# BETWEEN REAL AND VIRTUAL - A STUDY ON THE ARTISTIC POTENTIALITIES OF VIRTUAL REALITY SYSTEMS

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**Abstract:** Just as photography and film went through periods of experimentation and doubts between scientists and artists until they were consolidated as artistic media, virtual reality headsets (VR) will also have their natural time until they find their own ways of artistic creation. Although experiments with VR systems are still subject to uncertainties among artists in relation to their authenticity as a form of artwork creation, it is possible to perceive that the technology presents potential to bring new aesthetical possibilities, by its elements of immersion and interaction. On the other hand, as this is a recent digital technology, it is necessary to explore its totality to understand its creative limits. Based on some examples, this work promotes a brief discussion about the aesthetical and technical potentialities that VR systems can offer artists in the creation of aesthetic and immersive experiences.
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## Introduction

Machado (2010) stated that art has always been produced with the means of our time. Virtual reality systems (VR), currently known as advanced computing interfaces that enable real-time navigation and interaction in three-dimensional environments through multisensory devices, have become popular in their use for entertainment, health and education (Kirner 2007). The exploitation of these devices for artistic purposes is still incipient, as there is only a small group of emerging artists and scientists experiencing their potentialities.

According to Santaella (2003), new technologies can take a time of transition until they discover their own poetics, styles and original forms though aesthetical experimentations:

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> "When a new mean of producing language and communication emerges, an interesting transition is observed: first, the new medium has an impact on the oldest forms and means. In a second moment, the medium and the languages that can be born within it are taken by artists as an object of experimentation. So it was with radio, the first effective mass media, capable of remotely reaching millions of people at once. In a first instance, the radio influenced the theatre and later was explored as an autonomous source for creation" (Santaella 2003, 156).

VR itself is not limited only to the current digital headsets which allow 360-degree navigation in three-dimensional, photographed or filmed spaces. According to Grau (2003), these contradictory terms describe a space of possibilities and impossibilities formed by illusory stimuli that are addressed to the senses, promoting the sensation of immersion to the viewer. This technique was widely explored in antiquity to create illusory spaces decorated with large scale paintings capable of simulating alternative realities.

However, to understand how the current VR digital formats can be exploited artistically in their totality, it is necessary to comprehend their origins and how its transformation occurred until it became the format as we know it. According to Pareyson (1993), the formability of any work of art depends on the direct relation of the artist's intention to the predisposed material, which contains its own limits, rules and values. Before the experimental appropriation of any medium or material, understanding its main characteristics and historical values is fundamental for mastering it. Therefore, the next topic presents a brief overview on how the VR technique arose from the human being's will of nature imitating.

**Virtual Reality as Art**

The first artistic manifestations – such as dances, paintings, rhythmic sounds and the first sculptures – emerged as representation forms of the stimuli that men received from nature, or according to Aristotle, *mimesis* (Wagner 2016). For Aristotle, *mimesis* was a representation of the feeling as an object of importance in artistic works, associating pleasure with nature imitation, representation of reality and as a way of

acquiring new knowledge. On the other hand, the sense of imitation here is not based on the mere replication of natural elements, but rather on the representation of the beautiful (nature) through the artist's gaze.

However, for some artists the mere two-dimensional representation of nature was not enough. Some have gone beyond the limits of two-dimensionality and created spaces of illusion that could be experienced through the visual effect that places the viewer at the core of the work, making him an integral part of that artificial nature. According to Grau (2003), the first vestiges of immersive environments were found in the old Roman Republic (60 B.C.) in which frescoes were painted in the Second Style[6] of Pompeii and that were intended to provide an illusory effect to the visitor who was observing the walls in the center of a living room. An example is the Great Frieze at the Villa dei Misteri in Pompeii, Italy. The painting covers all the walls in Chamber No. 5 in Vila Item and features twenty-nine life-size figures on a red back-ground, inlaid with marble. The fresco, which measures 5 x 7 meters, almost fills the observer's field of view in 360 degrees (Image 1).

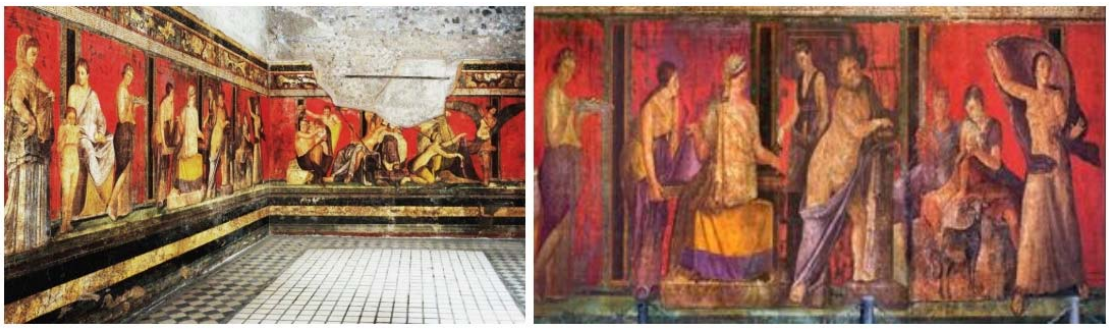

Image 1 - The Great Frieze, Chamber n. 5 at Villa dei Misteri, in Pompeii 60 A.C.

The visual technique used in this work was intended to extinguish the barriers between observers and observed through the scenes distributed horizontally in the height of the viewer's eyes, allowing him to be immersed in the same context of those characters. In this sense, the matter of distance is nullified in works of aesthetic illusion that focus on spaces of possibilities formed by illusory stimuli directed to the senses, capable of immersing the observer into a plausible, utopian or fantastic context. The immersion factor in this case is due to living in a space where the field of

[6] The Second Style is classified as 'architectural style' and it is a mixture of the first period, but with blocks of fake marble along the base of the walls, trying to give an impression that the observer is looking through a window where illusionistic paintings can be seen.

perception of the observer is sealed by plastic objects that expand the perspectives of real space in the illusory space, or in other words, in an artificial world that provides space a totality (Grau 2003).

With the evolution of technological means, artists also altered their ways of thinking about artistic production, which in turn implied in the elaboration of works that were sometimes based on the mime of nature, sometimes overcoming them, creating illusory and intangible contexts – or according to Baudrillard (1991), *simulations* and *simulacra*, respectively. *Simulacra* are simulations of the real that are more attractive to the spectator than the reproduced object itself. The creation and choice of fictional contexts, imaginary characters and narratives allow people to project ideal images of themselves that they would like to be or live in – imperfect simulations of the real that fascinate the user and satisfy him in his yearnings as a sort of *catharsis*, even if satiety occurs only in the illusory or virtual plane. This term began to be used in the 1920s instead of 'illusory' and demonstrates the natural and chronological evolution of art history: the field of virtual movement and virtual bodies goes from painting to sculpture, from flat to three-dimensional space, from the illusory to the virtual (Weibel 2009).

However, some artists went beyond the mere superficial and distorted representation of nature as criticized by Baudrillard (1991), evidencing how digital imagery could be explored as a way of evoking new experiences through interactivity. *The Legible City* (1988-1991, Image 2) from the Australian media artist Jeffrey Shaw is a pioneering interactive art installation where the visitor rides a stationary bicycle through a simulated representation of three different cities – Manhattan, Amsterdam and Karlsruhe – constituted by three-dimensional letters that completely replaces the existing architecture of these cities with text. The simulation is displayed in a single large screen positioned in the front of the visitor who can freely navigate through the cities to read texts, form phrases or recombine the words to form different meanings.

Image 2 - *The Legible City,* Jeffrey Shaw.

CAVEs[7] (Cave Automatic Virtual Environment), similarly to the decorated rooms created to immerse viewers in the representation of a given context or scene, adopt the technique of surrounding visitors through digital images in a cubic space with about 3 meters of edge where the walls and floor are projection screens. As an example, Diana Domingues' *HeartScapes* (2005) proposes a virtual reality installation with stereoscopic images and multisensory interfaces for immersion inside a human body. In this CAVE, the viewers' heartbeats are captured by devices that modify the images presented in real time, which generate the feeling of being in front of a fully functioning body. This simulated environment proposes sensitive exchanges of perceptions of the biological system with the digital technologies (Image 3):

[7]The CAVES use multi-synchronized projections of the same image divided by four to six projectors (back projection).

Image 3 - Diana Domingues' *HeartScapes* (2005).

The American artist Rachel Rossin, in her exhibition *Lossy* (2015), created an exhibition in which she explores the two-dimensional and three-dimensional formats of artistic formats, between physical and digital. She painted a set of pictures, scanned them and created a two-minute video from these records. With these images, she created a 3D world through electronic game creation software, *Unity*, which allowed the interaction of visitors through virtual reality headsets. In the work, fragmented objects and shapes float within the environment and occasionally disintegrate. Thus, isolating the eyes with the stereoscopic device, the exhibition simulates the fantasy of living inside of a painting (Image 4):

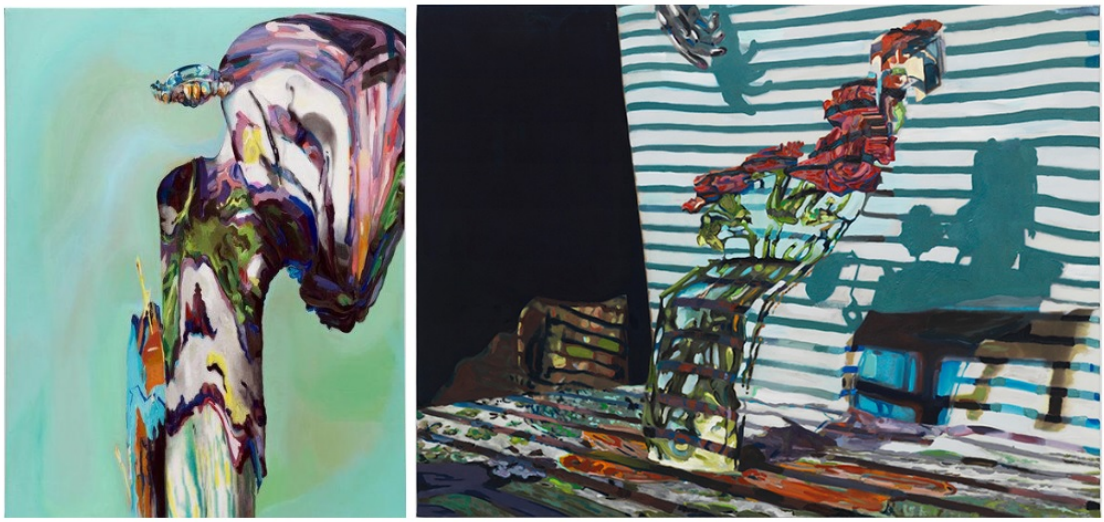

Image 4 – *Lossy* (2015) – Self-portrait (left) and how it is portrayed in 3D format (right).

Rossin's work draws our attention to the duality of art formats imposed by the digital means – from material to immaterial, from two-dimensional to three-

dimensional – which evokes different experiences and expands the range of possibilities that refer to the process of forming an artwork, which will better discussed in the next topic.

**The Formativity Process of a VR Artwork**

According to Pareyson (1993), art materials in their physical formats are subject to certain fixed and immutable laws, and in the face of these rules, the artist finds himself in the challenge of respecting or even overcoming them. However, when it comes to the creation of artworks in digital formats what are the limits that may restrict the artistic formativity? Physical materials can be converted into artworks by transforming processes such as modelling, cutting, painting, sculpting, playing and so on. Artistic formation by digital means is subject to obey rules established by programming syntaxes that will be transduced into imagery signals and converted into pixels and luminosities programmed by computer. Therefore, virtual reality experiences created for digital headsets can be developed by the current visual graphics engines which allow both the reconstruction of existing contexts with fantastic elements and the modelling and exploration of illusory contexts as plausible realities.

**Aesthetical Aspects**

Virtual environments are mainly based on two basic creation processes: three-dimensional modelling and rendering. Three-dimensional modelling refers to the process of creating objects, scenarios and characters in 3D space (represented by the X, Y and Z axes in the Cartesian Coordinate System) by means of polygons manipulated by computer software (among the best known are *Blender, Maya, 3DS Max, Cinema 4D, MODE* and *SoftImage*). These modelling features also allow the creation of animations, scenario simulations, texture applications, lighting and colours. Rendering is the process of converting and compiling a series of graphic symbols into an image, approaching to the desired visual result. This process can be performed through applications inserted in 3D modelling software and, in order for the three-dimensional elements to transform their polygonal shape, it is necessary to promote rendering to smooth edges, textures, lights and colours to ensure a better image resolution.

The surface of a three-dimensional scenario or object can be composed of three visual elements capable of generating realistic results from the interactions and

configurations between them: *materials* which are 2D visual representations applied to the surface of a 3D object; *shaders* that are constituted of small scripts that contain algorithms that calculate the color of each rendered pixel based on the lighting interactions and the previously applied material configuration; and *texture* which refers to the quality of the material applied to the object (e.g. wood, stone, rough, smooth, etc.), which will influence its color, illumination and reflection

Regarding the choice of colors for the production of a given VR artwork, it is also necessary to think how these colors, commonly seen in reality, will be represented, mixed and converted to build a simulated three-dimensional environment, be it more realistic or fictitious. In the case of Diana Domingues'*Heartscapes*, color fulfils the role of representing the basic elements that constitute the CAVE's visual field, allowing its *interactors*[8] to identify the shown objects according to their prior knowledge of the world (for example, blood is conventionally represented by red color). Although the simulation built in *HeartScapes* and the chosen colors are not totally reliable to reality (perhaps due to rendering limitations of that period), the work fulfils its role in immersing its interactors in the proposed context through the combination of selected colors. For instance, we can notice that Domingues wanted to use specific colors to intensify the sense of depth though the *chromosteoscopy*, which is a visual illusion by which the depth impression is transmitted in two-dimensional color images, usually caused by the red and blue when they are side-by-side or close to each other.

Besides the visual aspects, sounds can also improve the immersion factor through soundscapes that represents the digital scene in which the interactor is immersed. Through 360-degree audio effects that can be created through audio editing software or even game engines, it is possible to simulate auditory effects such as distance from source sounds as the visitor navigates the digital environment and its spatiality through reverberation.

**Interactivity and Agency**

Furthermore, a*gency* is the main element that needs to be considered when it comes to designing VR experiences. Murray defines this term as "the power to carry out meaningful actions and see the results of our decisions and choices" (2016, 125)

[8]The *interactor* refers to the subject who, when in contact with a work of interactive character, needs to perform physical and/or mental actions in order for the work to exist (Couchot 2003).

that are the result of interactions between interactor and machine. When we perform actions in technological immersion contexts, we expect our attitudes to have significant consequences in the scenario or in the interacting apparatus.

Two elements need to be taken into account during the development process: programming predicted actions and their outcomes generated by the system. For instance, in Unity *colliders* are regions or objects that are endowed with collision property, that is, bodies that are able to physically recognize and respond to the contact of their surfaces with other collisions in the virtual space (e.g. two spheres colliding). Colliders can be used as *triggers* that enable the activation of a planned action by the developer. When the delimited regions of the colliders are interacted by the user or another element within the virtual environment, one or more actions previously programmed through lines of code (*scripts*) can be executed.

Increasingly, 3D Web technologies have been used as powerful integration platforms for visual computing applications. Low-level graphical APIs have made it possible to deliver 3D mesh data to a wide variety of devices in a consistent and platform-independent manner.

**Conclusions**

Virtual worlds, which bring impossible interactive possibilities to be performed in real life, are now increasingly invented. We have now reached the point where computers have systems capable of reproducing nature in its visual sense. 3D modelling software traces elements found in our reality and even modifies them according to the intentions of the creator. Stereoscopic glasses allow contemplation and transportation of the viewer to three-dimensional worlds that imitate reality: inaccessible, unreal and immutable natures become plausible through pre-established sets of rules programmed by computer software that open doors to universes of possibilities.

Although the experiments with virtual reality are still subject of uncertainties among artists in relation to their authenticity as means for creation of artworks, it is possible to perceive that the technology has sufficient potential to bring new possibilities of relation with the artistic object, by its elements of immersion and interaction. On the other hand, because it is a recent digital device, it is necessary to first master it so then artists will understand its creative limits. As photography and film went through periods of experimentation and doubt between scientists and artists until they were consolidated as artistic means, digital technologies, in particular virtual

reality devices, will also have their natural time of maturation until they find their own ways as means of artistic creation.

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