Natural to the human interactions with digital interfaces: a new perspective to understand the virtual experiences[1]

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Abstract

This is a discussion about the evolution in the way we do interact with digital interfaces. Precisely, it's a critical reflection on technical and technological advances of human-machine interaction mechanisms, in the sense that their transformations are leading us to an increasingly intuitive relationship with computers (from 2D to 3D, from click to touch, from joystick to gestures). Thereby, and more importantly, this phenomenon is awaking a new way of understanding our own body, space and, even, reality projected in virtual environments (something between real and virtual, original and copy, truth and lie). In other words, leaving the *modus operandi* to assume the *modus vivendi* in our communications with digital interfaces, it's possible to presume that possession of skills and competences managing computers or video games will no longer be a barrier. After all, we are walking to a more cognitive dialogue with machines (touch, walk, talk, etc.).

The article conduction is guided by a descriptive methodology which consists of a qualitative analyses based on empirical data collected by the authors with observatory explorations to virtual reality systems available at the Interdisciplinary Center in Interactive Technologies from the University of Sao Paulo (CITI-USP) – Second Life, Nintendo Wii, Oculus Rift, Digital Cave – and, of course, on the reflection supported by theoretical references about the user immersive experience. It means this essay extent some ideas of researchers as McLuhan (1964), Deleuze (1988), Baudrillard (1994),

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Milgram (1994), Kerckhove (1995), Negroponte (1995), Lévy (1999), Castells (1999), Jenkins (2003), Accioly (2010) and Zuffo *et al.* (2012).

In resume, with this work is fostered the thought that a more natural to the human interaction with digital interfaces turns the techno-experience more realistic, engaging and interactive, so more immersive. However, while we get the feeling of being more close to the virtual universe, our perception generates a conflict related to the notion of the context in which we are operating. After all, the senses are encouraging us to believe we're dealing with something real (I feel it, therefore I am in the virtual environment), while the mind insists to remember us those are digital simulations (I think, therefore I am not in the virtual environment), creating hybrid situations and, in somehow, changing the idea that digital universe is affixed to the edge of fake in true-false dichotomy, to be located in an asymmetric, ambiguous and paradoxical duality point.

Keywords: Digital transformations, Digital interface, Cyber culture, Immersion, Virtual reality, Human-Machine interactions.

1. A new perspective of understanding virtual experiences

The first interactions between human and computer systems were sustained by space representations and dialog metaphors (menus, clicks, icons, etc.). But, nowadays, it is possible to identify an inclination towards more natural explorations of digital environments (3D images, gesture, touch and voice commands, etc.). In fact, the constant evolution in the way people deal with digital interfaces indicates an increasingly tendency to intuitive relationship with machines.

> "Soon we will not have to learn the operation system of a digital interface, because in addition to a similar aesthetics of objects visualization of the real world (shape, color, texture, scale, perspective), it will be able to identify our movements and translate them into coherent actions in the virtual environment (to walk, to run, to jump, to talk). We are gradually leaving the *modus operandi* to take the *modus vivendi* in our relationships with computer machines", (Zilles Borba and Zuffo, 2015, p.2)[4].

In this process it is very important to realize the technical and technological evolution of digital interfaces turns techno-experiences more interactive and involved. Therefore, they will turn more realistic (Zuffo *et al.*, 2012) (Figure 1).

[4] Free translation

As already argued by Baudrillard (1994), Kerckhove (1995), Negroponte (1995), Pausch *et al.* (1997), Jenkins (2003), Bowman and McMahan (2007) and Accioly (2010), while the humanity approach the virtual space – in the sense of immerging on it – is remarkable the grow of a perceptual confusion related to the notion people do have of the context in which they're operating. So, as the digital interfaces turn more natural to the human cognitive knowledge, seemly the user come to understand the simulation as a hybrid reality, something between the real and the virtual, the original and the copy, the atomic and the binary or, even, between the organic and the synthetic. In other words:

> "Although computers are far from providing the fantastic concept of teleportation of the atom, of flesh and bone to virtual worlds, from a semiotic point of view it seems to be increasingly apparent that there is a conflict in the interpretation we do of our own body, space and even the reality that is projected on the monitors. Today we feel hybrids, half in and half out of synthetic stage simultaneously. And in large part, the explanation for this phenomenon – the idea of presence in another reality – would be in visual, sound and motor immersion mechanisms applied in virtual reality, because they are responsible for constructing narratives that encourage us to shift illusion to parallel universes, establishing therefore a kind of hybrid status for our perception of these techno-experiences (Zilles Borba, 2014, p.239)[5].

It seems that natural to the human interactions with digital interfaces encourage the individual senses to believe the organic body is really transposed inside the synthetic world (I felt, therefore I am in the virtual reality). But, at the same time, the reason insists on reminding him/her that those are digital simulations (I think, therefore I am not in the virtual reality).

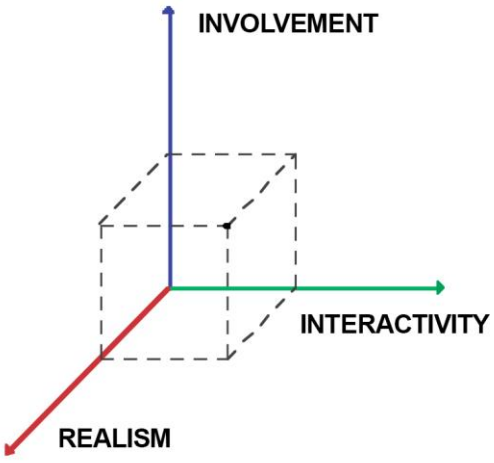

Figure 1: virtual experience immersion elements

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2. Methodology

This work methodology is guided by a literature review on the evolution of digital interfaces and a series of exploratory observations applied by the authors to different mechanism of human-machine interactions. The collected data is qualitatively analyzes with the support of a valuation model developed by the authors specifically to this study, and it is based in theories and empirical investigations (Miro, 1970; Kerckhove, 1995; Milgram, 2004). The methodology is our suggestion of measuring the perceived quality of user's immersion in the virtual space through a variety of interfaces models focusing the understanding of both sense and reason immersion in the simulation experience. The discussion of results is based in a technological way of thinking – McLuhan (1964), Deleuze (1988), Baudrillard (1994), Milgram (1994), Negroponte (1995), Levy (1999), Castells (1999) and Jenkins (2003). In resume, this essay is intent to bring contributions to understanding human perception and behaviors in technological environments.

3. Analyses: perceived quality of immersion with digital interfaces

At the compass of technical and technological advances in communications technologies – broadband, memory capacity, real-time 3D image processing, etc. – it is interesting to observe an increasingly trend to our operations with interactive interfaces turn in an analogic logic. It means, if in the early days of digital communication to user a computer the user needed to know a lot of command lines, nowadays her/his inputs to the machine are fully guided clicks, menus, windows, icons and graphic metaphors which creates a friendly-user experience. But, tomorrow it seems that the user will have even more natural experiences. They will look like experiencing the physical world. As we will see in next pages, the interactions with interfaces to go towards the reuse of human ability (to talk, to walk, to run, to jump, etc.). Therefore, this produces a more satisfactory dialogue between user and computer machine. After all, the person's cognitive effort to explore the virtual world through an interface will become low and, likewise, the complexity interpreting its communication mechanism will be accessible and easy to understand to every people (even those who have not experienced a computer experience yet).

Following is presented individual analyses of immersion experience with digital interfaces in different periods of its evolution on time. To any kind of interface were collected data and analyzed how the immersion feeling (senses) and the presence feeling (reason) were perceived by the user's perspective.

a) Command-line interface (CLI)

First human-machine interface interactions were totally based on the command-line writing. With the support of a keyboard as entrance dispositive, people could send specific functions to the computer. It means the experience with the digital interface is limited to user's knowledge on programming languages. For example, to make a good use of a MS-DOS operation system the user has to know the interface *modus operandi*. When interacting with this model of digital interface it is clear the existence of a barrier between real and virtual spaces. There's a huge absence of immersive mechanism, so the user easily perceives he/she is not involved with the virtual world (Figure 2).

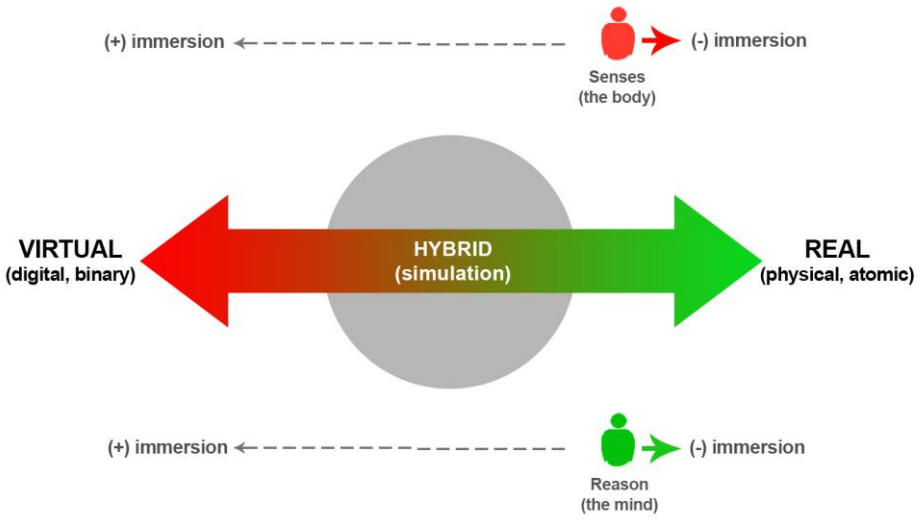

Figure 2: analyses of immersion experience with a command-line interface

b) Graphical user interface (GUI)

Graphical user interfaces bring to the human-computer interactions a more attractive experience. It happens because this model of interfaces brought the first image visualization experiences with the computer screen. Also, the depth navigation through the hypertext was responsible to create a new perspective to explore digital interfaces

and its contents. According to Friedberg (2006), it vantage point comparing to command-line interfaces is to visualize and manipulate objects with direct actions - *What You See Is What You Get* (WYSIWYG). Apple Macintosh, for example, was known for promoting a WIMP interaction (*Windows, Icons, Mouse, Pointing Device*), in which operations started to use a more intuitive human command entrance dispositive as the mouse. Furthermore, the content visualization has become organized into windows and icons, allowing users to navigate through different environments and even to select (and perceive) computer functions through predetermined menus in a friendliest way than command-lines typing. So, it was not anymore necessary to have programming language knowledge to start any dialogue with computers.

In resume, when exploring a graphical user interface it is possible to receive more vision stimulus then in the command-line interface (to navigate, to click, to select). However, it is important to underline that experiences with this model of interface steel requires some user learning about the machine *modus operandi* because it is not a natural to the human interaction, but a metaphor of real dialogs and spaces (Figure 3).

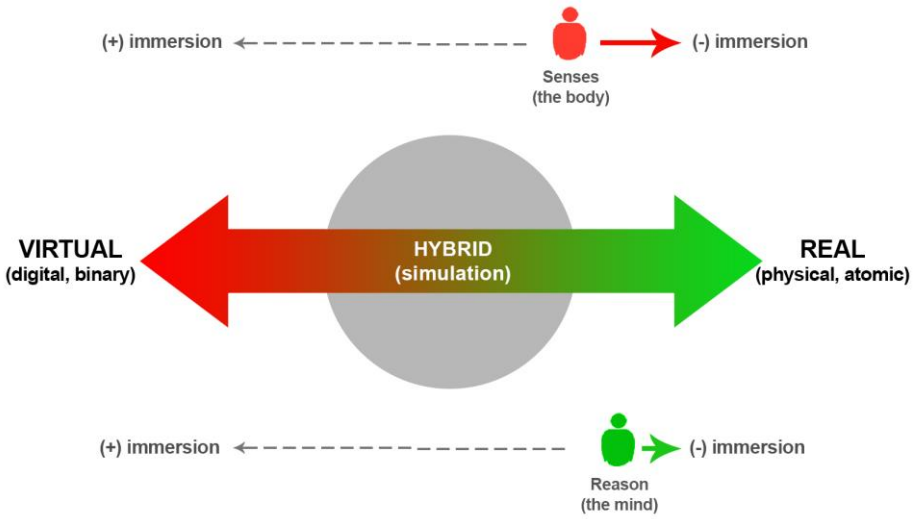

Figure 3: analyses of immersion experience with a graphical user interface

c) Three-dimensional user interface (3D UI)

Three-dimensional virtual reality dates back the old effort of Renaissance art to continue the physical space in a pictorial one. It transports in the user to the image world, but also

proposes something else: “the possibility to navigate into images, as if was possible to get inside, in fact, another reality”[6], (Ferreira, 2010, p.159).

The graphical factors, comparing to interfaces already seen in this essay, the 3D UI has a better capacity to imitate real world aesthetics (shape, color, texture, scale, depths). It means the user stops viewing metaphors of spaces (icons, windows) to visualize photorealistic elements (streets, trees, houses, stores, etc.). Because of this visual feature they are interfaces hugely used to simulated war zones, urban constructions and others complicated or dangerous activities to be conducted in the real world (Baudrillard, 1994). In the Second Life platform, for example, three-dimensional interfaces allow user to visualize in a computer screen simulations of an imaginary world based in the real-world aesthetics. This ensures a good engagement with the virtual world, especially because the subject can explore the synthetic space through the avatar eyes and, with it, to walk through streets (using the mouse and keyboard combination) and to talk with other users (microphone, speaker,). Using this kind of commands dispositive the user has a better immersion feeling, but it is true that it is a metaphor of natural movements of human beings which prevents the corporal presence feeling (Figure 4).

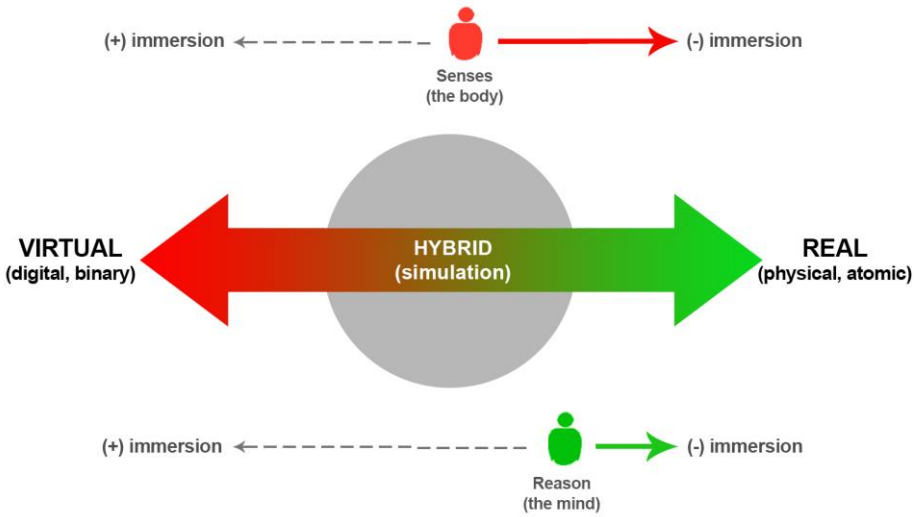

Figure 4: analyses of immersion experience with a 3D user interface

[6] Free translation

d) Motion sense interface (Kinect)

Gestural interfaces are associated with video games – Xbox Kinect, PlayStation Camera, and Nintendo Wii. The main characteristics of these interfaces are to track the movements and positions of the user's body to bring such information to the system without requiring any data input devices. So the user's body is the tool to send commands into the machine. Consequently, interactions with this model of interfaces proposes an intuitive and natural to the user experience, stimulating the immersion feeling and transferring the *modus operandi* paradigm (the operation mode) to a *modus vivendi* one (the living mode).

For example, when playing a tennis match the user doesn't really press buttons in a joystick. He/her moves the own body to literally apply a tennis shot movement in front of television screen. On this way, it is right to say that, even with the content visualization still inside a computer screen – the interface mediation starts to be more transparent. So, the machine is responsible to track and translate our natural movements to the simulation world visualized inside the television box and creating a kind of connection between the organic (user) and synthetic body (avatar) – a borrowed body, a detachable body (Figure 5).

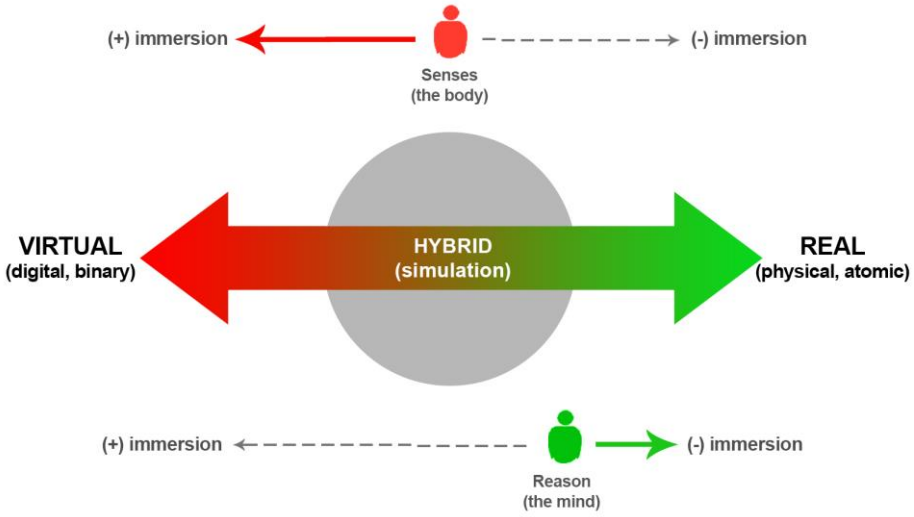

Figure 5: analyses of immersion experience with a motor sense interface

e) Head-mounted display interface (HMD)

The head-mounted display model of digital interface creates a strong appeal to immersion feeling in the user experience. This is because the senses are stimulated to believe that they are dealing with a physical context, not a virtual one (Pausch *et al.*, 1997). The stereoscopic technic applied to the visualization experience with the display screen is the responsible for creating this virtual presence illusion, not only because it computer graphics quality, but also because its capacity to cancel any notion of the physical space surrounding the user. Oculus Rift, Google 3D Cardboard, Samsung Gear VR or Sony Morpheus are examples of HMD devices in which the user experiences hybrid perception feelings with the objects, spaces, body and, even, the reality. Also, with this high quality image experience, the user body movement can be tracked, adding to the vision sense some great proprioception and kinesthetic stimulus.

In fact, the senses are stimulated to believe that dive into a parallel world. And even if the reason knows that these are electrical simulations, the feeling of presence in the digital environment is convincing (realistic, interactive, involved). Looking to the immersion analyses graphic is possible to diagnose the existence of a perception conflict, where senses and reason take a forked path to interpret what is real or virtual in the simulation experience (Figure 6).

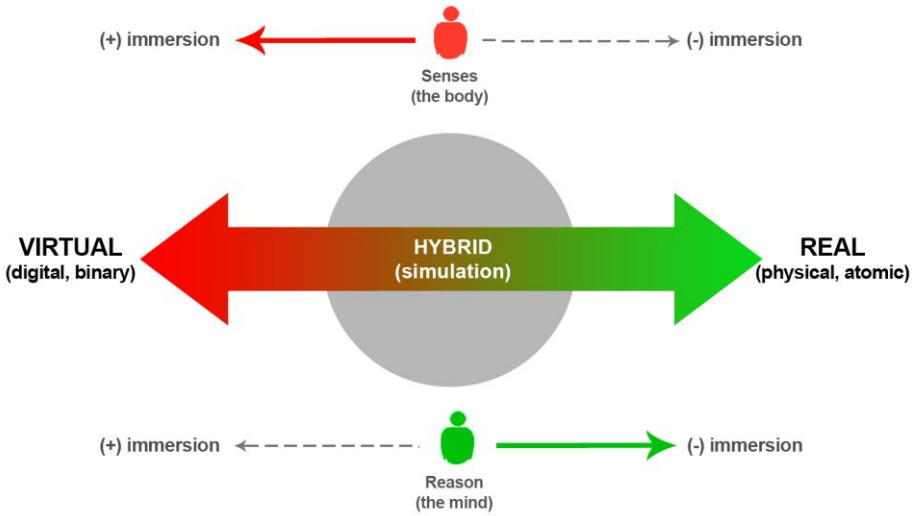

Figure 6: analyses of immersion experience with a HMD interface

f) Cavern Automatic System Environment Interfaces (CAVE)

One of the most advanced models in virtual reality available is the Cavern Automatic Environment (CAVE). When interacting with its interface the user is stimulated to dive in the three-dimensional context through a high-level presence illusion in the virtual stage. "It is a stereoscopic multi-projection system mounted in a cube form, where high-resolution images are projected on each side of its walls, allowing users to be fully inserted (immerged) in a computer generated simulation"[7], Zuffo *et al.* (2001).

In a CAVE interface paradigm the subject establishes cognitive relationships with a computer system because makes use of his/her senses, especially the natural movements of the body, vision capture and stereo audio experiences to perceives space and objects around. So, any knowledge about the physical world is fundamental to explore this kind of virtual interface, creating a more natural interaction to the human. In a technical way, the visual immersion occurs due to the stereoscopic equipment (projectors, 3D glasses, etc.), while the motor immersion depends on track dispositive capacities to identify and translate the user's body movements inside the cube (tracking cameras around the cube structure). "In a CAVE system, the mind and the body are stimulated to have a virtual dive, specially supported by audiovisual and motor impulses of the artificial reality, setting a high notion of presence", (Zilles Borba, 2014, p.246).

When interacting with a CAVE system in the facilities of the Interdisciplinary Center of Interactive Technologies from the University of Sao Paulo (CITI-USP) it was diagnosed an excellent quality on the images projections inside the cube. To see them in a huge scale brings a more natural perspective then visualizing virtual worlds in a traditional computer screen. In fact, as the HMD visual immersion experience, the objects and spaces have the same aesthetics realism (shape, color, texture, depth), but the natural scale generated in the cube walls and ground (three meters each side) creates a huge involvement to the user, who really feels bellowing that context. As the Figure 7 shows, with this technological interface senses are stimulated in a similar way to the real world, creating an illusion of body presence in the virtual world. It is a case to underline the empirical idea that if people can fell the reality they are living that reality. However, the reason is always stills remembering it is a virtual experience, bring they back to the real world and, consequently, creating a kind of hybrid situation, which is conflictual to

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human perception – after all the senses and the reason always operate together in the formation of the notion of reality – placing the user in a hybrid point where there is a paradoxical intersection between both realities: real and virtual.

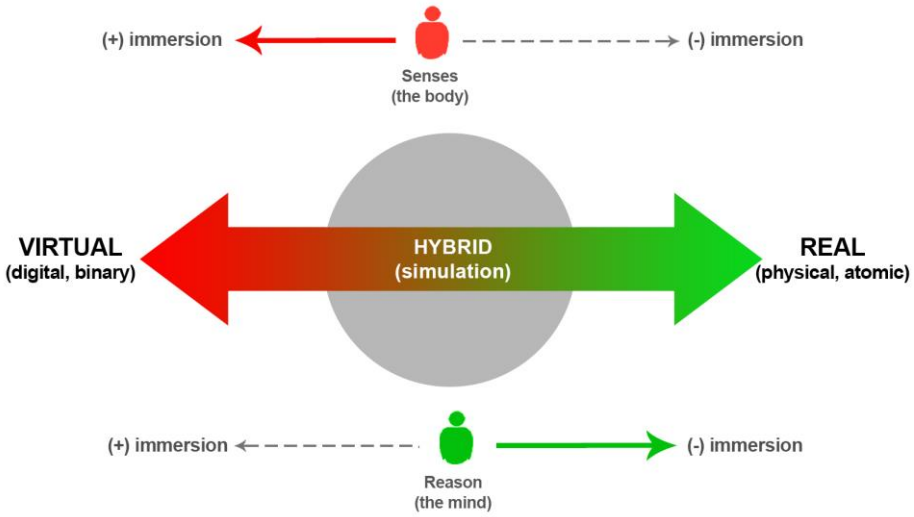

Figure 7: analyses of immersion experience with a CAVE interface

4. Reflections: discussing and comparing immersion experiences

As seen throughout this work, technical and technological development of digital interfaces are directing the human-computer relationship to a more natural and intuitive performance. Whether because the visual realism (image), involvement (space) or interactivity (dialogue) there's a trend of returning to the logic of physical activities. Such phenomenon is observed in two levels: a) the visualization experience (from the metaphor to the realistic analogy) and b) the operation experience (from the click to the gesture). Also, as already appointed, this kind of transformations in the communications mechanisms with the computer machines are eliminating any need for learning the operating mode of an interface (modus operandi) to give place to a new experience paradigm linked to the natural habitat of human being.

By looking at the graphic schemes that summarize user's immersion in each one of the digital interface models observed in this essay, it was notable a large behavior division (and understanding) between the ones mediated by a traditional computer screen (Figure 2, 3, 4 and 5) and those which are not (Figure 6 and 7). In the first group it is possible to diagnose that presence feeling is based in a metaphor, especially because the immersion sense is only projected through representation of conversations, movements and/or

spaces. Also, in this kind of interface, to navigate user has to know something about system interaction logics, because it's not natural to his/her cognitive knowledge. Only in the Second Life (Figure 4) and the Kinect (Figure 5) it was identified some hint of immersion feeling commanded, respectively, by audiovisual and corporal stimulus.

In turn, with the digital interfaces not based on traditional computer/television screen it was diagnosed a new notion for the virtual experiences. Figures 6 and 7 show how the user has a conflictual understanding of space, objects and even his/her own body. Looks like, the senses were tricked to believe the organic body dives into the virtual reality (at least some parts of it) creating some psychological conflict with the brain. The technological evolutions produced a more immersive experience to the body and, also, the idea of presence in the simulation, while user's mind stills remembered that it was all about an imitation of physical reality.

Conclusion

First of all, to create a total immersion feeling, in which even reason believes to live in the virtual context, it was concluded that multi sensorial stimulus must to be aggregated to the techno-experience. It is imperative to prevent any sensorial organ of identifying elements responsible to break the simulations of a physical ambience during the virtual one (sight, hearing, touch, proprioception, kinesthetic, smell, taste).

Also, it was concluded that even though screens are experts mediating digital contents, they act like frames responsible of canceling user's immersion. In the future, to create a more natural to the human interaction, it is a need to annulated them (also the command devices, such as: keyboard, mouse, joystick), assuming a strong transparency as mediators between real and virtual worlds.

Also, it is possible take the conclusion that natural to the human interfaces, by now, produces a perceptive conflict to the user understanding of space and body. It happens because he/her feels inside the virtual space, but the reason knows it is all about a simulation. So, as the interfaces keep its evolution, on the way the will turn totally natural to the human cognitive actions, the subject's perception (and emotional resolution) will be more linear leading us to believe living as a complete organic body (or something else) in the virtual context.

With this last conclusion, also is possible to predict that in the future, independently of the technical knowledge people have on the computer machine – its logics, commands and languages – everyone will be able to interact with virtual contents and/or other humans through the telepresence virtual technologies. In fact, this perspective indicates that digital exclusion because the absence of cultural knowledge on electronics interfaces will be an outdated barrier and, as consequence, it will promotes accessibility, interconnectivity and extent the human mind and body through digital communications flow responsible for our transcendence as human being.

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