesús Muñoz Morcillo, project leader and researcher at KIT, the main purpose of VR-based documentation, more broadly, is to document the multi-sensory level of experience, including proxemics, kinetics and patterns of inter/intra-activity, all of which are crucial for discerning the meaning of a media art piece.¹⁴⁴

5.1.1 Artwork Description

Versailles Fountain is a two-channel video sculpture comprising 20 neon and 38 CRT monitors of various sizes and topped with a decorative pinecone sculpture. The monitors are arranged in a specific way to evoke the lavish fountains of the Palace of Versailles, thereby seen as a metaphor for the entertainment industry of the time. The monitors display images of real, flowing masses of water, and are surrounded by blue, wavy neon tubes that resemble lines of light reflections on moving water. The monitors are used as a malleable sculptural material, which in connection with the immateriality of the video images and emitted blue light, form a new,

¹⁴³ The term “re-enactment” is used by Muñoz Morcillo and his team to describe the e-Installation i.e. the virtualized installation visualized in a virtual environment using a HMD. In media art preservation, we might say a work is “re-staged,” “re-installed,” or “re-mounted.”

¹⁴⁴ Muñoz Morcillo, interview with author, April 17, 2019.

feigned-materiality — a “fountain,” in which not water but light ripples down.¹⁴⁵ According to Muñoz Morcillo, the monitors are hooked up to two different circuits, “producing a barely-perceptible half-second time delay between UHF (ultrahigh frequency) and composite video connections.”¹⁴⁶ Due to the use of old neon lamps and CRT monitors, like many artworks using technologies from this period, *Versailles Fountain* is in constant need of repair and is, therefore, not always accessible to the public.¹⁴⁷

5.1.2 Documentation

Versailles Fountain is owned by a private collector and is on permanent loan at the ZKM Centre for Art and Media. Information about this work is scarcely available to the public; most information is restricted for privacy reasons. However, it is known that the work has been exhibited several times, including between October 2008 and January 2009 at ZKM, in a large exhibition of Paik’s works curated by Bernhard Serexhe, which included over 30 works from the artist from the ZKM Collection; and in October 2014, during the Beyond 3D Symposium, where the *Versailles Fountain* e-Installation was accessible to the public by means of HMD.¹⁴⁸ *Versailles Fountain* was also previously installed at the Hamburg Mediale in February, 1993, in an exhibition curated by Wulf Herzogenrath.¹⁴⁹

There is little audiovisual documentation of this artwork and, likely as a result, it is rarely mentioned in literature, rendering it both physically and intellectually unavailable to experience

¹⁴⁵ See Muñoz Morcillo et al., “e-Installation,” 7; and Chyong-Yi Yu, “Das Motiv, Wasser’ in der Kunst - unter Berücksichtigung der Werke Bill Violas und Fabrizio Plessis,” (MA Thesis, Universität Trier, 2008), 47, <https://ubt.opus.hbz-nrw.de/opus45-ubtr/frontdoor/deliver/index/docId/298/file/dokument1.pdf>.

¹⁴⁶ Muñoz Morcillo et al., “e-Installation,” 7.

¹⁴⁷ Ibid.

¹⁴⁸ “Beyond 2014 (Installationen),” ZKM, accessed August 11, 2019, <https://zkm.de/en/event/2014/10/beyond-2014-installationen>.

¹⁴⁹ See Hajo Shiff, “Auf fortschrittliche Weise übel,” *Taz*, February 6, 1993, <https://taz.de/!1631480/>; and Bas Jeijne, “Vuur zien waar geen vuur is; Hypermoderne tompe-loeils in Hamburg,” *NRC*, February 26, 1993, <https://www.nrc.nl/nieuws/1993/02/26/vuur-zien-waar-geen-vuur-is-hypermoderne-trompe-loeils-7174330-a714505>.

and study.¹⁵⁰ Due to the aforementioned privacy restrictions, it was difficult for me to access documentation as a researcher. *Versailles Fountain* is not available to the public in ZKM's online collection catalogue, and I could not locate records of this artwork in any other collection or archive.¹⁵¹ Several photographs of the work can be found on the Internet: a photograph, taken either in 2008 or 2009, shows this work installed at the ZKM as part of the exhibition *Nam June Paik Works from the ZKM Collection*, October 23, 2008 - January 1, 2009 (Figure D1); and photographs, taken between 2010 and 2013, of the work installed at the ZKM show a similar configuration, but with the addition of a plexiglass partition, a protective shield around the base of the video sculpture (Figure D2 and D3). The latter photographs were taken by museum visitors and uploaded to the public photo-sharing website, Flickr. I could not find images from the exhibition *Mediale Hamburg 1993*.

According to Morgane Stricot, Media and Digital Art Conservator at ZKM, the ZKM has photo documentation of the set-up and dismantling of *Versailles Fountain* and a set-up guideline provided by the collector. In addition, the ZKM has condition reports for the work, which they update with all the changes that occurred through the years of exhibition.¹⁵² According to Bernhard Serexhe, former chief of collections at ZKM, "the technical state of this work was first documented in 1999 by Thomas Moll in Berne, Switzerland." This documentation had been thereafter, "deepened, refined and completed by the technical department of ZKM."¹⁵³ The technical condition of the work was also documented by Déborah Schott, under the supervision of Serexhe, as part of her master's thesis, "Enjeux et perspectives de la conservation-restauration de

¹⁵⁰ Ibid., 8.

¹⁵¹ I contacted ZKM, the former chief of collections at ZKM, and Paik's Estate, however the information was restricted. When re-installing (or "re-enacting") an artwork, it is necessary to look at all available documentation to ensure the work has been accurately represented/re-installed. One of the reasons the team at ZKM chose to virtualize *Versailles Fountain* was due to this lack of documentation.

¹⁵² Morgane Stricot, email message to the author, June 27, 2019.

¹⁵³ Bernhard Serexhe, interview with author, July 28, 2019.

l'art vidéo: les sculptures vidéo de Nam June Paik du Zentrum für Kunst und Medientechnologie Karlsruhe,” published in 2014.¹⁵⁴ Although I could not view these condition reports, Serexhe explained that, a complete conservation documentation usually includes “the strictest criteria of a detailed condition report including all dimensions and material specifications, as well as the electrical measurements of each individual part.”¹⁵⁵

5.1.3 Technical Process

The virtualization of *Versailles Fountain* was carried out in two phases between October 2013 – February 2014 (phase I) and October 2014 – February 2015 (phase II) by students and university researchers, as part of a practical course in the Master of Computer Science programme, a collaboration between ZAK and ISAS, two departments of KIT.¹⁵⁶ In the first phase, computer science students, Jennifer McClelland, Pascal Becker, and Xuefei Zheng, created a 3D-reconstructed model of *Versailles Fountain* and implemented the model into a proprietary game engine developed by Antonio Zea from ISAS. This game engine worked with a full-body kinect-based tracking system, only accessible at ISAS. In the second phase, computer science students, Lea Steffen and Fabian Mack, produced an improved version of the e-Installation. This version achieved a higher level of “realism,” through improved audio and visual effects produced in Unreal Engine 4 (UE4). Additionally, the exhibition space of the ZKM, where the video sculpture was originally installed, was modelled, allowing users to virtually walk in the museum space.

¹⁵⁴ Serexhe, interview with author, July 28, 2019.

¹⁵⁵ Ibid.

¹⁵⁶ Muños Morcillo, interview with author, April 17, 2019.

This version was made available for download and can now be experienced using HTC Vive HMD and tracking technology.¹⁵⁷

The technical process of generating an “e-Installation” can essentially be broken up into four stages: “1) creating a geometric 3D model, 2) using sensor data to model the more complex parts, 3) incorporating existing digital content, and 4) developing program logic.”¹⁵⁸ The goal of the first stage in the process of generating the *Versailles Fountain* e-installation was to produce a 3D model of Paik’s installation. The simpler parts of Paik’s installation, such as the physical shape of the artwork, was modeled in Blender. In the second stage of the process, the more complex parts (such as the pinecone), as well as the textures, were reconstructed from real data captured from the installation. To do this, the team used Structure from Motion, a photogrammetry software, to reconstruct the 3D geometry of the artwork. Additionally, a panoramic image of the gallery surroundings was created to place the virtual *Versailles Fountain* into its exhibition environment at ZKM.¹⁵⁹ In the third stage, the existing digital content was migrated and incorporated into the virtualized version of the work. The digital content comprised two video files (the video content played on the CRT monitors in Paik’s installation), stored on the hard disk of a PC, which play in a loop on the (virtualized) CRT monitors in the e-installation. Finally, in stage four, the team implemented the “program logic” written in Python. This involved displaying the video files as textures on the virtualized CRT monitors in the 3D model of *Versailles Fountain*. Initially, the results could be experienced using the telepresence system at the ISAS lab at ZAK. In this set-up (phase I), the user was equipped with an HMD (Oculus Rift) and headphones and

¹⁵⁷ “Demos,” KIT, accessed August 26, 2019, <http://e-installation.forschung.kit.edu/english/74.php>. At the time HTC Vive had not yet been released. In addition, a version created during the second phase of the e-Installation project can be downloaded from the project's web page. The application works both on the PC/Windows with mouse and keyboard as well as with the VR glasses Oculus Rift.

¹⁵⁸ Muñios Morcillo et al., “e-Installation,” 9.

¹⁵⁹ In phase II, this would be replaced with the 3D model of the ZKM exhibition space.

could freely explore the virtualized installation, being able to walk and look around. A PC server, running the application, simulated the multi-sensory experience of the e-Installation according to the user's location in physical space and perspective in the VR headset. The simulation was transmitted to the client PC and rendered visible to the user in HMD in real-time.¹⁶⁰

In both phases of the project, the students used VR for the first time, however, the researchers from KIT were experienced computer scientists with a background in telepresence technologies, including VR and tracking technologies. According to Muños Morcillo, expertise in 3D modelling and 3D reconstruction, as well as some basic knowledge in how to use a game engine, are necessary to carry out this level of documentation, i.e., a VR reconstruction of a media art installation, an e-Installation. The most complex part of the project, he said, was developing the proprietary tracking system needed to produce a “realistic” VR experience. However, with the introduction of the HTC Vive (VR system with tracking functionalities) in 2016, the visualization can be produced much easier.¹⁶¹

In the creation of the *Versailles Fountain* e-Installation, the following software and equipment was used: a DSLR; VisualSFM, a GUI application for 3D reconstruction using Structure from Motion (SfM), for the 3D reconstruction of complex parts; Blender, an open-source 3D creation software, for modelling simple symmetrical objects such as the neon lights and CRT monitors; a Proprietary Game Engine (phase I) and Unreal Game Engine (phase II); Oculus Rift, an HMD, with surround-sound headphones, to visualize the audiovisual information; Microsoft Kinect, motion sensing input device, to capture the user's position and orientation; and a proprietary full-body tracking system (used before the introduction of HTC Vive). At the time, the estimated cost for the construction of this tracking system using 4 Kinect sensors, 1 server, and 4

¹⁶⁰ Ibid.

¹⁶¹ Muños Morcillo, interview with author, April 17, 2019.

PCs (1 for each Kinect) was 10 000 EUR.¹⁶² The software for producing the 3D models, video textures and VR-visualization was free, with the exception of UE4, which cost at the time about 20 EUR per month, but is now free to use.¹⁶³

The three university researchers worked part-time (25%) for six months during each project phase. It took the researchers and students 6 months to produce the first version of the e-installation. After that, the team implemented a new version with UE4 including a complete ZKM map. The porting into UE4 with a larger map and new visual effects took another six months.¹⁶⁴

5.1.4 Decision-making process

During the VR documentation of *Versailles Fountain*, decisions were made regarding the details of the 3D model and what to include in its VR environment. To inform the decision-making process, research on *Versailles Fountain* was complemented by specific knowledge of the curator and technical personnel at the ZKM. Once information relating to art history, material conditions, technical documentation and the artist's intention was carefully examined and contrasted, a treatment model for 3D modeling and re-enactment was designed, with a focus on computational complexity reduction, while still respecting the requirements and authenticity criteria of the original artwork in its digital re-enactment.¹⁶⁵

An environment (in this case, the exhibition space at ZKM) was recreated to preserve the intentions of the artist and the curator. Ideally, the artwork's entire physical constitution should

¹⁶² Muños Morcillo, email message to author, June 25, 2019. The costs do not include the salaries of the researchers. He estimates that a 9 months full-time salary would be enough for a similar project, with three experts and student participants, working part-time.

¹⁶³ Muños Morcillo, interview with author, April 17, 2019. Full details of this proprietary tracking system can be found in the (phase I) e-Installation report (Muños Morcillo et al., "e-Installation," 7.)

¹⁶⁴ Ibid.

¹⁶⁵ Serexhe, interview with author, July 28, 2019. See also Muños Morcillo et al., "e-Installation," 8.

be reproduced, including its hardware and circuitry; however, given time and technical limitations, the team had to decide what level of detail was required in the modeling of the external appearance of Paik's installation.¹⁶⁶ This included questions about the rotation of the knobs, and whether to reproduce the unintended side effects of a time delay between the UHF and the composite video signals that can be detected in the original installation.¹⁶⁷

It is important to note that this project was not done on request or on behalf of the private owner of the work (in Lucerne, Switzerland) nor of ZKM. Rather, ZAK approached ZKM, who agreed to participate; the chief of collections, Bernhard Serexhe, was consulted throughout the project.¹⁶⁸ According to Muños Morcillo, Serexhe, asked the owner for permission to virtualize the piece, however the artist's estate was not contacted.¹⁶⁹ Serexhe, who knew the artist, spoke with Paik on several occasions regarding fundamental issues in the preservation of his works. According to Serexhe, "one of his typical answers was: Go with the flow." Paik, according to Serexhe, knew that technological developments would quickly render the devices he used to create his installations obsolete, and was open to using more recent technology, "as long as the idea and aesthetics of his works would be respected and preserved."¹⁷⁰ In the case regarding rotations of the knobs, discussion with the curator and ZKM technicians determined that the knobs did not have an effect on the images or on the meaning of this work, and therefore a 3D model of the knobs was not required. The time-delay was a side effect of worn out equipment, and not an effect originally intended by Paik, and therefore was also not re-produced.¹⁷¹ In principle, Serexhe said, the fact that the artist was no longer alive had no influence on any conservation decisions:

¹⁶⁶ More detail requires more time and money, and, like most of these VR pilot projects, the e-Installation project had a focus on user experience and accessibility vs. as a tool strictly for conservators. The average user's (museum visitor's) experience would not normally be affected by seeing the internal circuitry, or not.

¹⁶⁷ Muños Morcillo, email message to author, June 25, 2019. See also Muños Morcillo et al., "e-Installation," 10.

¹⁶⁸ Serexhe, interview with author, July 28, 2019.

¹⁶⁹ Muños Morcillo, email message to author, June 25, 2019.

¹⁷⁰ Serexhe, interview with author, July 28, 2019.

¹⁷¹ Muños Morcillo, email message to author, June 25, 2019. See also Muños Morcillo et al., "e-Installation," 10.

“Every work of art has its own character and authenticity, which is due to many factors. The work of art given to the public is thus liberated from the presence of its creator. And it is the conservators' task to preserve the work as such - completely independent of this creator - and to make it accessible to the public. This applies to the works of living and non-living artists.”¹⁷²

5.1.5 Long-term accessibility

In planning long-term accessibility of *Versailles Fountain* e-installation, the most important issue to consider is the conservation of the VR application and the update to newer computer and VR systems. The application is currently accessible via the project's website, but access to the e-Installation in the future is currently an unsolved issue. Since the project was a pilot experiment, undertaken as part of a practical course, ZAK does not have a specific long-term strategy for updating the application and granting access to the documentation.¹⁷³

5.1.6 Results

According to the project report, the results demonstrated that in cases where an artwork is unavailable due to maintenance, a digitized version could act as a surrogate of the work, simultaneously increasing the lifespan of the original.¹⁷⁴ Regarding its authenticity, after experiencing the VR re-enactment, Peter Weibel, Chief Curator and ZKM Director, expressed enthusiasm about the project. According to Muños Morcillo, after seeing the results at ZAK, Weibel said, “well, now I can put the video sculpture away.” For Muños Morcillo, the most important outcome of the pilot project was the new knowledge that was produced about the original video in-

¹⁷² Serexhe, interview with author, July 28, 2019.

¹⁷³ Muños Morcillo, interview with author, April 17, 2019.

¹⁷⁴ Muños Morcillo et al., “e-Installation,” 8.

stallation. For example, technicians working on the virtualization discovered that there was minimal delay between the two video channels due to the use of different monitors, something Paik tried to avoid. This detail was unknown even to the curators at ZKM but was indeed important to consider if it had relevance for the interpretation of the artwork.¹⁷⁵

Serexhe, however, is more skeptical than the authors of the report. Because the work was not documented under “strict conservation aspects,” for him, the VR simulation of *Versailles Fountain* cannot be regarded as “documentation.” Rather, he says, “the VR simulation enables a visualization and VR experience of the spatial arrangement, also from an aesthetic point of view.” It should therefore be understood as an *extension* of previously existing documentation, which may be helpful for developing “knowledge and approach to the work,” but it cannot replace the experience of the original work.¹⁷⁶

After the *Versailles Fountain* project, the team at ZAK collaborated with the artist Marc Lee producing a VR version of his interactive net-based installation, *10,000 Moving Cities - Same but Different* (2013/2014). The VR version was bought by the ZKM including the VR-system (Intelligent Sensor Actuator System, ISAS) developed at the KIT’s Intelligent Sensor Actuator Systems Laboratory. This took place before the eruption of HTC Vive in the computer market, which has similar features as the ISAS system. After that, Lee’s *10,000 moving cities* and another e-Installation, Stephan von Huene’s *Kaleidophonic Dog* (1967), were reconfigured to be used with a HTC Vive system.¹⁷⁷

¹⁷⁵ Muños Morcillo, email message to the author, June 25, 2019

¹⁷⁶ Serexhe, interview with author, July 28, 2019.

¹⁷⁷ Muños Morcillo, email message to author, June 25, 2019

5.2 Virtual Hall: Simulation of 2 David Hall Artworks in Virtual Reality (2017-2018)

Between 2017 and 2018, a small team of researchers and 3D animators from Duncan of Jordanstone College of Art & Design (DJCAD), University of Dundee began to experiment with the use of VR to simulate media artworks that may not be possible to exhibit in the future, due to technological obsolescence. The team recreated in VR two of David Hall's best-known video works: *A Situation Envisaged: The Rite II (Cultural Eclipse)* (1988-90) in 2017 and *TV Interruptions: The Installation* (1971/2006) in 2018. The resulting VR simulation allows viewers to experience these works by being immersed in a 3D virtual gallery space, giving viewers an idea and "feel" of what the work would be like in real life. The Virtual Hall project offers a way to present David Hall's video sculptures, and similar works that rely on obsolete technology, in a virtual setting.¹⁷⁸

5.2.1 Artwork Description

David Hall (1937-2014) was a pioneer of video art in the UK. *TV Interruptions (7 TV Pieces): The Installation* (1971-2006) is an installation comprising seven video works, initially conceived as short "artistic interventions" broadcasted on the Scottish news channel, STV, as part of the Edinburgh Festival in 1971. The videos show various actions, from a burning TV set to a running faucet. There were originally ten videos, aired unannounced and uncredited, of which seven were later issued as *7 TV Pieces*. The work was remade into an installation by the artist in 2006, comprising 7 monitors with black and white video and sound. The videos were originally shot on film, "because no video recording equipment was available."¹⁷⁹ Each video

¹⁷⁸ Adam Lockhart, interview with author, April 17, 2019.

¹⁷⁹ "TV Interruptions (7 TV Pieces): The Installation 1971, remade 2006," Tate, accessed August 11, 2019, <https://www.tate.org.uk/art/artworks/hall-tv-interruptions-7-tv-pieces-the-installation-t14180>.

lasts about three minutes, with a total duration of 23 minutes in the installation. The videos are titled individually: *Interruption Pieces*, *Tape Piece*, *Window Piece*, *Time Lapse Piece*, *Pans Piece*, *Street Piece*, and *Two Figures After TV Interruptions*. According to Tate, “in the gallery installation, the videos are shown on seven randomly clustered monitors. Viewing is interrupted as sound and image merge and conflict, evoking a similar experience to when the works were originally shown on television.”¹⁸⁰

Hall continued to exhibit single screen works, but his primary focus was the creation of video sculptures. In 1988, Hall created *A Situation Envisaged: The Rite II*, a multi-screen video installation comprising 15 monitors constructed as a single block, displayed close to a wall. All but one of the monitors (displaying multiple TV broadcasts) face the wall; only their reflections on the wall can be seen. In the centre, the forward-facing monitor shows an image of the moon. The audio is a musical score created by David Cunningham, composed from sounds on several broadcast channels.¹⁸¹ Like Paik’s *Versailles Fountain*, Hall’s video sculptures use old CRT monitors and, therefore, require frequent maintenance. These original monitors are no longer manufactured and therefore cannot be replaced.¹⁸²

5.2.2 Documentation

A Situation Envisaged: The Rite II is the third installation in the *Situation Envisaged* series. It was first shown at *Video Positive '89*, Tate Gallery, Liverpool in 1989 and later at *Signs of the Times*, Museum of Modern Art, Oxford in 1990, La Ferme du Buisson, Paris in 1993/94 and

¹⁸⁰ Carmen Juliá, “TV Interruptions (7 TV Pieces,” Tate, last modified July 2013, <https://www.tate.org.uk/art/art-works/hall-tv-interruptions-7-tv-pieces-the-installation-t14180>.

¹⁸¹ See “A Situation Envisaged: The Rite II (Cultural Eclipse),” Luxonline, accessed August 11, 2019, [https://www.luxonline.org.uk/artists/david_hall/a_situation_envisaged-the_rite_ii_\(cultural_eclipse\).html](https://www.luxonline.org.uk/artists/david_hall/a_situation_envisaged-the_rite_ii_(cultural_eclipse).html); and John Byrne, “Modernism and Meaning: Reading the Intervention of British Video Art into the Gallery Space,” in *Diverse Practices*, ed. Julia Knight (Luton: University of Luton, 1996), 240-241, <https://johnmichaelbyrne.files.wordpress.com/2014/02/modernism-and-meaning-jb.pdf>.

¹⁸² Lockhart, interview with author, April 17, 2019.

RE: [Video Positive], FACT Gallery, Liverpool in 2007.¹⁸³ *A Situation Envisaged: The Rite II* installation is owned by Richard Saltoun Gallery, a private gallery in London, UK. It was recently exhibited in *David Hall: Situations Envisaged* between 17 July and 14 August 2015 at Richard Saltoun Gallery in a solo show curated by Stephen Partridge featuring major works from his estate. Many images of the *A Situation Envisaged: The Rite II* can be found online, including images of the work installed at Richard Saltoun Gallery from the 2015 exhibition (Figure D4).¹⁸⁴ The Gallery has one Digital Betacam videotape with five sub-masters, and one set of five exhibition DVDs. According to Rhonda Ellis, who worked on the virtualization of *A Situation Envisaged*, “David Hall gave very detailed instructions of how these works should be exhibited in a gallery setting. It was intended that the viewer/participant should move around in relation to the screens.”¹⁸⁵

TV Interruptions (7 TV Pieces): Installation Version is in the collection of Tate, London. It was acquired by the gallery in 2014, through the help of Tate Members, and exhibited in *BP Spotlight: David Hall: TV Interruptions* between October 2014 and March 2015.¹⁸⁶ Photographs and film stills of the installation can be found online, in addition to several excerpts from the films (Figure D5).¹⁸⁷ According to Christopher King, time-based media conservator at Tate, the Tate has display specifications (including specifications provided by Hall in 2006), these include: media production diagrams and a document relating to what image will be showing on each monitor at any one time if started together (as they are not hard synced); documentation from an

¹⁸³ See Byrne, “Modernism and Meaning,” 240; and “David Hall A Situation Envisaged,” Richard Saltoun, accessed August 11, 2019, <https://www.richardsaltoun.com/exhibitions/42/works/artworks-12888-david-hall-a-situation-envisaged-the-rite-ii-cultural-eclipse-1989/>.

¹⁸⁴ “David Hall: Situations Envisages Installation View at Richard Saltoun Gallery,” Richard Saltoun, accessed August 11, 2019, https://www.richardsaltoun.com/exhibitions/42/installation_shots/image292/.

¹⁸⁵ Rhoda Ellis, “Virtually David Hall,” accessed August 11, 2019, <https://rhodaellis.com/portfolio/virtually-david-hall/>.

¹⁸⁶ Tate, “TV Interruptions (7 TV Pieces): The Installation 1971, remade 2006.”

¹⁸⁷ “Hall, David: TV Interruptions: 7 Pieces,” Media Art Net, accessed August 11, 2019, <http://www.medienkunstnetz.de/works/tv-interruptions/images/1/>.

exhibition at Tate Britain, which includes emails, installation drawings, plans and diagrams; all correspondence generated during acquisition; and some exhibition images. The Tate does not have video documentation of the installation.¹⁸⁸ Due to time and financial constraints, it was not possible for me to travel to London to view the documentation in person, which is the only way to access the documents. However, King provided examples and templates of the type of documentation the Tate would normally hold for “simpler” works, like *TV Interruptions*, including a technical report and metadata from media; a “pre-acquisition” form, which is completed before the work arrives, estimating costs and recording key information before the artwork is treated by the conservation staff; a production diagram that identifies what components have been created as part of the life of the work; a “display specification” form that collates information about mountain specifications gathered from the artist and other sources; and detailed records of the artwork’s components and metadata kept on Tate’s collection management system (TMS). For more complex works, such as performance, software or internet art, Tate has more elaborate documentation templates that help record the higher volumes of required information.¹⁸⁹

5.2.3 Technical Process

In total, four people worked on the two VR simulations. Both projects were supervised by Adam Lockhart, who worked with Hall and who is an expert in the preservation and curation of early media artworks. The first piece, *A Situation Envisaged: The Rite II* was mainly realized by DJCAD student Rhoda Ellis, who created a 1:1 scale static virtual exhibition space as part of her undergraduate degree. *TV Interruptions* was virtualized by Sang-Hun Yu, a 3D animator, and Sean Ahern, who did some programming for the simulations and helped import the 3D models

¹⁸⁸ Christopher King, interview with author, July 10, 2019.

¹⁸⁹ Ibid.

from Maya, a 3D modeling and rendering software, to Unity, a cross-platform game engine. In both simulation projects, the technicians had previous experience with VR. Ellis started using VR in her undergraduate studies to create exhibition spaces, wherein static objects can be placed, while Sang-Hun Yu was studying documentation of crime scenes in 3D and VR for his PhD. Sean Ahern had been working with 3D and VR for nearly 20 years, prior to working on this project.¹⁹⁰

To create the simulation, a high-spec PC with a powerful graphics card was necessary (costing 2700 BPD), in addition to the HTC Vive headset kit (500 BPD), and TPCast wireless adapter (300 BPD). For *A Situation Envisaged*, UE was used, while Maya and Unity were used for *TV Interruptions*. The time to create the simulation is hard to estimate; because the project was an experiment, the team was not dedicated to the project full-time. According to Lockhart, it took about one month per simulation, but the number of hours varied according to the complexity of the piece and how much detail was added. The method and the outcome they were aiming for required significant expertise; the multimedia aspect and the required 3D modelling increased the level of skill needed.¹⁹¹

5.2.4 Decision-making process

As the project did not involve documenting the physical artwork installed in an exhibition space, the team reproduced the installation in its entirety, without the aid of traditional surveying methods/scanning technologies (3D photography, photogrammetry or LIDAR). This meant generating 3D models of the artworks and an exhibition space, based on instructions by Hall of an “ideal” gallery space. This was decided mainly because these other methods would produce a lot

¹⁹⁰ Lockhart, interview with author, April 17, 2019.

¹⁹¹ Ibid.

of extra data that would slow down the simulation when viewed in VR. Additionally, in these installations, there were no unusually shaped objects, which would require more complex scanning methods.

The artist's original specifications for the work served as guidance for their activities on the project. In addition to existing documentation, Lockhart's experience working with Hall largely informed the decision-making. Since they were placing (mounting) the 3D modelled artworks within a VR environment, there were no compromises that may normally have to be made when working in a gallery space due to practical, financial or other constraints. In addition, Hall did not specify in his instructions a particular model of CRT monitors to use in his installation, therefore it was not necessary to reproduce the exact CRT monitors used in previous iterations of this artwork. The simulations were therefore more akin to curating an exhibition in a virtual world rather than documenting an exhibition in reality.¹⁹²

5.2.5 Long-term accessibility

Presently, the simulations can only be viewed using the HTC Vive set-up, but the project team is looking at making the simulations available on other platforms, accessible online. Due to the experimental nature of the project, they have not considered its long-term access and sustainability; a future project aims to look at these issues.

5.2.6 Results

The purpose of *Virtual Hall* was to recreate media artworks that one day will not be possible to show as originally intended, due to technological obsolescence. This was a pilot project on the possibilities of creating a simulation of a media art installation in VR, not a replacement

¹⁹² Lockhart, interview with author, April 17, 2019.

or edition of the work, but a reproduction that gives the viewer an impression of the original work in situ.

King, who experienced the *TV Interruptions* simulation, reacted positively to the results, saying, “Given VR doesn’t fully simulate the real world to any acceptable degree yet and it doesn’t implement many practical features that would be necessary to do so (ex. infinite walking), the simulations still gave me useful information about the work, or at least expressed a lot of information that would have to be carefully written and drawn to be communicated correctly.”¹⁹³ Another surprising outcome of the use of VR, he says, was that “the slightly sparkly artifacting of the headset’s optics/screens lent themselves to simulating the surface look of a CRT television.”¹⁹⁴ Regarding possible applications of such a simulation, King suggests that “a simulation could be a useful way to build consensus and understanding in a mixed skillset project team trying to adapt this ideal installation to a real physical space (which could also be modelled).” It would also be useful, he claims, “to explore variability before installing a real iteration of the work.” From a documentation perspective, however, King argues,

Given that we have many other tools at our disposal which have a proven long term track record for access and file standards (3D models, vector artwork files, video, text documents, artist interviews, etc.), and we have already been able to use these to manage variability or change over time in artworks, I think it would be difficult to justify incorporating VR simulations unless it offered something different or vastly superior.¹⁹⁵

For a work like *TV Interruptions*, he continues, “I don’t think VR does do this, at least in our current context, where we wouldn’t find it challenging to meet the display specification.” However, he believes, “there may be more complex works with variable elements whose documentation

¹⁹³ King, interview with author, July 10, 2019.

¹⁹⁴ Ibid.

¹⁹⁵ Ibid.

could benefit from simulation to explore impacts of variability before committing to an IRL installation.”¹⁹⁶

Tom Ensom, Digital Conservator at Tate, who experienced the simulation in London at the 2018 conference *Besides the Screen*, says the potential of VR as a documentation tool for media art installations is “clearly very powerful” and he is excited to see the technology develop.¹⁹⁷ For Ensom, the main purpose of the simulation was the documentation of an “idealised installation of the work with close proximity to reality through detailed 3D modelling of the environment and VR hardware.”¹⁹⁸ The resulting simulation, he argues, “would allow people an alternative way of experiencing the work, without it needing to be physically installed.” However, he said, “as a conservator, I am cautious to say that it could be considered a true ‘realisation’ of the work. It definitely blurs that line.”¹⁹⁹

Using the HTC Vive, the public was able to test out *A Situation Envisaged* VR simulation as part of the group exhibition *Media Archaeology: Excavations* at the NEoN (North East of North) Festival, Dundee, Scotland (November 2017). According to Ellis (who worked on the project), there was a good response from the audience. On the opening night, Ellis spoke with some people who had experienced the original installation, including new media curator Dr. Sarah Cook, who commented that “she didn’t remember the monitor stack being on a plinth in the original.” However, as Ellis argues, “according to David Hall’s instructions, it must have had [been on a plinth in the original], that is where the majority of the wiring was stored.” Ellis notes that, “there was clearly something in the way the virtual version has been made that makes [the

¹⁹⁶ Ibid.

¹⁹⁷ Tom Ensom, interview with author, July 18, 2019.

¹⁹⁸ Ibid.

¹⁹⁹ Ibid.

plinth] seem more prominent.”²⁰⁰ Photographs and a documentation video of the VR simulation from the festival can be viewed on the personal website of Ellis.²⁰¹

The process of creating, maintaining the integrity of the work, authenticity and the user experience, were explored in *Virtual Hall*. This pilot project is part of on-going research Lockhart and his team are developing in this field.²⁰²

5.3 *VR Archive for Performance Art (2016-2019)*

Since its founding in 2004, Live Art Denmark (hereinafter, Live Art), in Copenhagen has experimented with how to best document performance art using photography, video, performative writing and other media. According to Henrik Vestergaard, Administrative Director and Project Leader, VR offers several new options for performance art documentation — VR can capture the room, the mood, the audience’s relationship with the performance and performer, and actions that take place in multiple locations in the room at once. Access to performance art has always been limited by its special conditions, but VR offers a new potential for not only the documentation of a performance but also its dissemination.²⁰³ Between November 2016 and January 2019, Live Art documented 54 performances using 360-degree video, which can be viewed using a VR headset. The aim of the *VR Archive for Performance Art* project was to test out the technology and to see what VR offers to the documentation of performance art.²⁰⁴

5.3.1 Artwork description

²⁰⁰ Ellis, “Virtual Halls at NEoN Festival,” last modified November 11, 2017, https://rhodaellis.com/2017/11/11/virtual-halls-at-neon-festival/?iframe=true&theme_preview=true.

²⁰¹ Ibid. See also Ellis, “Virtually David Hall.”

²⁰² Lockhart and Sang-Hun Yu, “VR Simulation of David Hall’s TV Interruptions,” (paper presented at the Besides the Screen International conference paper, King’s College, London, July 2, 2018), <https://discovery.dundee.ac.uk/en/publications/vr-simulation-of-david-halls-tv-interruptions-the-installation-19>.

²⁰³ “Now and Again 360,” Live Art, Denmark, accessed August 11, 2019 <http://liveart.dk/now-and-again-360/>; and Henrik Vestergaard and Ellen Friis, interview with author, February 15, 2019.

²⁰⁴ Ibid., interview with author.

The first collection of 360-degree video documentation of performance art contains 24 works, recorded between November 2016 and December 2017 at multiple venues in Europe. As of August 2019, the second collection contains 30 works, recorded between 2018 and 2019 in various locations in Denmark and Canada, with artists from all over the world.²⁰⁵ The VR archive includes solo and group performances, which range from 10 to 40 minutes in duration, and were recorded both indoor and outdoor. Many of these works were performed for the first (and sometimes only) time. A full list of the performances and recording locations can be found on the Live Art website.²⁰⁶

5.3.2 Documentation

The performances comprising the *VR Archive* were not previously documented by Live Art. Before experimenting with VR, Live Art would document a performance using written text, photography and/or video, depending on the type of performance and location. If the performance is located in a traditional theatre setting (with the audience facing towards the main stage), Live Art would usually document such performance with regular 2D video. If the performance is more conceptual, and would not otherwise benefit from being an “interactive” experience, they would use photography.²⁰⁷ However, the way a performance is documented relates to the environment of the performance, and quite often either to the details of the commissioned project, or the very reason for the project (testing out documentation strategies). For example, the video series *Now and Again: Performance for Video* (2014), was a commissioned project that invited involved commissioning eight artists to produce a performance for video recording, thereby transforming a live moment into a permanent state. The videos were meant to be

²⁰⁵ Vestergaard and Friis, email message to the author, August 12, 2019.

²⁰⁶ “Virtual Reality Documentation of Performance Art,” Live Art, Denmark, accessed August 11, 2019, <http://liveart.dk/virtual-reality-documentation-of-performance-art/>.

²⁰⁷ Vestergaard and Friis, interview with author, February 15, 2019.

watched by the viewer with headphones on, to give a sense of intimacy with the performer. In some cases, the performers address the viewer, providing instructions, and in turn, making the viewer perform.²⁰⁸ In the project *Critics and Cocktails* (2010), Live Art worked with Mary Paterson and other writers on the subject of performative criticism, described as “writing on and as performance.” Live Art has also published books, such as *Berliner Luft* (2009), in which the works performed at Berliner Luft festivals 1-4 (2004-2009), organized by Live Art, are described in detail. Most recently, Live Art has been writing scores of performances, as a practical way of preserving and disseminating works. Most of the performances in the VR collections were also documented using photography, which is, according to Live Art, the only kind of documentation that seems to work for all event settings. In all cases, Live Art includes essential metadata: the artist, the title of the performance, the date, and location of the performance.²⁰⁹

5.3.3 Technical Process

The first collection of performance documentation was produced with the original Samsung Gear 360 camera and released in 2016. It is available on YouTube in 4K. This collection was recorded using a lower quality camera, as a way to try out the format and to learn about its possibilities and limitations. The second collection was documented using the Insta360 Pro, a VR camera capable of recording 8K videos with spherical audio. These higher-quality recordings are stored on the internal hard disks of the VR goggles.²¹⁰

The overall cost and viability of implementing VR documentation (as a strategy for preserving performance art) depends not only on the (available/selected) hardware and software, but

²⁰⁸ Vestergaard and Friis, message to author, August 12, 2019. See also “Now and Again,” Live Art, accessed August 14, 2019, <http://liveart.dk/artist/now-and-again/>.

²⁰⁹ Vestergaard and Friis, message to author, August 12, 2019.

²¹⁰ Live Art, “Virtual Reality Documentation of Performance Art.”

also on the technical expertise available at the institution. In the case of Live Art, the VR documentation and processing were undertaken by its two employees: Henrik Vestergaard, administrative director, and David Sabastian Lopez Restrepo, VR expert. In addition to the Gear 360 camera (200 EUR), the first collection used Gear 360 ActionDirector (video editing software; included in the price of the camera), YouTube (free) and PS4 Pro with VR goggles (300 EUR). The second collection used the Insta360Pro (3 500 EUR), a much higher-quality and high-resolution camera, along with Insta360 Stitcher (video stitching software; included in the price of the camera), Adobe Premiere Pro (photo and video editing software; 420 EUR for 6 month's access to the business edition), HandBrake (open source video transcoder; free), and the Oculus Go VR headset (265 EUR) with Skybox VR Video Player (free) to store and play back the VR videos. After recording, each collection required nearly three months to complete (editing and processing) with an estimated total cost of 20 000 EUR, with funding obtained from the Danish Art Council.²¹¹

According to Henrik, the first collection was documented more easily for several reasons. The Gear 360 was very easy to use. For example, one can easily use its proprietary software to edit the video on the computer or using their phone application. It was also easy to upload the videos to YouTube as the quality was much lower, and therefore the size smaller than the videos produced using the Insta 360. The second collection was more demanding in terms of cost, time and technical expertise, in part because of Live Art's desire to create higher-quality videos. The Insta 360 required Live Art to purchase a new PC with more processing power, and four different programs were needed to process the video from input to output. The result, however, was a

²¹¹ Vestergaard and Friis, interview with author, February 15, 2019.

much higher quality video, and thus a much more detailed and richer documentation of the performances. However, this also meant that, due to their file size, the videos could no longer be uploaded to YouTube, embedded into a website or accessed by the public except using Live Art's HMD.²¹²

5.3.4 Decision-making process

Several decisions had to be made during the VR filming process. It was very important, first of all, to know where to place the camera in the space (dance studio, theatre or, in some cases, an outdoor performance space). Vestergaard and his team explored different viewpoints (eye on the wall, from above or below) and ultimately settled on using the perspective of the ideal location for the audience member i.e. front and center. The performances were recorded live, from start to finish in one take, using one camera from a single vantage point. When recording, the camera was mounted on a tripod in the front and center with the audience. In this way it was possible to capture both the performance, the space and the reactions of the audience.²¹³

5.3.5 Long-term accessibility

Presently, a 360-degree panoramic video version of the first collection can be accessed via YouTube, which is free for all to use. The second collection (with higher quality videos) can only be experienced using Live Art's HMD. This collection will go on tour and be exhibited at galleries, festivals and performance spaces. Live Art has estimated that it will cost them nearly 5 000 EUR per year to upkeep the *VR Archive for Performance Art*. As of now, they have no funding left for the project, so future access to this project is in question.²¹⁴

²¹² Ibid.

²¹³ Ibid.

²¹⁴ Ibid.

5.3.6 Results

Compared to other means of documentation, VR has the potential to document the space, the interaction between the audience and performer(s), and the liveliness of the event, which is bound to space, time, actions and responses. In other words, to document a performance is to capture its instantiation within the performance environment and its space-time continuum. With traditional forms of documentation, such as photo and video, it has proven very difficult to capture the atmosphere of a performance and nearly impossible to capture the entire performance in larger group works, especially those happening in open spaces. VR has the added advantage of evoking the original performance environment, because of the technology's ability to capture it in 360 degrees. Furthermore, the use of VR turns watching performance art documentation into an active experience; the viewer can decide where to look and for how long. For Vestergaard and Friis, "it turns the act of watching documentation into a performative event."²¹⁵ However, Vestergaard notes that, due to practical issues of filming in VR (quality of sound, availability of light, among others), its use has some limitations. Currently, one would select this form of documentation when the performance is more intimate and when there is proper lighting. For the making of the first collection, using the cheaper camera, the quality was determined to be not good enough to be used as documentation. It is always difficult, Vestergaard says, to record in large, outdoor spaces with low lighting, and with the Gear 360, this issue was particularly prevalent. The Insta Pro 360, while produced a higher image quality, recorded poor quality sound. In the future, Live Art hopes to use an external microphone with the camera to capture better sound. Furthermore, it can be expensive and demanding to create performance documentation and then

²¹⁵ "The VR Archive for Performance Art," YouTube, last modified August 24, 2018, https://www.youtube.com/playlist?list=PLs2dgPfebOKOjHDqgz7i_m_-OGcGjiyrl.

to use HMD as a platform for its dissemination does not appear to be an effective use of resources or a financially sustainable approach , as only a few people can experience the documentation using an HMD at any one time.²¹⁶

The *VR Archive for Performance Art* was built as a platform for researchers, artists, students, and general audiences to experience performance works as if they were present. Since September 2018, this archive has been part of the permanent collection of LOKALE, an artistic and curatorial collection in Copenhagen. Live Art are presently working to form partnerships with CPH Stage theatre festival and the Danish Theatre Museum.²¹⁷

5.4 *Memories: Virtual Reality (360-Degree Video) Documentation of Memories by Bastardilla (2019-present)*

Street Art Museum Amsterdam (SAMA) is a small institution with around 200 pieces of street art²¹⁸ located in and around Amsterdam Nieuw-West. The project *Memories* began in 2019 as a way to document the making and final result of the mural *Memories* (2019) by Bastardilla, so that it can be experienced by wider audiences, outside of Amsterdam and the Netherlands, as well as after the demolition of the building on which it was painted. As SAMA (and every street art museum) is facing the imminent loss of a significant portion of its collection due to urban reconstruction and gentrification, this museum is intent on preserving the tangible and intangible heritage that has been generated over the last seven years. For that reason, the museum has begun to explore the possibilities of VR and AR to document these works and archive the collection, while still respecting the ethics of the street art movement. Knowing that the building, located on

²¹⁶ Vestergaard and Friis, interview with author, February 15, 2019.

²¹⁷ Live Art, "Now and Again 360."

²¹⁸ Usually, street art is distinguished from graffiti in that street art is created with permission or by commission.

the corner between Nicolaas Ruychaverstraat and Burgemeester Röellastraat, is going to be demolished over the next four years, SAMA developed a project to document a new mural, *Memories*, in VR.²¹⁹

5.4.1 Artwork description

Memories was commissioned by SAMA and created by Colombian artist Bastardilla²²⁰ in May 2019. The monumental mural is located on the side of a residential block located between Nicolaas Ruychaverstraat (house numbers 207-267) and Burgemeester Röellastraat (house numbers 18-40) in Geuzenveld, a neighborhood in Amsterdam Nieuw-West. The residential block, constructed by Cornelis Wegener Sleswijk between 1958-1959, comprises a gallery shop on Nicolaas Ruychaverstraat, with houses above, and an entrance located on Burgemeester Röellastraat. Before the addition of the mural, the apartment block had a blank facade on the Dr. J. Colijnstraat, originally a completely dark brown brick wall with an external chimney. *Memories* (Figure D6) consists of a large human figure on the right side of the wall, who is surrounded by flights of kingfisher and cormorants, bird species that are found in the vicinity. The figure faces the chimney, and on the other side is a smaller group of exotic-looking birds, fallen bricks and sand, and flowers in the bottom left. The mural takes up the entire height of the 20-meters tall wall and was created with the help of a platform (scaffolding). *Memories* was inspired by the changes the neighbourhood underwent over the years; immigrants moving to the neighbourhood, original inhabitants moving away, and the demolition of many of the original buildings, replaced

²¹⁹ Anna Stolyarova and Vitória Ramirez Zanquetta, interview with author, July 4, 2019.

²²⁰ Bastardilla is a female street artist from Bogota. The subjects she paints are often reflections of the community around her.

by new ones. The mural was painted in consultation with the housing block residents, the Open Haard housing association and the Amsterdam Fund for the Arts.²²¹

5.4.2 Documentation

As the mural was commissioned specifically for SAMA's project, it had not been previously documented. Usually works of this scale are documented using photography and/or video to give an impression of the painting, its scale, and the surrounding area.²²² SAMA has begun the process of fully documenting their existing collection and cataloguing the documentation online with Axiell, a collections management software. In the meantime, SAMA's collection can be explored using Google Art and Culture Institute, in the form of photographs which can be enlarged to reveal details.²²³

5.4.3 Technical process

In collaboration with the Media College Amsterdam and Bob de Jong from Eastbound production house, the VR recording took place on May 6 and 22, 2019. The process of painting the mural was registered using VR, therefore it is possible to view the building and its surroundings before, during and after its completion. Three people were mainly involved in the making of *Memories: Virtual Reality (360 Degree Video) Documentation* project: Rufus Baas, professor at Media College Amsterdam and program manager at XR Lab, worked on innovative and experimental VR projects; Bob de Jong, founder of Eastbound, a creative VR agency based in Amsterdam; and Anna Stolyarova, founder of SAMA, who previously worked on VR applications such

²²¹ Ibid., and "Memories the Artwork by Bastardilla," Street Art Museum Amsterdam, accessed August 11, 2019, <https://www.streetartmuseumamsterdam.com/memories>.

²²² Stolyarova and Ramirez Zanquetta, interview with author, July 4, 2019.

²²³ "Street Art Museum Amsterdam," Google Arts & Culture, accessed August 11, 2019, <https://artsandculture.google.com/partner/street-art-museum-amsterdam>.

as *The World of Betters*, developed for a Western Union campaign. The documentation was recorded using Insta 360 Pro camera, its post-production was done with Adobe Creative Suite and Mistika VR. According to de Jong, it is difficult to provide a precise number on the hours worked on this project; as of July 11, 2019, the team was still editing and processing the project. The overall cost of making this type of documentation would normally range from 3 000 to 6 000 EUR, depending on the level of detail and scale of the project.²²⁴ Presently, a high level of technical expertise and technology are required to carry out this type of documentation and, therefore, it is not yet possible for SAMA to independently carry out this type of documentation. While Stolyarova has previous experience using VR, it was important and necessary for specialists to be involved in this project.²²⁵

5.4.4 Decision-making process

During the mural's creation, the artist, the community and technical experts were consulted throughout the entire process of its documentation. For the VR documentation of the mural, it was decided to capture the wall in several stages: before the production of the artwork, which resulted in a 360-degree image of the building and its surroundings; during the production of the artwork, in the form of close-ups of the painting and the artist in action; and after the piece was completed, providing wide angle views of the art piece and shots recorded from the scaffolding used during its production. SAMA wanted to document the before and after of the mural, as well as the experience of the artist creating the piece, to give more depth to VR documentation project.²²⁶

²²⁴ Bob de Jong, email message to the author, July 11, 2019.

²²⁵ Stolyarova and Ramirez Zanquetta, interview with author, July 4, 2019.

²²⁶ Ibid.

5.4.5 Long-term accessibility

The documentation will be available at SAMA, to be accessed through the recently acquired Oculus Go. Furthermore, the files will be uploaded to YouTube and into the online collection catalogue, hosted by Axiell Collection Cloud. The museum is still looking for solutions regarding long-term accessibility of their VR archive, with the aim to develop a VR Collection Plan by 2020.²²⁷

5.4.6 Results

The main purpose of the documentation was to make possible for future visitors and residents of the area to experience the mural and the changes it underwent, even after the piece is no longer visible in its original location. SAMA chose VR for its potential to document and preserve their street art collection. Photography and video do not truly capture the magnitude and impact of the large mural. These 2D documents seem somewhat static in comparison to the ever-maturing 360-degree video and its capacity to capture the work in its surroundings or entire environment. For street art, the surroundings are extremely important in experiencing the work and, in the case of a mural measuring more than 20-meters in height, it is also important to give a sense of its proportions in relation to its surroundings. For SAMA, “Street Art is not related to a plain canvas, but an art form which lives on the streets. The life and meaning of the artwork comprises not just the painted mural, but the surrounding environment — the characters along the streets, the light, the seasons, the sounds.”²²⁸ According to Derry Razen, who is part of the curatorial team at SAMA, “Virtual Reality and Augmented Reality documentation/preservation of these pieces comes closest to capturing the impact that large-scale or suddenly encountered street art

²²⁷ Ibid.

²²⁸ Stolyarova, “Heroes of Amsterdam + Friends,” Street Art Museum Amsterdam, last modified April 21, 2019, <https://www.streetartmuseumamsterdam.com/single-post/2019/04/21/Heroes-of-Amsterdam-Friends>.

pieces have on viewers. Since VR/AR allow for a sense of setting and scale to be conveyed to a viewer the technology allows SAMA to convey the ‘wow factor’ that many enduring works of art have in a way that is accessible to a global audience.”²²⁹ Street art is context-dependent, VR therefore allows recording the artwork within its 360-degree environment, placing it back (digitally) into its context. It also allows SAMA to, “re-map the artworks that were destroyed due to demolition into the new environment,”²³⁰ thus documenting changes to the environment over time. According to Vitória Ramirez Zanquetta, Architecture and Applied Museology expert at SAMA, VR was considered the most appropriate documentation method for representing the artworks and their surroundings. Having in mind that SAMA believes that street art, “should not be physically removed from its context [and] the urban realm,” VR becomes a “fundamental tool to ensure the preservation of the art pieces and the relation with their environment, making it possible [to] experience that artworks closer to its original form” even in cases where they no longer physically exist.²³¹ Furthermore, VR conveys features such as scale and perspective better than photography or other two-dimensional documentation techniques. On the other hand, Ramirez Zanquetta notes, “VR might not be the best method to document features such as textures, materials, and techniques,” therefore, “[...]other methods of documentation have to be done in parallel in order to have a complete [documentation] of the artworks.”²³²

Over the next five years, 80% of Street Art Museum Amsterdam’s collection will be destroyed through gentrification or urban renewal initiatives. The works in SAMA’s collection will not just be painted over, but the buildings on which they are located will be demolished. Amsterdam Nieuw-West, the largest of Amsterdam’s seven neighbourhoods, is home to many

²²⁹ Stolyarova and Derry Razen, email message to author, July 31, 2019.

²³⁰ Stolyarova, email message to author, July 31, 2019.

²³¹ Ramirez Zanquetta, email message to author, July 31, 2019.

²³² Ibid.

precarious and low-income communities, and a youth demographic who will comprise 25% of Amsterdam's population in the coming years. According to SAMA, "as our collection is destroyed, with it will go access to affordable food, housing, and the further displacement and ghettoization of many already precarious people."²³³ Therefore, their dream over the next five years – if the neighbourhood is inevitably going to be destroyed and its shared heritage erased – is to document their entire collection, the neighbourhood, the people and the stories that make them, in a two-hour VR experience.²³⁴

²³³ Jesse Scott, "David Beckett Helps SAMA Come One Step Closer to Full Virtual Reality Documentation of the Entire Collection," Street Art Museum Amsterdam, last modified June 10, 2019, <https://www.streetartmuseumamsterdam.com/single-post/2019/06/10/David-Beckett-Helps-SAMA-Come-One-Step-Closer-to-Full-Virtual-Reality-Documentation-of-the-Entire-Collection>.

²³⁴ Ibid.

6. Discussion

The case studies presented in section 5 demonstrate how museums are moving beyond traditional, two-dimensional forms of documentation (written descriptions, photographs, and video) to capture or recreate a version of the original artwork or performance in VR. Media art installations, in particular, offer a range of multi-sensory aspects for media preservationists to consider, not only how to document the audiovisual components of the installation in VR, but also how to include the elements of presence, participation, immersion and a sense of reality. The case studies raised many questions about how to translate an experience in physical reality of an artwork into virtual reality, while sufficiently capturing the essence of the experience to consider the VR document, in some sense, an “authentic” representation of the artwork according to conservation standards.

6.1 Recommendations

At this point, it would be inappropriate to suggest a definitive set of recommendations for VR documentation; technical procedures should be determined after more case studies have been carried out. As a starting point, existing documentation models for describing media art installations (as outlined in section 2) such as the Variable Media Questionnaire, the Iteration Report, or the Artwork Documentation Package, in addition to any metadata standards associated with media art installations, should be consulted first in developing recommendations for VR documentation. With regards to the practical aspects of the documentation process, LIMA has established a set of procedures for documenting media art installations on video, which are continuously updated to reflect today’s resources and techniques.²³⁵ This knowledge could be applied to VR doc-

²³⁵ Kallinen and Biscaya, *Guidelines for Documenting Video Installations on Video*.

umentation until a more specific set of procedures are developed. LIMA's *Guidelines for Documenting (Video) Installations on Video* includes considerations for defining the purpose of the documentation (who is going to use the documentation and for what purpose); what is important to capture while recording and what can be added later in post-production; levels of complexity and quality to determine a realistic budget; technical limitations and possibilities of the production; developing a script or a shot list; and versioning (which is related to the purpose of the documentation).²³⁶ LIMA's guideline specifies three main categories of documentation, with some subcategories: 1) How to experience an installation (a) to record the installation for the audience; to give an impression for publication or education (b) artist documentation; to document or promote the work; 2) How to reinstall an installation (a) 'art historical' documentation; for professionals, research, knowledge exchange (b) re-installation (instructions for conservator/technician); and, 3) How to preserve an installation (a) preservation for future generations.²³⁷

To document a media art installation in VR, one must first determine the nature of the installation. Based on the case studies presented in this paper, to capture as close as possible the original work and experience of it, the following layers of a media art installation may need to be reproduced in the VR version: the physical attributes of the installation, including the exhibition space in which it is situated, the configuration, and equipment; participation and interactivity of the user/viewer; the soundscape, including ambient sounds within the exhibition space to give users a sense of presence and sounds produced by the artwork; and, the immersive, multi-sensory experience, including sight, sound, movement/direction, and possibly touch.

²³⁶ Ibid., 9. As the guideline notes, different versions of video documentation are often created from the same raw footage such as: 20 second teaser for website; 30 seconds viewing clip for website; 1 min. impression of the installation; 3 min clip for presenting the work to the public/curators, and/or students; 8 min. clip that tries to capture every detail and the loop in its entirety; 25 minute clip that shows how the installation is built step by step with a commentary track/voiceover. This concept can certainly be applied to VR documentation.

²³⁷ Ibid., 5.

The case studies showed various technological possibilities that could be employed in VR documentation, including 360-degree video displayed on a 2D screen (*VR Performance Archive* and *Memories*); 360-degree video displayed in a head-mounted display (*VR Performance Archive* and *Memories*); 360-degree video displayed in a head-mounted display and/or hand controllers (*e-Installation* and *Virtual Hall*); and a VR headset with tracking technology and/or handheld motion controllers (*e-Installation* and *Virtual Hall*). The possibilities for recording sound include multichannel audio, binaural audio, “live” audio recorded by the camera, “live” audio recorded by an external microphone and/or sound recorded, and pre-recorded audio added in post-production. The decision of what attributes to record or reproduce, and which technologies to employ, will affect the level of realism, and, therefore, should be determined by considering several factors including the goal of the documentation, the characteristics of the artwork/artwork’s integrity, the availability of technological expertise, and the budget allocated to the project.

As in the conservation of modern and contemporary art, a “decision-making model” is needed to establish the documentation options. The virtualization options will be very different from one case to another depending on the characteristics of the artwork and the artist’s intention. Before a VR documentation method is selected, an investigation into the materials and behaviours in relation to the artwork’s meaning must be undertaken. Knowing what aspects of an artwork are integral to its meaning will help avoid mistakes and misunderstandings during the virtualization process. During the virtualization of the artwork, a curator is often consulted on decisions regarding levels of detail in the 3D model and the VR exhibition environment. For example, if there is little connection between the material conditions of the work and its meaning, it may be possible to use a less complex method of virtualization. On the other hand, if the material

conditions of an artwork are essential to its meaning, it may be necessary to reproduce all the textures with higher accuracy. Likewise, for including ambient sounds, how much sound of the exhibition space is necessary to capture. In the case of *Versailles Fountain*, the original ZKM exhibition space was recreated in VR to preserve contextual information, while the *Virtual Hall* project simulated an “ideal” exhibition space. The simulation and recreation of an exhibition space can help convey the intentions of the curator and the artist, contextualize the artwork, and provide additional visual cues regarding size and spatial arrangement. Ideally, the entire composition of a media art installation (deemed important to a work’s meaning), including hardware, and circuitry should be captured in the VR documentation.

6.2 Cost and Expertise

We also learned from the case studies that VR documentation can be a costly and time-consuming process and requires a high level of technical expertise. The level of complexity and quality required in a VR recording will determine the budget. In addition, the technical competency of the team members and the quality of the equipment will have direct consequences for the budget. Comparing the overall costs of the projects in the four case studies is quite difficult, because the case studies were pilot projects, undertaken under fixed budgets; however, some general observations can be made. Appendix E provides a comparison of the technical details of the two media art installation case studies (Table E1) and the performance art and street art case studies (Table E2). The *e-Installation* and *Virtual Hall* projects are considered fully immersive experiences, created using 3D modelling techniques and game engines. When viewed in a HMD with motion tracking technology, *e-Installation* and *Virtual Hall* immerse the user in a life-scale virtual gallery space, allowing the user to walk around the space and view a realistic model of the

media art installation. The cost, duration and technical expertise required for each project, however, varied greatly, and relate directly to the complexity of the documentation strategy. *e-Installation* used a more complex documentation strategy, which involved 3D scanning and reconstructing the physical artwork using photogrammetry and (in phase II) the surrounding exhibition space at ZKM. *Virtual Hall* was not documented in situ but rather computer-generated. It was largely informed by existing documentation and, in particular, instructions from the artist regarding its ideal display specifications. This method took less time as the CRT monitors were not 3D scanned, but digitally created and replicated, resulting in less data to process. In both projects, the artworks were static video sculptures. An artwork with a high level of interactivity or kinetic (moving) parts would have increased the complexity of the documentation strategy, and thus, the amount of people, expertise, equipment, and in turn, costs required.

The *VR Archive of Performance Art* and *Memories* projects are 360-degree videos, recorded using traditional filming techniques with specialized cameras. *VR Performance Archive* documented live performances, recorded in environments that were at times not ideal in terms of sound and lighting. *Memories* was documented in several stages: before, during and after the creation of the mural, and involved creating a recording script that allowed for more planning. Both projects used the same camera for recording and similar software for editing and processing. One of the main differences in these two projects was the technical expertise at the institutions. Live Art was able to produce its own documentation in house, however, this also meant investing in cameras, computers, sound and editing equipment, and training of existing personnel. For SAMA, it made more sense to hire a third-party, who already had the equipment and expertise.

6.3 Limitations of Use

As VR documentation is a new method of media art documentation, it will take time and tests to accurately determine what kind of media art can and should be documented with it. Like with most emerging media art documentation strategies, VR documentation has been developed from “case study” research, and therefore it is more difficult to consider its application universally. For this reason, conducting case studies on different types of media art installations, using different combinations of technologies is necessary. Even more difficult will be the standardization of the measures and steps that must be undertaken to document a media art installation using VR, because every installation has its own specific features and levels of meaning. Selecting artworks for documentation in VR depends on several criteria and should be determined by people with expertise in appropriate fields of art and in requires technologies. For example, when selecting an artwork for the e-Installation project, the team defined the following key criteria: “a) the artwork’s relevance in terms of art history; b) the artwork’s level of vulnerability and accessibility; c) access to a documentation of the artwork with detailed information about the artist’s intention and the materials used, as well as the artwork’s technological basis, and its construction plans; d) the technical viability of the documentation method; and e) the conceptual and material suitability for the VR documentation method.”²³⁸

In 2019, the Dutch Foundation for the Conservation of Contemporary Art (SBMK)’s Decision-Making Model for Contemporary Art Conservation and Presentation, originally conceived in 1999, was revised in accordance with an international, multidisciplinary working group. In step 6 of the model, Conservation/Presentation Options, options for conservation and/or presentation are expanded. Possible options include emulation, migration, replacement, repair, or no

²³⁸ Muños Morcillo et al., “e-Installation,” 6.

action.²³⁹ In step 7, Considerations, the previously expanded options are discussed and weighed against each other to develop a conservation/presentation strategy. Criterion to take into account include “aesthetic and artistic values, authenticity, historicity, functionality, artist’s opinion, relative importance of the artwork, financial limitations, legal aspects, technical limitations, and restoration/conservation ethics.”²⁴⁰ These assessment criteria can change from case to case; decision-makers are “requested to discuss the developed conservation/presentation strategy within a framework of possibilities, risks, and limitations.”²⁴¹ The central question when deciding on strategy is, “in what sense will the identity/meaning of the work be altered as a result of the proposed conservation/presentation strategy?”²⁴²

Based on the case studies in this paper, it would appear that, media art installations with kinetic, interactive and audiovisual elements are especially well suited for conversion into virtual 3D environments, in particular, artworks by Nam June Paik, Jeffrey Shaw, or Olafur Eliasson. . We also saw that VR technology is equally applicable in documentation of performance and street art. Its applications, therefore, could be expanded to a wide-range of art forms including kinetic art and land art. Static works, or artworks without an element of interaction and need of contextual environment, however, might not be an appropriate choice today for VR documentation in terms of costs and technological expertise; however, the use of the comparatively less-costly and less-demanding 360-degree video documentation could be a useful addition to two-dimensional and textual documentation for providing information about dimensions, spatial arrangement, and the ideal distance to experience it.

²³⁹ Julia Giebeler, Heydenreich, Andrea Sartorius, and Andreas Fischer, *The Decision-Making Model for Contemporary Art Conservation and Presentation v. 1.1*, (Cologne: Cologne Institute of Conservation Sciences, 2019), 13, https://www.sbm.kn.nl/source/documents/f02_cics_gsm_fp_dmmcacp_190513.pdf.

²⁴⁰ Ibid., 14-15. Descriptions of each criteria can be found on p.15.

²⁴¹ Ibid.

²⁴² Ibid., 15.

6.4 Virtual Reality Documentation and Conservation Standards

While the benefits of VR as a documentation tool were already noted in this paper, the interviews raised interesting questions regarding the use of VR as a ‘documentation’ tool, or more precisely, whether representation of a media art installation in a VR environment can be considered a form of documentation. For example, in the *Versailles Fountain e-Installation* project, the project is referred to as both ‘documentation’ and a ‘re-enactment,’ while the *Virtual Hall* project is referred to it as a ‘simulation.’ These differences in terminology made me question if, in fact, the time-based conservators and curators consider this type of document as “documentation” by conservation standards. Regarding the virtualization of *Versailles Fountain*, as previously noted, Bernhard Serexhe said that, “the VR simulation enables a visualization and VR experience of the spatial arrangement, also from an aesthetic point of view,” and is “a nice extension of the previously existing strict documentation,” however, more generally, he had some reservations. When asked about his opinion about the use of VR as a documentation tool for media art installations, Serexhe said:

[...]we live in a time when - for simple marketing reasons - digitalization is considered the universal remedy for almost all problems. The fact that we are dealing with a whole range of other problems caused by digitalization, for example the fundamental dependence on appropriate hardware and software, including the latest apps, the constant occurrence of bugs, the ubiquitous constant siphoning off of our data, and the fact that we also have to pay a lot of money for this, is usually intentionally concealed. In all my time as an exhibition curator and collection director, as well as in my work as a publicly appointed expert in the field of electronic and digital art, and in my earlier work in the field of architectural-historical investigation, I have come to appreciate the thoroughness and relevance of analog documentation techniques that have been developed and refined for centuries and that cannot be replaced by some quickly programmed VR tools. [...]I consider VR tools as a nice addition, which only makes sense if a profound documentation with analog techniques is already done. Digitalization is basically a reduction of the analog world; it has the goal to make states and processes calculable in a reductive way and thus always captures only a part of reality. By finally establishing itself as its own reality, however, it overwrites essential aspects of analog experience so that these no longer become visible.²⁴³

²⁴³ Serexhe, interview with author, July 28, 2019.

In other words, Serexhe believes that previously established documentation models that have been perfected over many years should remain as the first standard of documentation, while VR documentation could be used as a helpful addition to communicate the work's spatial arrangement and "aesthetic point of view."

Regarding the use of the term 'documentation,' Adam Lockhart, project leader of the *Virtual Hall* project, said, "I'm not using VR as a documentation tool, but as a simulation tool to recreate works from scratch." He makes a firm distinction between simulation and documentation in noting that, "we aren't going into a space to record [i.e., document] an artwork using 3D video or lidar etc., although we could that to inform what we do. It's mainly to *recreate* [emphasis added] media works that will be or already can't be exhibited due to the obsolescence of the technology that they use."²⁴⁴ By contrast, in describing 'simulation' and 'documentation,' Tom Ensom, Digital Conservator at Tate, says for him, a simulation describes, "something that models reality in such a way that the simulation can to some extent stand in for the original thing and offer an approximation of the experience of the original thing." But decides that, "A simulation could be a form of documentation, as long as the simulation has an indexical relationship with the thing being documented."²⁴⁵ Video and photography are established forms of documentation because of their "indexical relationship" to the work or performance being documented. When extending this concept to simulations, whether an art objects is photochemically, electronically or digitally reproduced in documentation is less relevant than its indexical relationship i.e. the relationship between the object and its representation, be it photographic, videographic, or a digi-

²⁴⁴ Lockhart, email message to author, March 12, 2019.

²⁴⁵ Ensom, interview with author, July 18, 2019.

tal 3D simulation (VR documentation). Similarly, Christopher King, time-based media conservator at Tate says, “At Tate [...] we generate a lot of documentation, but have only started experimenting with more complex formats like Ambisonic recording, binaural recording and recording installation in 3D over the last few years.”²⁴⁶ Unlike the conservators at ZKM, King acknowledges, “We would view all of these as documentation[.]”²⁴⁷

In the case of the 360-degree video documentation of performance art and street art carried out by SAMA and Live Art, Denmark, respectively, they more clearly consider this form of representation “documentation.” SAMA, for example, considers VR a fundamental tool to ensure the preservation and dissemination of their collection, and have incorporated its use into their Collection Policy Plan, Collection Research Plan and Communications Plan, to support their Collection Catalogue that requires archiving using VR as a tool.²⁴⁸ Likewise, Live Art Denmark considers their VR Archive of 360-degree video documentation as the primary way to (re-)experience their collection of performances. It appears, then, that the key issue with considering VR representation as ‘documentation’ relates to “preservation,” namely, the fear that the VR document would replace, in some way, the original object. Ensom, for example, ultimately argues that there is no problem with “creating VR documentation *in addition* to more traditional forms,” but that, “it’s reliance on [VR documentation] that would worry me.”²⁴⁹

6.5 Long-term accessibility and future-proofing VR documentation

The creation of such a complex digital form of documentation creates another preservation issue: preserving the document itself. One of the major issues raised in the case studies was the long-term access to the VR materials. VR documentation comes with its own preservation

²⁴⁶ King, interview with author, July 10, 2019.

²⁴⁷ Ibid.

²⁴⁸ Stolyarova, email message to author, July 31, 2019.

²⁴⁹ Ensom, interview with author, July 18, 2019.

problems and will require preventive conservation in order to keep the software and hardware functioning. Therefore, the use of VR does not guarantee the original objects long-term preservation; continuous maintenance, migration and storage of all components are required. Some recent studies have begun to investigate the preservation of VR simulations, games and artworks.²⁵⁰

Tom Ensom is researching the preservation of VR at Tate and says that, “while it’s hard to predict the future of VR at this early stage, it seems among the most vulnerable mediums right now due to the complexity of the technological ecosystem involved and the reliance on the whims of the fast-moving VR industry.”²⁵¹ A solution to this, he says, may be in “using open [source] technologies wherever possible and maintaining access to old production environments so new versions can be authored.” Similarly, Christopher King is quite sceptical about the use of VR as a documentation tool. He argues that:

VR preservation practice, file standards and emulation of hardware/software are still developing. It still feels like we are the equivalent of the pre-cinematic era of VR technology where there are lots of competing standards and it hasn’t yet been adopted as a ubiquitous media technology. The authoring environments are also still in development and changing although I am told there is now a SketchUp plug in which could be a useful way to jump from a 3D model to an experiential simulation. Given that we have many other tools at our disposal which have proven long term track record for access and file standards (3D models, vector artwork files, video, text documents, artist interviews, etc) and we have already been able to use these to manage variability or change over time in artworks I think it would be difficult to justify incorporating VR simulation unless it offered something different or vastly superior.²⁵²

Therefore, to be given serious consideration by conservators, the use of VR as a documentation tool would have to follow strict conservation standards, which include a plan for long-term storage and access of the VR documentation.

²⁵⁰ E.g. Zach Lischer-Katz, “Preserving Virtual Reality at OU Libraries,” *Digital Scholarship Lab*, last modified November 20, 2016, <https://oudigitalscholar.com/blog/preserving-virtual-reality-at-ou-libraries/>; Candice Krenmer, *Preserving the Emerging: Virtual Reality and 360-Degree Video, an Internship Report* (Hilversum: Netherlands Institute for Sound and Vision, 2017); and Angela P. Murillo et al., “Complexities of Digital Preservation in a Virtual Reality Environment, the Case of Virtual Bethel,” *International Journal of Digital Curation*, vol. 13, no. 1 (2018): 1-14, among others.

²⁵¹ Ensom, interview with author, July 18, 2019.

²⁵² King, interview with author, July 10, 2019.

7. Conclusion

In this paper, a novel documentation tool was explored to capture or recreate media art installations. This method, which employs VR technology, can be integrated into museum preservation practices within the framework of existing documentation standards. When documenting complex media artworks, preservationists must consider both the historical materiality of the work and its artistic intent. Media artworks present specific challenges for preservationists, including how to keep the original apparatuses functioning. The preservation of the historical devices and technologies, associated with the functionality of a media artwork, has consequences for how the work is experienced and interpreted. However, there sometimes exists a schism between the goals of the conservation team and those of the collecting institution: “The aim [...] to ensure the preservation of the original apparatuses for the maximum possible duration frequently contradicts the wish of museums to keep artistic audiovisual material on display and to upload the interactive functions foreseen by the artist, so that the visitors can experience the artworks without restrictions.”²⁵³ For a work that is lost, destroyed, or deteriorated beyond repair, documentation can become the only way to access the artwork. Moreover, media art installations have an added limitation, as Caianiello notes, “Media art installations are generally installed for a duration of an exhibition, after which they disappear from view. And, in order to have physical and intellectual access to the work, they must be fully installed.”²⁵⁴ VR documentation, therefore, allows for a level of documentation of media art installations that conveys the artistic intention of a work through a multi-sensory, immersive experience.

²⁵³ Renate Buschmann, “On the Debate about Media Art and Its Conservation: An Introduction” in *Media Art Installations: Preservation and Presentation*, eds., Buschmann and Tiziana Caianiello (Berlin: Reimer, 2013), 202.

²⁵⁴ Caianiello, “Materializing the Ephemeral,” in *Ibid.*, 207.

As outlined in section 4, the benefits of VR documentation have long been recognized for cultural-historical sites (such as the Paleolithic cave paintings of Lascaux and Altamira). In order to protect original sites from irreparable damage, three-dimensional VR environments of the sites were created for researchers and visitors several decades ago.²⁵⁵ Such examples from conservation practice of heritage sites prove that reproducing (with modern materials and technologies) the experience of an artwork are achievable. VR technology allows media art installations to be documented and visualized in such a way that users can have a much more vivid and immersive experience, and thereby more extensive interpretation of the work, than by studying the two-dimensional sources alone. Furthermore, in the case of complex, interactive media art installations, it is not only the equipment that lends presence to a work, but also the spatial arrangement, and the user's responses. 3D animations can be used to enable a more complete viewing of the work (e.g. rotation on screen, panoramic photos, taking objects apart), and the interactive elements can be simulated within the environment, offering the capabilities of "re-experiencing" the artwork.

The use of VR as a tool for media art documentation is a new concept and an emerging practice in the field of media art preservation, with no set or clear definitions or guidelines. Further research, by way of case studies, is required to investigate how VR can be used to translate a physical experience into a virtual environment (e.g. studies of haptics to reproduce a sense of touch). Additionally, the preservation of VR documentation requires a serious consideration. VR documentation must be continuously updated (migrated), along with the VR software and hardware, to remain accessible. In order to preserve this novel form of documentation, further research must be done to understand its characteristics, strengths and limitations. Presently, there

²⁵⁵ Buschmann, 204.

remain considerable practical difficulties, not least of cost and effort; the success of VR documentation will require collaboration with the VR industry and technical experts in the field. At minimum, to stand the best chance of implementing (and preserving) VR documentation, museums can, and should monitor the evolution of technologies, to identify problems and opportunities. Above all, it is important to acknowledge that VR documentation is not perfect or exhaustive — no documentation model can take into account all information that needs to be collected, produced, recorded, organized, preserved, and presented. VR documentation has not been tested rigorously. As media art installations continue to incorporate complex technologies, it can be difficult to predict the artists' intentions and users' experience of these future works, perhaps rendering obsolete any procedures, guidelines, or VR documentation models that are categorical and rigid. Lastly, VR documentation may not be the most appropriate strategy for every media art installation. The cost, the amount of work required, and the expertise needed, means that preservationists must make decisions about which works are best suited for this form of documentation, as they have to justify their choice of documentation format.

Overall, the case studies in this paper show that VR can create a realistic and useful representation of the work in three-dimensions. This 3D documentation provides multi-sensory information about the artwork and a level of sonic and visual immersion that traditional textual and audiovisual means do not provide. VR documentation can provide insight into the spatial relations of the installation, its movements, behaviour, and the interactive experience of the user, all important aspects of the artwork's identity. In addition, VR documentation can provide access to at-risk or non-extant media artworks to curators, artists, conservators, researchers and the general public, and has potential applications in memory institutions, such as the documentation and presentation of performance-based art, street art, kinetic art, and land art. (Word count: 22 545)

Appendix A: Case Study Participants

Participant	Institution	Role	Project	Case Study
Adam Lockhart	Dundee University	Project Leader, Digital Media Archivist	Virtual Hall	2
Christopher King	Tate	Time-Based Media Conservator	Virtual Hall	2
Tom Ensom	Tate	Digital Conservator	Virtual Hall	2
Jesús Muñoz Morcillo	Karlsruhe Institute of Technology	Project Leader, Researcher and Lecturer	e-Installation	1
Bernhard Serexhe	Independent, ZKM	Independent curator and Appointed expert for Electronic and Digital Art, Former Head of Collections, ZKM	e-Installation	1
Derry Razen	SAMA	Curatorial team, art historian		4
Anna Stolyarova	SAMA	Project Leader, Museum Director	Memories	4
Vitória Ramirez Zanquetta	SAMA	Curatorial team, architecture and applied museology	Memories	4
Bob de Jong	Eastbound VR	Co-founder/Creative Director/VR Expert	Memories	4
Henrik Vestergaard	Live Art Denmark	Project Leader, Director	VR Archive	3
Ellen Friis	Live Art Denmark	Director, Curator	VR Archive	3

Appendix B: Case Study Questionnaire

1. When was the documentation carried out?
2. By whom?
 - a. Do you have a dedicated employee to make the documentation?
 - b. How many people were involved?
 - c. What is their previous experience with VR?
3. What equipment was required (hardware and software)?
4. What was the cost of the equipment?
 - a. consider overall cost of making this documentation, and provide cost break-down, if known
5. How much time was required to make the documentation?
 - a. if possible, break down the time from pre- to post- production, including filming and editing
6. What was the level of expertise required?
 - a. Was this method simple enough to be carried out and maintained by museums, galleries, or archives?
 - b. Must it be outsourced altogether, or even for processing?
7. What was the main purpose or use of this type of documentation?
 - a. Who is the intended user?
8. Why choose this method of documentation over another?
 - a. What are the benefits of this form of documentation?
 - b. What does VR bring to the documentation of installation art?
9. What sort of logistical decisions were made during the documentation process?
 - a. What aspects of the artwork were captured?
 - b. What informed your decision making?
10. What were the shortcomings of this method of documentation?
11. How will this documentation be accessed now and in the future?
12. What is the cost of upkeep (preservation of VR)?
13. How will your institution ensure its long-term accessibility?

Appendix C: Additional Questions

The following questions were posed to the conservator and the chief of collections at ZKM concerning Nam June Paik's *Versailles Fountain*:

1. What would you consider the main purpose of the VR simulation of *Versailles Fountain*?
2. Is the VR simulation of *Versailles Fountain* considered documentation (why or why not?)
3. And, more broadly, what is your opinion of the use of VR as a *documentation* tool for media art installations?
4. Since the artist is no longer living, and the work is owned privately, how did that influence the decision-making process?

The following questions were posed to the conservators from Tate concerning the outcome and purpose of *Virtual Hall*:

1. What would you consider the main purpose of the VR simulation of *TV Interruptions*?
2. Since it is being called a "simulation" and not "documentation," how do these two terms differ for you/the Tate?
3. And, more broadly, what is your opinion of the use of VR as a *documentation* tool for media art installations?
4. Since the artist is no longer living, how did that influence the decision-making process?

Appendix D: Case Study Figures

Fig. D1. Nam June Paik, *Versailles Fountain*. 1992. Video sculpture. ZKM, Karlsruhe. From: Kunstportal Baden-Württemberg, <http://www.kunstportal-bw.de/zkmnjp3a.html> (accessed August 11, 2019.)

Fig. D2. Nam June Paik, *Versailles Fountain*. 1992. Video sculpture. Source: 7_70, Karlsruhe – ZKM. 2010, Digital Image. Available from: Flickr, <https://www.flickr.com/photos/770/4266777769> (accessed August 11, 2019.)

Fig. D3. Nam June Paik, *Versailles Fountain*. 1992. Video sculpture. Source: der LichtKlicker, Karlsruhe – ZKM. 2013, Digital Image. Available from: Flickr, <https://www.flickr.com/photos/dabduedel/9639996754> (accessed August 11, 2019.)

Fig. D4. David Hall, *A Situation Envisaged: The Rite (Cultural Eclipse)*. 1989. Video sculpture. Richard Saltoun Gallery, London. From: Richard Saltoun Gallery, <https://www.richard-saltoun.com/exhibitions/42/works/artworks-12888-david-hall-a-situation-envisaged-the-rite-ii-cultural-eclipse-1989/> (accessed August 11, 2019.)

Fig. D5. David Hall, *TV Interruptions (7 Pieces)*. 1971/2006. Video installation. Tate, London. From Tate, <https://www.tate.org.uk/whats-on/tate-britain/display/bp-spotlight-david-hall-tv-interruptions> (accessed August 11, 2019.)

Fig. D6. Bastardilla, *Memories*. 2019. Mural. Street Art Museum Amsterdam, Amsterdam. Available from: Wikimedia Commons, [https://commons.wikimedia.org/wiki/File:Memories_by_Bastardilla_\(2\).jpg](https://commons.wikimedia.org/wiki/File:Memories_by_Bastardilla_(2).jpg) (accessed August 11, 2019.)

Appendix E: Comparison of Technical Details

Table E1. *E-Installation* vs. *Virtual Hall*

	E-Installation 2013-2015	Virtual Hall 2017-2018
Institution	Karlsruhe Institute of Technology	DJCAD, University of Dundee
Location	Karlsruhe, Germany	Dundee, UK
Artwork	Nam June Paik, <i>Versailles Fountain</i> (1993)	David Hall, <i>A Situation Envisaged: The Rite II</i> (1988-90); <i>TV Interruptions: The Installation</i> (1971/2006)
Characteristics of artwork (s)	Video sculpture, neon lights, and CRT monitors	Video sculpture, CRT monitors; Video installation, CRT monitors
Method	Photogrammetry, 3D reconstruction, Structure from Motion algorithms, 3D modelling in Blender, VR visualization, body tracking using Kinect	Computer-generated models, 3D modelling in Maya, Unreal and Unity game engine
Main Purpose	Multi-sensory level documentation and VR visualization of the media art installation	VR simulation of works that no longer exist; simulate gallery space
Primary User	Museum visitors, curators	Museum visitors
Cost	10000 EUR	3500 BPD (3795 EUR)
Duration	12 months (Phase I: October 2013 – February 2014; Phase II: October 2014 – February 2015)	2 months (1 month per work in the installation)
People	11 (Phase I: 3 students, 3 university researchers; Phase II: 2 students, 3 university researchers)	4 (1 university lecturer and 3 students)
Expertise	3D modelling, 3D reconstruction, tracking systems, basic knowledge of game engines	3D modelling, basic knowledge of game engines
Equipment	DSLR, Virtual SFM, Blender, Proprietary game engine, Unreal game engine, VR HMD, Kinect sensors, proprietary full-body tracking systems (later: HTC Vive)	High-spec PC, graphics card, HTC Vive headset kit, TP cast wireless receiver, Unreal game engine (<i>A Situation Envisaged</i>), Maya, and Unity game engine (<i>TV Interruptions</i>)

Table E2. *VR Performance Archive vs. Memories*

	VR Performance Archive 2016-present	Memories 2019-present
Institution	Live Art, Denmark	SAMA
Location	Copenhagen, Denmark	Amsterdam, the Netherlands
Artwork	54 performances by various artists from Europe and North America	<i>Memories</i> (2019) by Bastardilla
Characteristics of artwork	Solo and group performances, ranging from 10 to 40 minutes in duration, recorded both indoors and outdoors	Monumental mural painting (20-meters tall), located on the exterior of a high-rise apartment complex in Amsterdam Nieuw-West
Method	360-degree video	360-degree video
Main Purpose	Documentation, dissemination and accessibility	Documentation, dissemination and accessibility
Primary User	Audiences (web, and/or galleries, festivals, art centres)	Audiences (web and/or online gallery)
Cost	Fixed cost: 20 000 EUR (grant)	Undisclosed fixed cost; 3000-6000 EUR for similar project
Duration	3 months of production and post-production (each collection)	3 months, thus far (ongoing project)
People	2 (both employees of Live Art, Denmark)	3 (2 VR experts, Eastbound VR and Anna Stolyarova, SAMA)
Expertise	Video recording, 360-degree video software, stitching, video editing, graphic design, colour grading, audio design	Video recording, 360-degree video software, stitching, video editing, graphic design, colour grading, audio design
Equipment	First collection: Samsung Gear 360, Gear 360 ActionDirector, YouTube, PS4 Pro with VR goggles; second collection: Insta360 Pro, Insta 360 Stitcher, Adobe Premiere Pro, HandBrake, Oculus GO Vr, Skybox VR Video Player	Insta360 Pro, Adobe Creative Suite, Mistika VR

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