

Replay! When past experiences are reassembled through virtual reality¹

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Abstract

In this work we launch a discussion about the use of virtual reality (VR) to reproduce multi-sensorial experiences. In our perspective, it is important to understand that more than providing a realistic audiovisual experience through a digital display, the actual generation of VR devices generates additional sensorial stimuli in the user perception experience with a synthetic environment. For example, with a head-mounted display (HMD), a motion tracking system and voice recognition would be possible to recreate more sensations of the real world in an artificial context (touch, haptic responses, voice commands, 360° space visualization).

If the exploration of virtual spaces through multi-sensorial interfaces really mimics the human feelings (to see, to hear, to touch, to walk around), better than remembering experiences and past moments through a static image or a plane video screen, the VR appears as a media that provides to the user to live any experience again (or for the first time). At least in a virtual way, the user would be able to feel how it was the aura, noise, crowd or the atmosphere of historic scenes. Indubitably, nowadays VR awakes as an important media format to preserve feelings (sensations), reconstruct situations (geographic and atmospheric notion of places) and explain emotions (memories) related to particular ephemeral objects, spaces or even activities from the past/present to future people. For example, in a sophisticated multi-sensorial VR simulation the user could feel like what it was to be in the middle of a dense jungle during a war conflict that possible doesn't exist anymore because the deforestation phenomenon, or, maybe, to actively participate in a musical gig of an extinct rock band which left recorded the experience with a 360 video camera. Both experiences recall to intrinsic threads related to multi-sensory VR interactions, such as: telepresence, time-travel illusions, human-machine interactions, immersion and sensorial interfaces.

To conduct an initial but relevant discussion on the theme we decide to approach a theoretical review about culture and digital communications - Kerckhove (1995), Lévy (1999), Castells (1999), Bolter e Gromala (2003), Zilles Borba and Zuffo (2015) – followed by a mapping exercise of random projects using immersive VR techniques to preserve time and space experiences of humanity in an immersive, interactive and engaging way. In short, through participatory observation conducted to those cases

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supported by immersive equipment available in the Center of Interdisciplinary and Interactive Technologies from University of Sao Paulo (CITI-USP), such as Oculus Rift, Leap Motion, OptiTrack we pointed out aesthetics and narrative factors about this kind of experience. We believe this information could be relevant to those who want to reflect on patterns of how past experiences could be preserved and revived with VR technologies.

Keywords: Virtual reality, Multi-sensorial interfaces, Immersion, HMD, Natural to the user interfaces (NUIs).

1. Virtual reality as a multi-sensorial media

Nowadays much has been said about Virtual Reality (VR). Its popularization among the general public looks like an exponential process that will not slow down in the near future (Graft, 2014). VR presents innovative characteristics as a media because people can visualize and interact with digital contents in a higher immersion degree than using a personal computer with monitor, mouse and keyboard. But, VR is not really a novelty. It has been studied for decades in research labs.

“From decades research labs are using VR to create virtual experiences with the effect of a physical reality. Nowadays, because the computer graphics and technological devices development, this interface model has stood out beyond the university orbit, raising the interest of commercial corporations. This has catapulted its popularity among the general public and, consequently, released opportunities for a lot of markets to optimize actions with potential consumers”, (Zilles Borba et al., 2015, p.356).

To those who are not familiar with the term, VR must be understood as an advanced user-computer interface which allows the human to visualize, to interact and to manipulate digital contents through a virtual experience that reproduces aesthetics and activities from the physical world (Kirner and Tori, 2004). To create a simulation scene it makes use of electronic devices such as stereoscopic goggles, joysticks, motion sensors and a lot of technical equipment responsible for stimulating the sensory experiences of the human body, specially: sight, hearing and touch/proprioception/kinesthetic (Zilles Borba, 2014). All these sensory stimulations are fundamental to construct a particular user’s perception of the virtual experience.

Looking back for VR experiences we must underline the work of Sutherland (1963). He was one of the first researchers to propose a head-mounted display (HMD) device to visualize 3D images in the virtual environment. On that time, images were understood

as simple wireframes, but were incredible enough. After all, it was created a great immersive media platform using limited technology at that time. For example, the user could visualize standard geometrical shapes without any fill content as colors or textures, such as: cubes, ellipses and triangles.

To arrive in nowadays VR solutions – Oculus Rift⁴, HTC Vive⁵, Samsung GearVR⁶, PlayStation VR⁷, Google Cardboard⁸ – developers were conditioned to the own computer graphics evolution and, so on, to the high cost of hardware production.

Looking to the immersive VR media devices Zilles Borba and Zuffo (2015) point two interfaces paradigms: the head-mounted displays (HMDs) and the CAVEs (Cave Automatic Virtual Environments). Both are responsible for generating realistic (or even imaginary) spaces in the virtual environment and for stimulating the sense of presence of the user organic body in the synthetic scenario (Figure 1). The HMDs are wearable devices which stay fixed in front of the user's eyes as a helmet. This device can isolate the user visual perception of the physical world, creating the visual sense of only virtual elements existence. The visual experience is supported by high quality graphics and the idea of surrounding objects and elements are optimized with a 360° scene generated around the user. Also it is important to underline that the experience through the first-person view perspective creates a symbioses between the user and the avatar, allowing the human to really fell in the skin of the character and to live the virtual world (Bolter and Gromala, 2003). By it way, the CAVE is a 6-side cubic room where the virtual images are project on the walls, roof and ground. So, it is not a wearable device, but a physical space where virtual images are generated around the user. It allows the human to be literally inside the digital simulation and to look around the walls and use her/his own cognitive knowledge from the physical world to control the body, position and movements when manipulating the objects. To reproduce the sight experience of the physical world the user uses stereoscopic glasses, so the images are visualized popping-up out of the walls. Technically, to reproduce the user movements in the virtual world it is not necessary to use a joystick, a game pad or any control device, because around the

⁴ www.oculus.com

⁵ www.htcvive.com

⁶ www.samsung.com/pt/gear-vr

⁷ www.playstation.com/en-au/explore/playstation-vr

⁸ www.google.com/cardboard

CAVE there are motion sensors responsible to collect the human intentions and translate it to the electronic system.

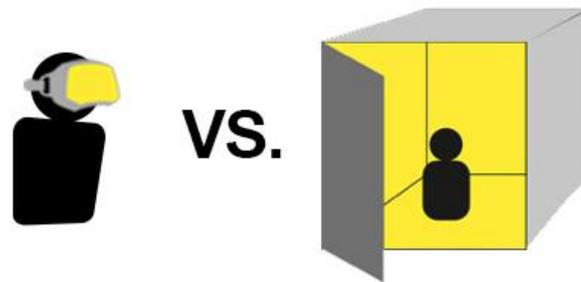


Figure 1: sample of immersive VR devices in HMD and CAVE
Source: Zilles Borba and Zuffo (2015)

Only with the actual graphic processing and quality of resolution it is possible to create synthetic environments which really mimic the real world (Zilles Borba and Zuffo, 2015). And it is not only related to its aesthetics and imagery (landscapes, objects, spaces) but also its activities, interactions and involvement through a natural to the user interface (Figure 2).

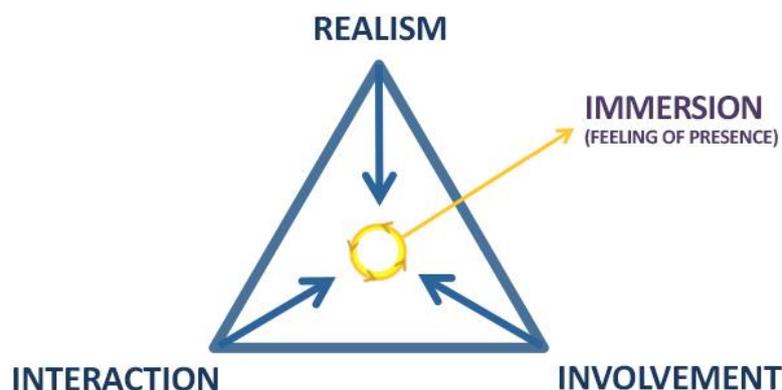


Figure 2: three fundamental pillars sustaining immersion feelings in VR
Source: Zilles Borba and Zuffo (2015)

2. VR experiences to register and to preserve past memories

The media have always been (and still are) responsible for registering important facts of humanity. Through technological features, such as photographic and video cameras, journalists freeze historical moments that will be forever preserved as graphics and/or audio-visual contents for the future people to consult about humanity culture (Kerckhove, 1995; Castells, 1999; Levy, 1999). For Mesquita *et al.* (2011), even the

advertising images are responsible for portraying the culture, customs, technologies, fashion and habits of people in a given period of History. Doesn't matter which technique is applied for collecting and/or reproducing images, media figures as key agent when talking about spreading information about the history of humanity.

At this point it is important to underline that, unlike the photo (visual) or video (audiovisual), VR has emerged as a kind of multi-sensory media, after all it can reproduce the sense of space, objects, activities and people relationships in a very realistic way (scales, forms, proportions, depths, colors, textures, lights and shadows) (Zilles Borba et al., 2016). In the immersive VR, scenarios can be visualized in a real scale and proportion and, even better, interactions can be performed with natural-to-the user movements allowing all their cognitive knowledge of the real world to be used to explore virtual places. That is, more than admiring a landscape in a photo the VR user can experience the same landscape (all around it) in an immersive experience of telepresence where the senses are fully encouraged to believe that the virtual reality in which she/he inhabits is a kind of physical reality (Figure 3).



Figure 3: the sense of inhabiting the virtual environment through immersive techniques
Source: Santos (2015), Samsung GearVR Media Presss (2016), author personal files (2016)

In 1964, Marshall McLuhan made a great classification between cold and hot media, where the first means that one prolonging one of our senses in a high-definition experience (photo) and the second one in a low-definition (telephone). So, it may be

possible to say VR is nowadays a hot as hell media, because it prolongs more than one sense (visual, audio and haptic perceptions) in a super high-definition way (McLuhan, 1964). The same conflict to label VR in the theoretical and philosophical field would appear when thinking about Roland Barthes analyses about the light and dark chambers (Barthes, 1980). The author says that any image represented by the human hands is a light chamber (draws, sculptures) and any image reproduced by mechanical tools is the dark chamber (photos, videos). I would say VR has much of both technics. For example, the manual creation of a 3D object by the designer's hand and also the mechanical reproduction of cars or characters behaviors by a programmer algorithm typed in the binary machine. In a reflexive way VR would be a grey chamber. Well, in my opinion, doesn't matter how we do label it, but it is clear that VR is a multi-sensorial media that breaks with all paradigms about visualizing and interacting with digital contents.

Indubitably, nowadays VR awakes as an important media format to preserve feeling (sensations), reconstruct situations (geographic and atmospheric notion of places) and explains emotions (memories) related to particular ephemeral objects, zones or even activities from the past/present to future people. For example, in a sophisticated multi-sensorial VR simulation the user could feel like what it was to be in the middle of a dense jungle in during a war conflict that possible doesn't exist anymore because deforestation phenomenon. Or, maybe, to actively participate in a musical gig of an extinct rock band which left recorded the experience with a 360 video camera (Figure 4). Both experiences recall to intrinsic threads related to multi-sensory VR interactions, such as: telepresence, time-travel illusions, human-machine interactions, immersion and sensorial interfaces.



Figure 4: 360° video projections in a mobile HMD device
Source: Google search (“McCartney 360°”)

3. Analyses of VR projects

To conduct an initial but relevant discussion about VR as a media that allows user to plays past experiences in an immersive way we applied a mapping exercise of random projects using VR techniques to preserve time and space experiences. In short, through participatory observations conducted to those cases supported by immersive equipment available in the Center of Interdisciplinary and Interactive Technologies from University of Sao Paulo (CITI-USP) – Oculus Rift, Leap Motion, OptiTrack, Razer Hydra joysticks and others – we pointed out aesthetics and narrative factors about the user’s experience. We believe this information could be relevant to those who want to reflect on patterns of how past experiences could be preserved and revived with VR technologies.

Following we do present two cases about past experiences reassembled through VR: a) the archaeological site of Itapeva (2015); b) the historical city center of Sao Paulo (1911).

3.1. The archaeological site of Itapeva (2015)

This VR project presents a fully immersive environment that simulates the Brazilian archaeological site of Itapeva. More than create a sensation of transporting the user to the archaeological site, this work presents great goals about how VR can be particularly used to explore ephemeral spaces and objects in a non-destructive way. It means this VR model show an opportunity to revive (or life for the first time) the feeling of exploring places with difficult access. So, in the University of Sao Paulo students of archaeology are able to explore the reconstruct space and perceive some important geographic and atmospheric notions about it (and around it). The VR model provides immersive feelings to the user when she/he wears an Oculus Rift (HMD) to visualize the aesthetics elements in a 360° vision exploration. The first-person perspective also provides the sense of presence and even the symbioses with the avatar’s body. As an extra visual resource “it is possible to play zoom in or out, to approximate or move away their vision on objects”, (Zilles Borba et al. 2016, p.47). The navigation and manipulation of objects tries to reproduce the natural to the user movements through the Razer Hydra joysticks (a couple of 3D input devices). In short all “this apparatus allows the user to observe details in the virtual landscape in a truly understanding on spatial scene, such as: scale, form, textures, lights and shadows” (Zilles Borba et al., 2016). And, of course, to practice some excavation and observation exercises (Figure 5).



Figure 5: VR provides the user to explore physical ephemeral places in a virtual non-destructive way
Source: Zilles Borba et al. (2016)

3.2. The historical city center of Sao Paulo (1911)

This project proposes to rebuild, based on photographic images and old illustrations, the historic center of Sao Paulo (Brazil) in a 3D environment. The main objective was to create a time-travel illusion that allows the user to feel the sensation of walking by a place that no longer exists (Cabral et al., 2007). The work was developed by the Center of Interdisciplinary and Interactive Technologies from the University of Sao Paulo (CITI-USP), supported by the City Hall of Sao Paulo, with the mission of reproduce more than an image of the heritage urban space. It means, with this model it was recreated feelings (sensations), reconstructed situations (geographic, architecture and atmospheric notion of that place) and, even, explained emotions, culture and habits of the Brazilian people in that period through a multi-sensorial way (visual, audio and haptic). The VR platform used in this simulation was a CAVE, so a multi-player experience could be engaged in the scene. For example, two or more users could get in the CAVE and only one would control the exploration with a Wii remote control (left, right, front, back). Also, it is important to underline this CAVE system had stereoscopic goggles. So, users could wear it and to visualize images in a 3D perspective same as in the movies theatre when it seems images are popping out of the screen (a cubic screen in this case) (Figure 6).

In short, in this case it is possible to play the experience not only in an individual way, but if more people around when exploring the virtual environment. And, in a deeper reflection it is possible to affirm that this kind of VR is an important media tool to preserve the history of our society, such as: architectural studies, urban space registration and a great multi-sensorial simulation narrative to be applied in museums to provide future people an immersive walking by the past of Sao Paulo. More than to allow people to see how it was the city in 1911, with today VR technologies we can make them to feel how it was to be a person in the middle of that historic city center.



Figure 6: the CAVE paradigm allow user to feel inside the space without any wear device
Source: Cabral et al. (2007)

Conclusion

At first, it was possible to conclude that VR has a huge potential to create multi-sensorial experiences to explore past, present and even future situations/activities. Technologies, techniques and high-tech devices available in the market are able to provide the feeling of telepresence to the user when exploring virtual environments. So, it means, VR allows people to replay experiences like they're actually a part of the ambience.

It was also concluded that the narrative and aesthetic generated by technological simulations in a VR platform gave a wide range of possibilities for application in the Media field. Now, more than being an active agent playing in a web platform (flat and plane monitor) and using control devices that are actually metaphors to the user's natural movements, in VR she/he can really dive into the virtual scene using her/his cognitive knowledge of the real world to move, to manipulate or to interact with objects, spaces and characters. In short, VR are bringing a new perspective to our media mass consume, after all we finally are facing a complete and multi-sensorial experience that creates the feeling of been another or live other realities.

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