

Rene G. Cepeda *

Rescuing new media art from technological obsolescence

*

Rene G. Cepeda is a new media art researcher and curator currently working on his PhD on the curation and display of interactive new media art. Rene has also lectured at the Universidad de las Americas Puebla where he taught exhibition design and introduction to art history. He has written for non-academic publications on Self-Othering in the art world and the new media artist Poppy and published on peer reviewed journals on the importance of video games to art history. His research interests include new media art, performance, interaction, pop culture, video games and exhibition design. <renegecepeda@me.com>
ORCID: 0000-0001-6306-7550

Abstract As time passes and digital technologies become obsolete, more and more new media artworks face the possibility of being lost forever. As many new media artworks depend on certain technologies, when these technologies are replaced with other or are not available any more, steps should be taken to make older artworks compatible with newer technologies that replace them. Using Jon Ippolito's concepts of storage, emulation, migration and reinterpretation, this text attempts to provide a basic framework to understand each different concept and the advantages and disadvantages to their implementation. This is all done using Gilbertto Prado's restoration of *Desertesejo* (2000/2014/2018) to illustrate the process.

Keywords New Media Art, Storage, Emulation, Migration, Reinterpretation.

Resgatando as obras de arte em novas mídias da obsolescência tecnológica

Resumo À medida em que o tempo passa e as tecnologias digitais se tornam obsoletas, mais e mais obras de arte em novas mídias enfrentam a possibilidade de se perderem para sempre. Como muitas obras de arte de novas mídias dependem de determinadas tecnologias, quando essas tecnologias são substituídas por outras ou não estão mais disponíveis, devem ser tomadas medidas para tornar as obras de arte antigas compatíveis com as tecnologias mais recentes que as substituem. Usando os conceitos de armazenamento, emulação, migração e reinterpretação de Jon Ippolito, este texto tenta fornecer uma estrutura básica para entender cada conceito diferente e as vantagens e desvantagens de sua implementação. O que é feito com a restauração da obra *Desertesejo*, de Gilbertto Prado (2000/2014/2018), para ilustrar o processo.

Palavras chave Novas mídias, Armazenamento, Emulação, Migração, Reinterpretação.

Technological advances in the last centuries of human existence have accelerated to an incredible degree. While for most of humanity's existence, humans could spend their whole life without witnessing a technological advancement that would dramatically change their day-to-day life, their profession, culture or values. Since the industrial revolution, the rate of change has sped up exponentially. By the early 2000s we have witnessed new technologies change every aspect of our life in spans of 5 years or less.

In the artworld, the change has been slower, with the biggest technological change before new media appeared being the development of brighter pigments and color theory in the 19th century which directly led to Impressionism and the development of modernism and the avant-garde. Before this development, painting as a discipline had not changed much since the Renaissance. The next paradigm change in art practice came with the invention of photography; while its inception occurs at almost the same time as the invention of the metallic paint tube and the aforementioned improved pigments, it is not until Alfred Stieglitz that photography enters into the artworld. This is the first new media introduced to the artworld in centuries; it is also the first media to be uncharacteristically delicate (in comparison with canvas and simple paper). The nature of film substrates makes them susceptible to deterioration, chemicals will continue to oxidize (one of the first issues Daguerre faced was the act of fixing the photographic plate and stopping the ongoing chemical reactions), acetate film is highly volatile, and light deteriorates all manners of photographic materials; new media only got more delicate as time went by.

Today, the conservation risks to art come not only from environmental factors such as demagnetized floppy disks or destroyed computers, but also from technological advancement itself. While an old daguerreotype remains usable to this day, old computer files from as recently as 10 years ago may not be. As new media art depends on what is unquestionably a capitalist industry to generate itself, it is subject to the whims of market forces and marketing decisions such as forced obsolescence. In practical terms what this means, is that as the platforms upon which a specific artwork was created in, age and are replaced by others, the artwork itself may disappear. One of the best documented examples of such a situation is *Desertesejo* (2000/2014/2018) by Brazilian artist Gilberto Prado. *Desertesejo* has existed in two different versions, the original VRLM and a second one made in the game engine Unity 3D for which there are two variations a VR variation and a screen-based variation. The reason for not classing the VR and screen-based experiences as variations derives from Jon Ippolito's efforts at creating a taxonomy of new media art and will be explored further into this text.

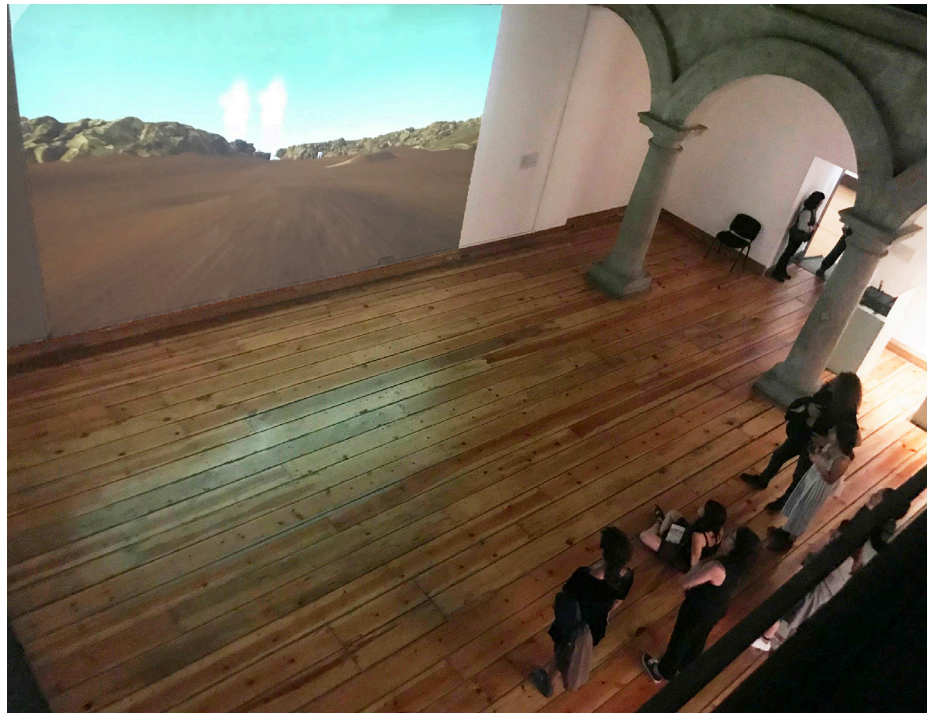


Fig 1. **Desertesejo (2000/2014)**, Gilberto Prado. Circuito Alameda, Laboratorio Arte Alameda, Mexico, 2018.

Regardless of the method to access the experience, *Desertesejo* presents the participant with a virtual world where they are free to explore. Upon picking a rock and placing it on a heap (which works as a real time virtual-physical marker of their presence to other participants) the participant takes the shape of a shamanistic animal (tiger, eagle or snake) and can proceed to explore the environment. As they move in the space they enter three rooms, the first of which is entirely empty, a second one where the participant can see the avatars of other individuals also present within the virtual space and finally enters the third space where they are capable of communicating with the others. As can be seen, this experience is a virtual 3d environment meant to be navigated at one's own pace, with no individual experience being the same. This is due to the real-time interactive and networked nature of the work. Should the technological scaffolding behind *Desertesejo* cease to function, the entire work is destroyed, video and still images are incapable of capturing and transmitting the true depth of the experience.

As originally created back in the year 2000, *Desertesejo* was a VRML (Virtual Reality Modeling Language) environment. VRML was a 3D modeling language used to create interactive 3D worlds that ran within a webpage, unfortunately by 2001 the format was abandoned and no longer available to use (Wood, 2019). This forced Prado to port his artwork to a newer technology in order to be able to show it in the 2014 exhibition *Singularidades/Anotações* (Prado & Cuzziol, 2019). While Prado refers to this effort as a restoration, it may be more accurately labeled as a reinterpretation.

According to curator and artist Jon Ippolito, there are four different ways one may go about preserving a new media artwork: storage, emulation, migration and reinterpretation (Wolf, 2013). Storage implies the literal storage of the work in the original media and with its associated artefacts at the time of their creation. Emulation means creating modern software and hardware capable of interpreting the old software and preserves the original code and functionality of the work. Migration, on the other hand creates new code that preserves the original functionality and is able to function in contemporary machines. Each migration runs the risk of losing parts of the original functionality of the work and must be done every time technologies change. Reinterpretation on the other hand attempts to preserve the original artistic intention (the poetry of the work as Prado puts it) in a completely new platform (Wolf, 2013). To put Desertesejo's rescue in perspective, restoration would fall within the purview of storage, as restoration seeks to return the object to its original form and as is evident in Prado's own notes, what took place was a reinterpretation. The software utilized was a completely new technology and no fraction of the original code was used, what was done was to preserve the experience (Prado & Cuzziol, 2019).

Of the four possible methods for rescuing new media art, storage is the least ideal as it does nothing to preserve the actual intent of the work, often in order to preserve artefacts, all contact with the artefact is stopped, this results in the artwork being rendered inert, while this practice is common in museums, it is not ideal. This deactivation is not as problematic in artefact-based art such as Maciunas' Fluxkit (1964) as it is easy for the spectator to imagine the use of each object, with digital new media, interaction is not often as straightforward and may be hard to imagine what is required from the participant and the devices involved. One such example is the video game *Bush Bash* (2014) presented in the V&A Design/Play/Disrupt (2018-2019). This video game has been turned into a video in the name of preserving the structural integrity of the artefact. This approach ignores the possibility of creating an alternate control interface while presenting the original as a traditional artefact. The cooperative interaction in *bush bash* involves driving the car while the copilot fires at enemies, as it stands, the communal aspect is lost and watching the video offered by the institution is inadequate in transmitting the original intentions of its creators. In effect the work is lessened by the removal of the interaction, changing the collaborative efforts of two individuals attempting to succeed and develop an interpersonal connection into a passive experience more akin to a car chase in any film only with lesser production values.

Porting, migration and recreation do not have this problem. Unfortunately, they present their own challenges to institutions interested in preserving new media art for the future. Porting is often the best way to preserve original code and retain all working aspects of the work. This process can be complicated and very expensive when the software and



Fig 2. **Bush Bash 2014 SK Games.** The car that functions as a control interface is encased in plexiglass.

control interfaces are custom solutions instead of commercially available ones. For example, video game emulators web browsers and popular operating systems such as Windows and Apple operating systems all can be emulated easily as there are several solutions available. However, not all interactive new media art is made using these options, more obscure systems like those used in the 60s and 70s tend to require custom solutions that lack support and thus, requiring a large investment both in time and financial terms in order to create an emulator. Copyright laws can also create problems for institutions attempting to emulate privately owned technologies, further adding to costs.

Migration generally applies to new media that continues to exist but has been upgraded or updated, or a similar compatible option exists. The risk with this approach comes from possible loss of features between versions and the need to continue migration every time technology gets left behind. One of the most common examples of this migration process can be an interactive video that used DVD technology to become interactive by allowing the use of menus to choose between scenes. This system can be easily migrated to Blu-ray without loss of compatibility, however Blu-ray is already being replaced with streaming video and online video, in this case the migration now requires the creation of a digital file which can then be accessed through a computer, not a physical device, which in turn replaces the remote with the mouse and keyboard, and so the work has now changed. Further down the line, even the software for playing this DVD image file will need to be emulated or the entire work will have to be recreated. Migration is still concerned with the preservation of the “original object” over the original experience, it accepts tradeoffs in usability and the poetics in order to preserve as much of the artwork in its original form.

Recreation concerns itself with the experience over everything else, it seeks to preserve what is often called the “aura” of the work over the specific form it originally presented. This method is ideal for the most ethereal of artworks, particularly those that lack real world interfaces. This requires an almost completely new project to be undertaken. While assets such as graphics, videos and meshes may be salvaged (and not always) code

and networking technologies will have to be redone. This process, as seen in Desertesejo may take a year or more time of painstaking recreation. It is also important to stress the importance of proper documentation of the work, the more involved the documentation of the original artwork was, the easier it becomes to recreate both in terms of effort, costs and accuracy. Therefore, the decision to recreate a work must be a careful one as it is a demanding process that may even come in conflict with the interests of traditional conservation.

Having covered the various means through which an artwork can be preserved, it is necessary to make a choice. Such a choice depends on a variety of factors, but the most important is the artist's desires in regard as to the continuation of their work. A few artists are not interested in the preservation of their work and may indeed expect the work to self-destruct or degrade as time passes, in other situations the artist may expect the complete preservation of their work while others like Gilberto Prado are more interested in the preservation of the message their artwork communicates rather than the artefacts he uses. Following this it is necessary to gauge the resources available. In the case of Desertesejo the artist undertook the entire enterprise of his own volition, however, when we deal with artists that are no longer reachable, this is impossible and institutions have to prepare for such situation. Most institutions won't probably have an in-house team prepared to undertake the preservation efforts. For this reason, it is important to have a contact list with every individual and company involved in the creation each artwork as this will simplify the process of tracking down individuals capable of performing the tasks required. In a worst-case scenario these individuals may be able to point the institution towards others who may be able to assist in the project. Other options involve contacting other larger institutions who may be able to assist in the recreation process. In some cases, even corporations or individuals may be able to provide expertise or even carry out the restoration as charity or for a reduced fee. Of course not all institutions may be able to afford a full restoration effort, in this case, storage is the best option as long as it is implemented as a temporary solution while funding and other resources are procured.

To best implement storage, thorough documentation of the artwork is needed. Source code assets such as textures, videos, 3D meshes, audio files and any other components of the artwork should be stored within the institution and independent of the artwork itself so they may be reused in any future restorations/migrations/reinterpretations. Alongside this, videos of the artwork functioning should be made, these videos should also explain what's is being done, what is the expected response, and attempt to present the work in its entirety with all variations of choice presented. Annotated images detailing the installation and setup of the work are also necessary as are interviews with artists and technicians involved. A good way to do this is to request a free account from the Variable Media Ques-

tionnaire website. This site, under Jon Ippolito's care is dedicated to the conservation of new media art and will keep track of all parts of an artwork as well as assist with the preservation of it by creating a record of the artist's wishes and the way each aspect of it is to be preserved. Finally, all artwork specific hardware should be stored in a dry climate-controlled space and checked periodically for deterioration. This strategy will guarantee the least amount of damage is done to the entire artwork while it awaits further conservation.

Once conservation can take place, care should be taken to ensure the essence of a work is preserved, there is no point in recreating or migrating an artwork if it does not respect the artwork's true function. It is worth remembering that in new media art, the artistic gesture occurs in the ephemeral space between software and the individual and it is assisted by physical artefacts, not the other way. Even if the artefacts themselves are considered important there are ways to work around this limitation, as software can be duplicated, it is possible to create a second version of the work that is usable by the public while presenting the original devices as traditional artworks. This achieves both the goals of preservation and interactivity.

When moving on to the actual process it is worth remembering that there may not be a specific professional available for the preservation of a work. In the case of emulators, many of them are made by an avid community and not a company. In fact, it is often enthusiasts who may not have the specific qualifications expected the ones that hold the specific knowledge necessary to preserve a particularly obscure technology. For this reason, it is important to look into online communities such as hackers and makers for solutions. In order to make future conservation efforts simpler, proper documentation of the process is required. Again, the Variable Media Questionnaire comes in handy as it is designed to handle these modifications and variations to an artwork. In any case an institution would do well to demand that any source code is well documented and have a third party evaluate such documentation. Any hardware should have diagrams documenting any circuitry and parts used.

As has been shown, new media art can be preserved for the future in a variety of ways, with some (recreation, emulation) being better at preserving interaction and the essence of an artwork over others (storage, migration) but that for certain situations, such as limited budgets, these options can be used as a stopgap while resources are accumulated. It was also shown that one of the most important aspects to preserving artworks is proper documentation and how such documentation can be used in said preservation. Finally, it is important to mention that each new media artwork has to be approached with its individuality and particular context in mind and to tailor any preservation effort in accordance.

Bibliography

- Bradbury, V., Ghidini, M., Hunter, R., O'Hara, S. and Smith, D. (2013) **'CRUMB doctoral research: reflections on creating and exhibiting digital art.'**
- Brown, K. (2014) **Interactive Contemporary Art: Participation in Practice.** I.B.Tauris.
- Cambridge English Dictionary, **VERSIONING** (no date) Cambridge English Dictionary. Available at: <https://dictionary.cambridge.org/us/dictionary/english/versioning> (Accessed: 17 April 2019).
- Cerf, V. (no date) **The Challenges of Preserving Digital Art**, Google Arts & Culture. Available at: <https://artsandculture.google.com/theme/NgKiVzI4SsOmJQ> (Accessed: 7 February 2019).
- 'Collaborative Modes of Curating Software'** (2015) IEEE MultiMedia, MultiMedia, IEEE, (1), p. 88. doi: 10.1109/MMUL.2015.3.
- Cook, S. (2004) **The search for a third way of curating new media art : balancing content and context in and out of the institution.** Ph.D. University of Sunderland. Available at: <http://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.400949> (Accessed: 16 November 2017).
- Dekker, A. (2018) **Collecting and Conserving Net Art: Moving Beyond Conventional Methods.** Milton, UNITED KINGDOM: Routledge. Available at: <http://ebookcentral.proquest.com/lib/sunderland/detail.action?docID=5389262> (Accessed: 25 February 2019).
- Dernie, D. (2006) **Exhibition Design.** New York: W W Norton & Co Inc.
- Dewdney, A. and Ride, P. (2006) **The new media handbook.** London: Routledge. Available at: <http://www.sunderland.eblib.com/patron/FullRecord.aspx?p=274408> (Accessed: 10 April 2019).
- Dietz, S. (2000) **Curating New Media.** Available at: http://www.yproductions.com/writing/archives/curating_new_media.html (Accessed: 9 May 2018).
- Dietz, S. (2004) **Art After New Media.** Available at: http://www.yproductions.com/writing/archives/art_after_new_media.html (Accessed: 9 May 2018).
- Dietz, S. (2005) **Collecting New-Media Art: Just Like Anything Else, Only Different.** Available at: http://www.yproductions.com/writing/archives/collecting_new_media_art.html (Accessed: 20 March 2018).
- Dietz, S. (2006) **'Just Art': Contemporary Art After the Art Formerly Known As New Media.** Available at: http://www.yproductions.com/writing/archives/just_art_contemporary_art_afte.html (Accessed: 2 May 2018).
- Dinkla, S. (1996) **'From Participation to Interaction'**, in Hershman Leeson, L. (ed.) *Clicking In: Hot Links to a Digital Culture.* Seattle: Bay Press, p. 370. Available at: <http://pl02.donau-uni.ac.at/jspui/handle/10002/619> (Accessed: 25 April 2019).
- Dix, A. (2004) **Human-computer interaction.** 3rd ed. Harlow: Pearson/Prentice Hall. Available at: <https://www.dawsonera.com/guard/protected/dawson.jsp?name=http://sso.sunderland.ac.uk/auth/metadata&dest=http://www.dawsonera.com/depp/reader/protected/external/AbstractView/S9781405890328> (Accessed: 6 December 2018).
- Dziekan, V. (2012) **Virtuality and the Art of Exhibition: Curatorial Design for the Multi-medial Museum.** Bristol: Intellect L & D E F A E.
- Gere, C. (2008) **'New Media Art and the gallery in the Digital Age'**, *New Media in the White Cube and Beyond: Curatorial Models for Digital Art*, pp. 13–25.
- Ghidini, M. (2015) **Curating Web-Based Art Exhibitions: Mapping Online and Offline Formats of Display.** Ph.D. University of Sunderland. Available at: <http://sure.sunderland.ac.uk/6088/> (Accessed: 12 January 2018).

- Gillman, C.(ed.) (2002) **The MITES Manual**. 1st ed. Liverpool: MITES.
- Graham, B. (2002) **Curating New Media Art: SFMoMA and 010101**. Available at: <http://www.newmedia.sunderland.ac.uk/crumb/phase3/append/sfmoma.htm> (Accessed: 30 April 2018).
- Graham, B. (no date) **Not a show about new technology, a show about interaction**. Available at: <http://www.berylgraham.com/serious/other/bgessay.htm> (Accessed: 20 March 2018b).
- Graham, B. and Cook, S. (2000) **CRUMB - Curatorial Resource for Upstart Media Bliss, CRUMB - Curatorial Resource for Upstart Media Bliss**. Available at: <http://www.crum-bweb.org/index.php?&sublink=1&ts=1527701517> (Accessed: 30 May 2018).
- Graham, B. and Cook, S. (2010) **Rethinking Curating: Art After New Media**. MIT Press.
- Google, **Saving Internet Art** (no date) Google Arts & Culture. Available at: <https://artsandculture.google.com/project/saving-internet-art> (Accessed: 7 February 2019).
- Hoare, N., Milliard, C., Niemojewski, R., Borthwick, B. and Watkins, J. (2016) **The New Curator**. London: Laurence King Publishing.
- Hughes, P. (2015) **Exhibition Design Second Edition: An Introduction**. London, UNKNOWN: Laurence King Publishing. Available at: <http://ebookcentral.proquest.com/lib/sunderland/detail.action?docID=4394129> (Accessed: 1 June 2018).
- Ippolito, J. (2004) 'Accommodating the Unpredictable: The Variable Media Questionnaire', *Performing Arts Resources*, 24, pp. 94–101.
- Ippolito, J. (2008) **Death by Wall Label**. Available at: <http://thoughtmesh.net/publish/11.php#> (Accessed: 4 May 2018).
- JCARMICHAEL (2014) **Digital Preservation, Association for Library Collections & Technical Services (ALCTS)**. Available at: <http://www.ala.org/alcts/preservationweek/howto/digital-preservation-tips> (Accessed: 18 June 2019).
- Kwastek, K. (2013) **Aesthetics of Interaction in Digital Art**. Crambridge, MA: The MIT Press. Available at: <https://mitpress.mit.edu/books/aesthetics-interaction-digital-art>.
- Laboratorio Arte Alameda (no date) **Centro de Documentacion Priamo Lozada**, Laboratorio Arte Alameda. Available at: http://www.artelameda.bellasartes.gob.mx/index.php?option=com_content&view=article&id=241&Itemid=179 (Accessed: 29 August 2018).
- Lima, L. and Prado, G. (2018). **Interactive Digital Images**. *DATJournal Design Art and Technology*, [S.l.], v. 3, n. 2, p. 43-71, nov. 2018. Available at: <https://ppgdesign.anhembibr/dattjournal/index.php/dat/article/view/86>. Accessed: 03 dec. 2018. DOI: 10.29147/dat.v3i2.86
- Lord, B. and Piacente, M.(eds) (2014) **Manual of Museum Exhibitions**. 2nd edition. Lanham, Maryland: Rowman & Littlefield Publishers.
- Marchese, F. T. 1, fmarchese@pace.edu (2011) 'Conserving Digital Art for Deep Time', *Leonardo*, 44(4), pp. 302–308.
- Muller, E. (2008) **The Experience of interactive art: a curatorial study**. Thesis. Available at: <https://opus.lib.uts.edu.au/handle/10453/21803> (Accessed: 12 January 2018).
- Mbryonic, 'Our Guide to Interactive Installations' (2016) Mbryonic. Available at: <https://mbryonic.com/installations-guide/> (Accessed: 25 April 2019).
- Paul, C. (2015a) 'From Immateriality to Neomateriality: Art and the Conditions of Digital Materiality', in. Vancouver, Canada. Available at: http://isea2015.org/proceeding/submissions/ISEA2015_submission_154.pdf (Accessed: 20 April 2018).
- Paul, C. (2015b) **Digital Art**. Third edition edition. London: Thames & Hudson.
- Prado, G. (no date) **Desertesejo**, Gilbertto Prado. Available at: <http://www.gilberttoprado.net/desertesejo.html> (Accessed: 28 October 2019).

- Prado, G. (2003). **Arte telemática: dos intercâmbios pontuais aos ambientes virtuais multiusuário**. São Paulo: Itaú Cultural. Available at: https://poeticasdigitais.files.wordpress.com/2009/09/2003-arte_telematica_dos_intercambios_pontuais_aos.pdf (Accessed: 28 October 2019).
- Prado, G. (2004). **Artistic Experiments on Telematic Nets: Recent Experiments in Multi-User Virtual Environments in Brazil**, Leonardo, v. 37, n.4, p. 297-302. DOI: 10.1162/0024094041724481
- Prado, G. and Cuzziol, M. (2019) 'Desertesejo (2000/2014): Notes on the Restoration Process', in Kurosu, M. (ed.) Human-Computer Interaction. Design Practice in Contemporary Societies. Springer International Publishing, pp. 239–252. DOI: 10.1007/978-3-030-22636-7_17
- Prado, G. and La Ferla, J. (Ed.). (2018). **Circuito Alameda**. Ciudad de México: Instituto Nacional de Bellas Artes | Laboratorio Arte Alameda. http://www.gilberttoprado.net/assets/circuito_alameda_gtttoprado_jlf.pdf (Accessed: 18 June 2019).
- Quaranta, D. (2012) **What's (Really) Specific about New Media Art? Curating in the Information Age**, Rhizome Blog. Available at: <http://rhizome.org/editorial/2012/dec/6/whats-really-specific-about-new-media-art-curating/> (Accessed: 16 November 2017).
- Quaranta, D. (2013) **Beyond New Media Art**. Brescia: lulu.com.
- Rhizome (no date) **Webrecorder FAQ**. Available at: https://webrecorder.io/_faq (Accessed: 8 October 2019).
- Rouse, Margaret, **What is versioning?** (no date) SearchSoftwareQuality. Available at: <https://searchsoftwarequality.techtarget.com/definition/versioning> (Accessed: 17 April 2019).
- Rush, M. (2005) **New media in art**. New ed. London: Thames & Hudson. Available at: <http://catalogue.sunderland.ac.uk/items/435540> (Accessed: 16 May 2018).
- Smithson, P. (2009) **Installing exhibitions: a practical guide**. London: A. & C. Black. Available at: <https://www.dawsonera.com/Shibboleth.sso/Login?entityID=http://sso.sunderland.ac.uk/auth/metadata&target=https://www.dawsonera.com/shibboleth/ShibbolethLogin.html?dest=https://www.dawsonera.com/abstract/9781408126042> (Accessed: 15 May 2019).
- Stuckey, H. (2010) **Play on Display: The exhibition of videogames in the museum**. Swinburne University of Technology. Available at: https://www.academia.edu/10152587/Play_on_display_the_exhibition_of_videogames_in_the_museum (Accessed: 25 August 2019).
- Stuckey, H., Richardson, N., Swalwell, M. and de Vries, D. (2015) **'What retrogamers can teach the museum'**, in Melbourne Australia. Available at: <https://mwa2015.museumsandtheweb.com/paper/what-retrogamers-can-teach-the-museum/> (Accessed: 8 October 2019).
- Vom Lehn, D., Hindmarsh, J., Luff, P. and Heath, C. (2006AD) **'Engaging constable: revealing art with new technology'**, in 2007 Conference on Human Factors in Computing Systems. San Jose California, USA. doi: 10.1145/1240624.1240848.
- Wang, N. and Xia, L. (2018) **'Human-exhibition interaction (HEI) in designing exhibitions: A systematic literature review'**, International Journal of Hospitality Management. doi: 10.1016/j.ijhm.2018.07.009.
- Weisser, A. (no date) **Videokunstwolken**, Faz.net. Available at: <https://www.faz.net/cmlink/videokunstwolken-12160747.html> (Accessed: 8 October 2019).

Recebido: 17 de setembro de 2019.

Aprovado: 29 de novembro de 2019.