# Art and Virtual Reality Research / Art and Virtual Reality Research

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**Abstract** *This text describes an **art** category which draws on the **Augmented Reality** (AR) **Technology,** which is capable of inspiring the copulation as well as the interaction, in real time, between images of reality, which might be those of the observer him/herself and the mental images, which might be artistic and generated by a computer. Stemming from the fusion of both types of image, where the former digitalises reality, whereas the latter simulates a three-dimensional image, a third image is obtained, which questions, it might be argued, reality itself. This text revolves around the attempt to demonstrate that AR is deemed a sub-group of **Virtual Reality** and its process as a whole as well as its imagetic system stems from the knowledge one has of the world, the exactness of reproduction one may attain of it and, finally, from the metaphor of one's presence in it.*

**Precedents** Historically, the researcher Paul Migram, in 1994, by proposing a taxonomy for the SPMR (Systems for the Presentation of Mixed Realities), initially introduced the concept of Virtuality Continuum, upon which different types of Systems of Mixed Realities were based. Migram deemed Augmented Reality (AR) a particular case in the universe of Mixed Realities (MR), thus placing it closer to the real environment rather than to the 3Dvirtual worlds. Such categorisation enabled Migram to justify the clear separation between the areas of AR and Virtual Reality (VR), therefore contributing to the researcher's creation of the generic concept of MR for the field, conceptually occupying thence all the space between the Real Environment and the Virtual Reality.

Currently, the fusion between the real and the virtual images is obtained through research conducted with augmented reality (AR), which is defined as being the interval between the real and the virtual , a mixed reality thus , fusing both reality and virtuality. AR is considered in Computer Science as a subgroup of Virtual Reality (VR) and its entire process of creation as well as imagetic system partake of three principles which initiate with the knowledge we have of the world , then one would move on to the reproduction one might "achieve" of such world. Finally, one should aim at the metaphor of the human presence in this world. In other words, it is centred on the human, the object and the environment.

In the universities of Brazil a few groups working with VR and AR are to be found. Gerson Cunha (2005) from the Federal University of Rio de Janeiro (UFRJ) has been a researcher with the Laboratory of Computational Methods in Engineering from the Coope, since 1996. In 1997, he founded the GRVa – Grupo de Realidade Vitual Aplicada do Laboratório de Métodos Computacionais em Engenharia –where he coordinates different projects in the area and has developed a tool for the visualisation of the VRML models termed GRVa Viewer. Another example was developed at the PUC from Rio de Janeiro by Michel Truyenque under the supervision of Marcelo Gatass, named an application of computational vision which uses hand gestures with a view to interacting with the computer. According to the researcher, computational vision may be used to capture gestures and create devices of interaction with more intuitive and rapid computers. The current devices of available interaction are based upon gestures using sophisticated equipment as the tracking devices, gloves. Special cameras, among others and special environment which make it difficult for publication to the public in general. This work presents a study on the feasibility of using Web cameras as a device of interaction based upon hand gestures. In his study he pondered that the human hand does not possess any device (mechanical, magnetic or optical) placed on it. He also esteemed that the environment where the interaction takes place possesses the characteristics of a space of regular work,

that is, devoid of lights or special backdrop. To assess the feasibility of such a mechanism of interaction, a few prototypes have been developed. In these prototypes, the hand gestures and the positions of the fingers are used to simulate a few functions present in mousse and keyboards, such as the selection of states and objects and the definition of directions and positions.

Despite the interesting and important research developed, this text does not aim at dwelling upon the sate –of –the art of this scientific field. A description of works of art which adopt and develop research in the fields of VR and AR will follow.

## Objectives
The goal of this research is describes an art category which draws on the Augmented Reality (AR) Technology, which is capable of inspiring the copulation as well as the interaction, in real time, between images of reality, which might be those of the observer him/herself and the mental images, which might be artistic and generated by a computer.

## Methodology
Art , as it approaches issues related to the human-computer interface , as those contemplated by VR , boasts a most peculiar perspective, which guides the research in this field towards the disappearance of interfaces via the elaboration of systems of direct attachment , of translation , of thorough immersion and the consequent absence of distinction between both the machine and the human realities. Tangible as well as adaptable means of communication are contrived. To the theorist Cláudia Giannetti (2002,31) ,one might consider the bio-adaptor as a functional version of what the philosopher Friederich Nietzsche  used to say as regards the reduction of reality to but a "fable", save that the one in question herein is constructed from the exterior by a computer. The backdrop issues presented herein refer to the perception as well as the knowledge one may have of the world as the difference between natural and simulated realities, the objectivity of reality, the role of the observer and the rapport between the inner and outer spheres.

In addition, stemming from the premise that one may develop sophisticated skills to both perceive and manipulate our physical environments, the production of art in the context of VR as well as AR seeks to construct worlds around such skills with a view to endowing digital information with a physical form, weaving dual worlds composed of bits and atoms together.

Historically in the 80's and the 90's, even if not using the VR stereoscopic equipment, the artists explored numeric interaction through different modes of creative processes. Instead of sensations of immersion, one had access to multimodal experiences. In such installations, the equipment consisted of a computer, a multimedia projector and loudspeakers.  For instance, Paul Garrin, with the installation The White Devil (1992), illustrated the atmosphere of terror which threatens the life of Americans. The visitor to his installation is faced with a huge iron gate closed before a mansion. The property is burning and the inquiring visitor approaches it to better see. A fierce dog, however, attacks, chases him/her as he/she moves. The "dog" is a sequence of pre-stored computer video images controlled by a computational program, which provides the observer with the impression that the dog moves across the various monitors placed in the site of the installation.

The insertion of VR in installations dates from the 90's, together with the scientists who sought to enrich and accelerate the human-computer interface. The installations featuring VR are rather complex and have shown the tendency of people immerging metaphorically in environments of synthesis, where digitalised images of the real were but devalued.

Indeed a tangible example comprising an interactive installation featuring VR is the work named Famous Grouse Experience by the artist and Professor Joaquin Sauter, created at the ART+ Com space located in Germany, in collaboration with the London based Land Design Studio in 2002. The interactive environment composed of a corridor with the projection on the ground of video images of liquids, generates waves as the public walks on it in real time. The choreography of light and aroma of whiskey spread across the space is a total experience to the senses of the visitor. Another work produced by Sauter in the context of AR, which inserts virtual images in reality,

named Medial Stage and Costumes Design allowed for the projection in real time of costumes on the performing artists of the opera The Jew of Malta, staged in the Berlin Opera Festival in 2002.

Artistic works in AR do not abound, for the fusion between both images (virtual/real) demands as yet a rather complex process of elaboration. The Laboratory for Research in Art and Virtual Reality in conjunction with the Image Laboratory of Electric Engineering from the University of Brasília elaborated a work named Contato , a group formed by Mario Maciel , Ricardo Queiroz , Rafael Galvão and Suzete Venturelli , exhibited at the Humano Pós-Humano Exhibition held at the Centro Cultural Banco do Brasil in 2005.Based upon a system consisting of projections, a computer, digitalisation position programs, 3D environments and a digital camera, the system enables the interaction to take place between the actuators and the image of synthesis. In other words, as they move before the camera, which digitalises their position along the X and Y axes, the audience moves a three-dimensional image of particles which spread virtually as a result of the displacement caused. *(Figure 1)*

Another work in progress by the group, based upon the ARToolKit Programming Library (AR) enables the fusion between moving images of the real captured by a camera in real time and images of synthesis created in VRML, which are distorted as the interaction with the actuator occurs. The resulting third image reunites both realities in a single determined space-time.

The work has been conducted as follows:

After the modelling in VRML language, where various three-dimensional models were created, the results were thus tested in the ARToolKit Programming Library. Initially, the camera needed calibrating so as to ensure exactness of image. Subsequently, patterns were devised by the group, which were associated with the VRML objects, modelled beforehand. Lastly, the work moved towards the visualisation of 3D objects in the real world. As stated before, this artistic research includes the creation of a system based upon



*Figure 1 Contato*



*Figure 2 Sopro da vida (AR)*

In this very sense, writing their very systems, some artists have been investing in the elaboration of installations with VR technology seeking a more tangible connexion between nature and culture, that is, between nature and artifice. According to the French theorist Edmond Couchot (2002) , the attempts of reconciling nature and artifice have provide the theme of the works by the artists Crista Sommerer and Laurent Mignonneau , entitled Trans Plant , 1992 , in an interactive environment which enables the creation of an artificial garden stemming from the movement of one's body.

The universities have been providing a forum concentrating the most relevant artistic experiments.

**Conclusion** This text revolves around the attempt to demonstrate that AR is deemed a sub-group of Virtual Reality and its process as a whole as well as its imagetic system stems from the knowledge one has of the world, the exactness of reproduction one may attain of it and, finally, from the metaphor of one's presence in it.

The human - To seek the participation of the viewer has become one of the most influential streams of art research in the twentieth century, where the clearest change refers to the invention of systems of computational visualisation. With the current processes of artistic creation based upon both VR and AR, one cannot fail to notice that from the reality one creates, situations are bred where the observer may interact and control certain aspects of the world amplified and "augmented". The observers thence partake of the self-organisation and are therefore defined as interactors whose detected presence results in an effective alteration of the system.

The object – the realistic as well as photorealistic representation of reality which incorporates in its perspective the viewer's position is a feature of VR and the main characteristic of AR is the incorporation of the video image in motion into the fusion of real as well as virtual images. The interactors move within two realities : the reality accorded by his/her awareness that he/she partakes of a type of a simulation game and the reality offered by his/her perception which is indicative of the fact that his/her presence and conduct actively influence the artificial world (GIANNETTI, 2002).

The environment – The system many times contemplates the installation of the system in a metaphorical space inspiring more often than not the disappearance of intrusive interfaces which are replaced with gestures as well as bodily movements, which tend to breed the integration between bits and atoms.

The application of both VR and AR in art makes for the appearance of a genre of theoretical analysis of such works. The one presented and discussed herein sought to assess how and why they are elaborated. The attempt centred around the demonstration of its structural mechanism , creative contexts and concerns regarding the interactors

and actuators , -term favoured herein , for people are not actors in the broad sense of the word – which unfolded in how the interactivity between the image and the individual is produced and how the system of control , which prompts action , works.

The attempt herein has been that of showing, through exemplification, the manner in which the VR and AR technologies work, how they are constructed and organised. The applicability of VR and AR systems in art within systems which allow for action control and, to a certain extent, admit the intervention in the system itself, on both conceptual and sensorial levels.

**Observations** Recent VR anda AR researches concentrates on the elaboration of more intuitive interfaces. However , this will only be possible if this new technology may actually enable the development of virtual spaces more similar to reality, with more natural techniques of interaction with such environment. To this effect, such techniques of interaction should enable the user to perform tasks such as selection, manipulation and navigation tapping his/her knowledge about the real world. Bidimensional techniques termed "desk metaphors" based upon menus, buttons, dialogue boxes and others are inappropriate to improve the quality of interactions and to the applications which use helmets and devices such as data gloves, among others.

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