7-5-2021

Cataloging Virtual Reality Artworks: Challenges and Future Prospects

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(Manuscript)

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Published in *Cataloging & Classification Quarterly*, 5 July 2021 online; v. 59, no. 5 (2021)

https://doi.org/10.1080/01639374.2021.1942367

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In 2019, Pepperdine Libraries acquired two virtual reality artworks by filmmaker and artist Paisley Smith: *Homestay* and *Unceded Territories*. To bring awareness to these pieces, Pepperdine Libraries added these works to the library catalog, creating bibliographic records for both films. There were many challenges and considerations in cataloging virtual reality art, including factors such as the nature of the work, the limits found in RDA and MARC, and providing access to these works. This paper discusses these topics, as well as provides recommendations for potential future standards for cataloging virtual works.

Keywords: virtual reality; virtual art: RDA; metadata; Oculus Rift; HTC Vive

Introduction

The integration of art and technology has always been an intriguing and exciting concept for artists, especially with the surge of innovations seen since the mid-twentieth century. By the twenty-first century, practically every artistic endeavor has some sort of connection to technology, from their technical processes to their distribution. From computer-generated images and films, to synthesized music and digital photography, the process of writing (using word processing software or internet-based documents), and even dance have all been transformed by the introduction of technology into the public consciousness. The intersection of visual art with a particular technology, virtual reality, has been a topic of particular interest to artists, academics, and curious minds.[1] Museums have been integrating these technologies into their institutions to bring new and exciting perspectives to their collections, with museums like the Louvre, the Smithsonian, and the Natural History Museum incorporating virtual reality exhibits that highlight collections and provide new educational experiences to their patrons.[2] While museums are embracing virtual reality's capabilities and the opportunities it creates, libraries have been slower to incorporate these technologies into their collections and services. Whether it be cost, lack of

staffing support, or mere lack of interest, there seems to be a hesitation about where and how virtual reality fits into the library.

This is not to say that libraries are technology-averse, or that virtual reality cannot be found within library spaces. Libraries often embrace new technologies and make them accessible to their patrons, from computer labs to online resources, instruction on how to use technologies, and even digital media labs. These labs, also known as makerspaces, have been on the rise in both public and academic libraries, though not without criticism.[3] Still, their popularity is palpable; the American Library Association (ALA) has even created a resource guide for managing makerspaces, with recommendations, webinars, and general tips for implementing these spaces.[4] It is in these makerspaces that we see libraries dabbling with virtual reality technologies.

Emerging technology comes to Pepperdine: The Genesis Lab

In 2016, Pepperdine Libraries, in collaboration with the Information Technology Department, proposed the creation of an interactive makerspace called the Genesis Lab to be housed in the newly renovated Payson Library. As described on the website, the "Genesis Lab is a digital makerspace for Pepperdine students, faculty, and staff...inviting creative minds to utilize the tools in this innovative space."[5] Since its opening in August of 2017, the Genesis Lab has expanded its services, including free 3D printing for all students, faculty and staff, virtual reality (VR) headsets, Google Cardboards and 360 cameras available for checkout, and even summer camps for children interested in science, technology, engineering and math (STEM). It is also the headquarters for Pepperdine's burgeoning eSports team. The Genesis Lab has become an integral component of Pepperdine's undergraduate Payson Library, as well as an exciting and collaborative space for the Pepperdine community.

The VR headsets found in the Genesis Lab—HTC Vive and Oculus Rift, as well as a newer Oculus model, the Quest—are a popular attraction. According to the Librarian for Emerging Technology and Digital Projects who oversees the Genesis Lab, these headsets were in daily use by students before the COVID-19 pandemic forced campus to close, citing the game *Beat Saber* as the most common recreational use of the headsets. Of the classes that visited the Genesis Lab for library instruction, 87.5% used the VR headsets for educational purposes, and art students frequently employed the application Tiltbrush—which allows users to paint VR artworks—for their assignments. The Genesis Lab offers a myriad of VR games and other experiences, with continuous plans to grow this collection in creative and innovative ways.

In 2019, the Genesis Lab, in collaboration with the Fine Arts Division of Seaver College (Pepperdine's undergraduate school), developed programs and events relating to digital art, with the goal of bringing artists who work with VR as a creative medium to Pepperdine for discussions and lectures (further events have been placed on hold due to campus closures in the wake of the COVID-19 pandemic.) Pepperdine art professor Kate Parsons spoke at Payson Library with members of the art collective FLOAT LAND about their project *Screensavers*, a VR interactive experience based on the screensavers created by After Dark.

On October 2, 2019, artist and filmmaker Paisley Smith came to Payson Library to discuss two VR works she created: *Homestay* and *Unceded Territories*. These two VR pieces are now stored on computers in the Genesis Lab that run VR software and have connected headsets. Because Pepperdine Libraries purchased copies of these works from Smith, it was decided to add them to our catalog. There were many reasons for deciding to catalog Smith's works, which also serve as the structure for this paper. First, the unique nature of these VR works brought to light the complicated and oft-discussed considerations and issues with cataloging and classifying

virtual reality works. Second, though these works are digital, they are only accessible within the Genesis Lab, so awareness of their existence (by way of bibliographic records) was essential for their use. As VR is still considered an emerging technology—particularly in academic and public libraries—this also provided the opportunity for a deeper synthesis of current cataloging practices and what constitutes a "work" in the functional bibliographic requirements (FRBR) model. Lastly, cataloging these materials would be a challenge, as there is no model or set of standards for cataloging virtual reality works. The goal of this paper is to provide future catalogers with an example of pitfalls and successful practices with current RDA cataloging practices.

VR in Context

XR, MR, VR, AR: A note on terminology

Virtual reality technologies are used in different forms, including augmented reality (AR) and extended reality (XR). Over the years, the hierarchy for these terms has shifted, as mixed reality (MR) was once considered the umbrella term for AR and VR,[6] but more recent writings use XR as the blanket term.[7] According to the Consumer Technology Association (CTA), "X Reality," or XR is the official umbrella term, with the X serving "as the placeholder for augmented (A), mixed (M) and/or virtual (V)."[8]

Regardless of ranking or order, these technologies differ slightly and should be defined. VR is seen as a completely immersive experience, in which a user can interact with the virtual environment through at least one of the senses. AR is considered any technology in which the real world and virtual world overlap, such as a Snapchat filter or games like *Pokémon Go*.[9] MR acts as a middle ground between AR and VR, where digital and physical objects exist in the same space.[10] Though Pepperdine Libraries' Genesis Lab has collections in all of these forms of

XR, Paisley Smith's artworks most accurately fall into the category of VR, which will be explored more later in this paper.

Virtual reality's beginnings

Virtual reality's history begins in the early twentieth century. Aviation was in its precarious and expensive infancy, creating a need for flight simulation technology, with design patents appearing as early as 1910.[11] As Hillis summarized, by 1930, the Link Trainer replicated the physical mechanics of operating a plane's cockpit. World War II saw further development of both flight simulation and computational technology; in 1944, the Servomechanisms Lab at the Massachusetts Institute of Technology (MIT) developed a device that "when pointed at a television-like screen" provided tiny dots that "bore similarities to reaching out to touch or contact an object," creating a simulated environment.[12] The early commercialization of virtual reality began in 1962 when Morton Heilig developed what would be known as the Sensorama Simulator, an arcade game featuring a 3D display and motion, stereo sound and olfactory components, which allowed the user to experience scenes like riding a motorcycle or walking past an aromatic store. In 1966, Sutherland further developed the VR headset, with his 1968 paper "A head-mounted three dimensional [*sic*] display," which laid out the parameters for creating such a device. By 1969, Sutherland built the first head-mounted display at the University of Utah.[13] The 1990s saw continuous growth of the VR industry, as the World Wide Web grew in popularity and personal computer technology improved. Many VR headsets were developed but were often heavy and burdensome with low-quality screen displays.[14] Science fiction and the tech industry often have a symbiotic relationship, and VR is no exception. The 2011 novel *Ready Player One* by Ernest Cline is said to have inspired the company Oculus to build their headset.[15] In 2012, a Kickstarter crowdfunding campaign to fund the Oculus Rift, an

innovative VR headset, received over $2 million in donations.[16] In 2014, it was announced that Facebook acquired Oculus, and the product and company are now under the control of Facebook.[17]

But is it art?

VR is a fascinating subject that has been explored in depth by many academics, critics and journalists, with topics ranging from technological aspects to metaphysical quandaries about the nature of reality.[18] Virtual reality is often associated with the video game world, as many of its roots stem from the gaming industry. The question of whether video games (and games in general) are art is a topic of much debate. One notable critic was the late film writer Roger Ebert, who once controversially claimed that video games could never be considered art. Discussed at length in a blog post from 2010, Ebert argues that games differ from art because "you can win a game. It has rules, points, objectives, and an outcome…" furthering that an immersive game can only be considered art when it "ceases to be a game and becomes a representation of a story, a novel, a play, dance, a film. Those are things you cannot win; you can only experience them."[19] He later reeled back his opinion, admitting to not actually playing video games, though staunchly continued to define art as works that allow one to "learn more about the experiences, thoughts and feelings of other people."[20] Ebert's statements feel ill-informed, as many in the gaming community would argue that a well-made video game can elicit "experiences, thoughts and feelings" different from one's own. One might argue that since art is a subjective form, the observer's ability to critically engage with a work is what makes it meaningful. It would certainly be hard to argue that Paisley Smith's virtual reality works, *Homestay* and *Unceded Territories*—both of which have strong emotional impacts while containing interactive and game-like qualities—are meaningless, especially after fully immersing oneself in these works.

Another question remains on the exact nature of virtual reality experiences. What, exactly, can and should they be classified as? Film? Video game? Where, and how, do these materials fit within the library as a physical space and as concept?

Homestay *and* Unceded Territories

According to the "About" section of her website, Los Angeles-based Canadian artist and filmmaker Paisley Smith has an interest in virtual reality because it allows her to "reimagine our everyday, and to help individuals find solutions for their artistic practices and businesses, including how to connect meaningfully with audiences online."[21] She has worked in photography and video and began exploring virtual reality filmmaking as a way to expand barriers to creativity.

Her first VR film, *Homestay* explores a traumatic loss she and her family experienced. Throughout her life, Smith's family were homestay hosts for international students studying abroad in Canada. One year, a young man from Japan named Taro died by suicide while living with the Smiths. *Homestay* explores themes of loss, grief and mental health. The work is narrated by Smith, whose voice appears throughout. The film experiencer walks through a garden, inspired by the Nitobe Memorial Garden at the University of British Columbia, which alters with time and interaction with the work. Trees, bridges and lakes emerge and disappear as the narrative continues. These changes occur when users touch red leaves that fall from a tree in the landscape.

Unceded Territories, a collaboration with First Nations artist Lawrence Paul Yuxweluptun, is far different in tone and style. In this VR experience—whose landscape is based largely on a Yuxweluptun exhibit of the same name—the viewer takes on the avatar of a "super predator" (i.e., the colonizer of indigenous lands). This experience is ultimately a comment on

the conquering mentality of White Europeans. Using a handheld VR wand, the viewer throws paint onto the landscape to add color. However, these throws are randomly replaced with fireballs that destroy the world. In a podcast interview about the piece, Smith and Yuxweleptun expanded on the concept, explaining that as the super predator, the experiencer is given the world to do what they want with, intentionally making the experience of throwing the paint enjoyable, with fun music and bright colors. It is not until it is too late to change anything that one realizes the world has been destroyed.[22]

These two pieces are stored on computers in Pepperdine Libraries' Genesis Lab. *Homestay* was built for the HTC Vive headset, while *Unceded Territories* was built for the Oculus Rift. Any member of the Pepperdine community (students, faculty, staff) is free to experience these works any time during the Genesis Lab's open hours. Therefore, it was decided that Pepperdine Libraries would add these works to our online catalog to improve awareness as well as provide a record of these materials. The next section will elaborate more on this process.

Cataloging

Need for cataloging

While there are many VR games and experiences available for use in our Genesis Lab, the majority of them are available for download or purchase from online stores (e.g., Steam). It was decided that only a few items located within the Genesis Lab would be added to the catalog, specifically those which were deemed educational in their purpose or potential use, items that can be checked out, and items unique to the Genesis Lab.

As of the writing of this paper, the Genesis Lab has 25 Google Cardboard headsets, five Ricoh Theta 360° cameras, three Insta360 cameras, and one selfie stick available for checkout. These physical items were cataloged and added by the cataloging librarian, with input from the

Librarian for Emerging Technology and Digital Projects. Because of the unique nature of *Unceded Territories* and *Homestay*—being that these items are not available for purchase by the general public and are only accessible within the physical space of the Genesis Lab—it was decided that these two VR works should have bibliographic records in our catalog.

Past precedents

There is some precedent for cataloging three-dimensional objects. Beginning in 2019, the Nevada State Library developed the first VR cataloging project, in which members cataloged works from the company Lifeliqe, which provides educational augmented reality tools. These works have been added to WorldCat and were helpful for beginning the cataloging process.[23] Groenendyk also wrote extensively on cataloging 3D educational models.[24] While the records cataloged by the Nevada State Library cataloging project are excellent records, it was not quite appropriate to use the exact cataloging practices for Paisley Smith's works. First, the majority of the Nevada State Library VR records were for educational models. Lifeliqe is a company focused on making STEM educational K-12 products, and their augmented reality pieces include biological models of animals, human organs, and insects. The works of *Homestay* and *Unceded Territories* are only educational in the ways in which art can teach and inform, not created solely for that purpose. The Lifeliqe records are encoded using "z" in the MARC 008 field, or "other." According to the OCLC Bibliographic Formats and Standards, "z" is used for "computer-produced graphics, duplication masters, transparency masters, spirit masters, and garment patterns," further instructing to "Use code *r* for most other three-dimensional miscellany."[25] Code "r" is used for realia, or "objects and any other three-dimensional item…that does not fit into any of the other categories."[26] Neither of these codes are suitable for Smith's work, which are more film-like in their experiences; both *Homestay* and *Unceded Territories* were entered

into film festivals (Vancouver International Film Festival and Tribeca Film Festival, respectively). In the "About" section of her website, Smith describes herself as a "filmmaker & virtual reality creator." To catalog these works as "other" or "realia" would go against what the creator intended these works to be interpreted as. While the Nevada State Library records were a tremendous help in building bibliographic records for Smith's works, there were noticeable differences in cataloging approaches as well as different concerns.

Cataloging with RDA

As of this writing, the Resource Description and Access (RDA) Toolkit has no mention of the terms "virtual reality," "augmented reality," or "extended reality" in its guidance, documents policies, or resources. There are no official standards for cataloging or describing such works and no controlled vocabulary, glossary, or suggested terms. In the newly updated RDA guidelines, there is now a schema for "interactivity mode," which is defined as "content of an expression responds to actions performed by the user," which may be helpful in future VR cataloging practices.[27] Luckily, RDA is a flexible and fairly lenient standard for descriptive cataloging, with emphasis put on clarity and specificity. Pepperdine Libraries catalogs using RDA standards and MARC21 format with the OCLC products Connexion and Record Manager in WorldShare Management Services (WMS). The following section will discuss some fields in MARC used to catalog Smith's works and explore the reasoning behind the cataloger's decisions. To view these two records, please refer to OCLC numbers 1126572286 (*Homestay*) and 1126336672 (*Unceded Territories*). These two records are also appended to this paper.

Control fields

The Leader, 008 and 007 fields were used to encode the record for faceted catalog searches. For the "type" of record, Leader/06, the author used "g," or "projected medium." The

form of item field (008/29) was encoded as “o” (Online), and the type of visual material (008/33) was encoded as “v” for Videorecording. The technique (008/34) was entered as “a” for Animation. For the 007 fields, the appropriate codes for electronic resource and film were entered.

The author debated whether using “m” for Motion picture or “v” for Videorecording would be more appropriate for the 008/33 field. Judging from other records encoded with “v,” it appears that this is used primarily for eVideos and DVDs. With the former, an online component is implied, usually with an 856 field with a stable URL for reference. While the films are electronic in nature, they are not available online, which initially caused the author to erroneously treat these works as traditional film using “m.” Upon further inspection of standards, “m” is used for physical film reels, and the record was updated to fix this error.

Title

In the 245 or title field, the author cataloged the titles as shown in the credits of the films and added a clarifying statement in brackets. For both *Unceded Territories* and *Homestay,* the author used the term “[virtual reality film]” after the ending of the title, before $c. While RDA suggests against using brackets in the title, the author decided to add this clarifier to the titles for reasons of access. When a patron searches Pepperdine Libraries’ WorldCat Discovery catalog, one of the first elements of a bibliographic record that is seen is the title; having the clarifying brackets (“[virtual reality film]”) helps to ensure there is less confusion about the nature of these records beyond the encoded data not seen in patron-facing records.

Physical description (Extent) field

The 300 field was also an important component of this record. For $a, the author put “1 interactive virtual reality film (approximately *x* minutes),” with their respective times entered in

for *x*. The author used "approximately" because the lengths of these virtual reality films are malleable depending on how a user interacts with them. For $b, the author used the standard "sound, color" to indicate the film's physical details. For recording duration of expressions of works, RDA advises that if an estimated time can be entered to "[r]ecord the approximate duration preceded by the term *approximately*."[28] While this standard can be used for virtual reality films, RDA standards fail to address rules for works that have a dynamic, indeterminate, or infinite duration and should be improved upon in future revisions.

Content, media and carrier types (33X) fields

For the content type (336) fields, the author used "$a three-dimensional form $b tdf $2 rdacontent" and "$a three-dimensional moving image $b tdm $2 rdacontent." According to RDA value vocabularies of the RDA Registry, a "three-dimensional form" is defined as "A content type that consists of content expressed through a form or forms intended to be perceived visually in three-dimensions."[29] The value "three-dimensional moving image" is defined similarly, consisting of "content expressed through images intended to be perceived to be moving, and in three dimensions."[30] These two values accurately describe Smith's VR works; the author believes there was not enough distinction between "form" and "moving image" to use a single entry for the content type field, as virtual reality works might be defined differently depending on the creator or artistic intent.

For the media type (337) field, the author chose "$a computer $b c $2 rdamedia." Though Smith's works require connectivity to computers to be viewed, they also require VR headsets. There is no media type vocabulary relating to the latter. The media type "projected" ("$a projected $b g $2 rdamedia") could potentially be used to describe a VR headset, though the

definition would need to be updated to reflect a VR headset as a type of projector of moving images.

For the carrier type (338) field, the author used two entries for each record: "$a other $b vz $2 rdacarrier" and "$a online resource $b cr $2 rdacarrier." The options for these three fields are adequate enough for describing virtual reality, though if the technology's popularity continues, new media types should be added to the RDA Registry value vocabularies.

System details note (538) field

For the 538 field, the author put the preferred system requirements specified by Paisley Smith when the two VR films were acquired. For the materials specified subfield ($3), the author put the respective VR software file with which the films were built, "$3 Oculus Rift .EXE file" for *Unceded Territories* and "$3 HTC Vive .EXE file" for *Homestay*. The $3 field is used to specify the type of file. Since these two films used different file formats, the author felt it important to distinguish the difference in file format as a means of access. For the system details note ($a), the author put the system requirements specified by Smith for the optimal experience, including the operating system and other computer information. The fields appear as the following. *Unceded Territories*: "$a System requirements: Windows 10, recommended 16GB RAM, with Intel Core i7-8700 or similar processor, video card Nvidia GTX 1080 or better; Oculus Rift platform, headset, room scale, hand controllers." *Homestay*: "$a System requirements: Windows 10, recommended 16GB RAM, with Intel Core i7-8700 or similar processor, video card Nvidia GTX 1080 or better; HTC Vive platform, headset, room scale, hand controllers."

Subject and genre/form field

As with any other film, the author cataloged appropriate subject headings relating to the thematic elements of *Homestay* and *Unceded Territories* in the 6XX fields. The term "Virtual reality" is an official subject heading in the Library of Congress Subject Headings (LCSH), but while these films *are* virtual reality, they are not *about* virtual reality. The author found no terms relating to AR, VR, or XR in the Library of Congress Genre/Form Terms (LCGFT). The term "3-D films" does appear in LCGFT though it does not specify if the term is inclusive to virtual reality. Traditionally, 3-D film does not involve virtual reality technologies, but rather glasses that create the illusion of three dimensions. The use of this genre term could be considered appropriate in the case of Smith's films but doing so would fail to address the larger question of virtual reality as a genre or form. Though Smith defines her works as film, using the genre term "3-D films" for VR works would in most cases be inappropriate or confusing, particularly since most virtual reality creators do not categorize their works as film. Thus, the term "3-D films" does not provide a solution for virtual reality subject headings. The author contemplated adding a LCSH for "Virtual reality," but ultimately decided against it and instead used the Getty Institute's Art & Architecture Thesaurus (AAT) term "virtual reality" in a 650 _7 field, with a $2 to indicate the source ($2 aat). Still, it would be beneficial to have these terms added to the genre/form listings in the Library of Congress for future virtual reality bibliographic records.

Conclusion

Recommendations

Cataloging these VR films brought to light some major gaps in the current standards. There are currently no official standards for cataloging and describing virtual reality works. While VR is still a relatively new phenomenon in terms of its accessibility both within the

commercial market and within public and academic libraries, its popularity will continue to grow. While certain components of RDA could work for describing virtual reality works, many parts of the guidelines are too vague to instill a sense of clarity in creating bibliographic records. As more libraries and other cultural institutions begin to collect virtual reality works, a need for standardization will be imminent. Some of the MARC fields highlighted in the earlier section will need to be addressed. Currently, the control fields allow for catalogers to encode VR works as "other," "realia," "projected medium" and possibly "video recording" as appropriate, but virtual-reality specific terms (AR, XR, etc.) should be added to these fields. Clearer standards or examples for describing the physical extent of these types of works would be beneficial for future cataloging. RDA should address the content, media and carrier types, particularly the former two, to ensure VR works are accurately described and categorized. Conceptual models like the International Federation of Library Associations and Institutions (IFLA) Library Reference Model (LRM) will need to address how to think about these works. There should be a larger discussion had for including XR terminology into genre and form glossaries, such as the LCGFT.

Concluding thoughts

Pepperdine Libraries was brought into a unique position of acquiring two virtual reality films that are special to our collection. This paper explored the nature of the artworks as well as the history of virtual reality. It also briefly explored some conceptual ideas about what virtual reality is, as well as precedents set forth by previous catalogers of virtual reality.

Cataloging these two virtual reality films proved to be challenging. It was necessary to explore the concept of virtual reality within the context of the FRBR model and try to use the standards and guidance of RDA as well as the previously cataloged virtual reality in WorldCat to

transform these works into coherent bibliographic records. It was enjoyable to have the chance to experience the films and hear Paisley Smith talk about the pieces. As a cataloger, the author enjoys assignments that are unusual or atypical, and these VR films were certainly a recent highlight.

More broadly, a larger conversation around virtual reality and its role in libraries must continue. Researching both the history of virtual reality and its role within libraries demonstrated layers of nuance on the topic that can only be benefited from more discussion. More standardization for cataloging virtual reality works will bring more virtual reality bibliographic records into WorldCat and beyond. Though the lack of standards can be a major deterrent for many catalogers, increased attempts at creating records for XR, AR and VR works will help bolster this conversation and explore other components that may not have been considered. As more bibliographic records are created for VR, the better sense the cataloging community will have as to what guidelines and standards need to be put in place.

Acknowledgments

The author would like to thank Anna Speth for providing statistical and anecdotal information about the usage of the VR headsets within the Genesis Lab, Colleen Mullally for proof-reading the article and making editorial suggestions, and Elizabeth Parang for proof-reading, editorial suggestions, and research help. Additional editorial suggestions provided by Arielle Ered.

Declarations of interest: None.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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