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What is it like to be an Avatar?
The Phenomenology of Immersion in Computer Games

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Abstract

Immersion is a type of experience characterizing the gameplay of computer games. I propose a phenomenological model that defines the essential features of such experience. I start from the notion of immersion as a graded experience composed by three phases: engagement, engrossment, and total immersion or presence. Then, I put in relation these three grades with a phenomenological framework in which I explain how the immersion is experienced by the player. In the first phase of gameplay (engagement), players discover and learn how the game works, as well as its commands. When she has assimilated sensorimotor skills demanded by game mechanics in her body schema, the computer game as interactive medium becomes experientially transparent. The player is not longer aware of the computer game as an interactive medium, but she is experiencing a virtual environment that appears rich of affordances and obstacles for goal-directed actions. In the second phase (engrossment), the avatar turns into a prosthetic extension whose function is to extend the physical body of the player in the virtual world so to realize her intentions and plans. The experience of computer games is rooted in the prosthetic extension: through the magic of real-time control, it is like if the player is reaching directly the world of the game by means of a prosthesis, an extended arm. In the third phase (total immersion), the player feels like an embodied presence who is “there”, in the game world. I suggest that presence arises only when the player can interact with 3-D game space, and when the avatar is a navigable point of view provided by camera device. Also, the presence occurs when the player represents the game environment as an egocentric space whose point of origin is her own body, and this is possible because of body schema's plasticity. I conclude arguing the our embodied experience can be modified, reshaped, by interacting with interactive media. More specifically, the body is a nest of potentialities that can be discovered and actualized by media, whereas the physical body is only one of its shapes.

Keynote: Immersion; Presence; 3-D environment; Gameplay; Phenomenology.

The problem of immersion in computer games

A computer game is “a rule-based system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels emotionally attached to the out come, and the consequences of the activity are negotiable” (Juul 2005, p. 36). However, computer games are different from any other kind of games because “the computer upholds the rules of the game and where the game is played using a video display” (Juul 2005, viii). But computer games are not only a rule-based system, as they are ludic projects that constrain a space of possibilities for the user, which means due to their design they generate experiences, they are experiential engines, so “it is possible to describe a game as a formal system that will then generate an experience when played” (Sicart 2008, p. 35). Interacting with a rule-based system affects the player, who lives an qualitative experience. This experience is the immersion.

In game studies the notion of immersion has been frequently discussed. Resuming Bateson's metacommunication, Katie Salen and Eric Zimmerman (2003) argue that playing is a double-consciousness process, wherein the player knows that what pretends to be real actions are effective only in game world, therefore she is always aware of the artificiality of play. The double-consciousness of play is a sort of remediation that links the transparency of medium (i.e., medium's potentiality of reproducing authentically the real world or making an alternate reality) to the awareness of artificiality of play (i.e., hypermediality, the perception of media as designed and artificial). For instance, in the first-person shooters, such as *Halo: Combat Evolved* (Bungie Studios, 2001), a part of gameplay experience is immediate, defined by the sensory vertigo provoked by navigating in a 3-D space. But playing this kind of computer games involves also the awareness of user interface, as player employs strategically the pause-game, in-game chat, or advices shared in non-ludic social contexts (e.g., social networks, web sites, forums, etc.).

As stated by Salen and Zimmerman, the immersion is not an experience of "being there", in the game. This fallacy occurs when players are engaged in a practical activity that seems to take an its own "reality", emphasizing overly the forms of pleasure elicited by engagement, and ignoring the double consciousness grounded in the gameplay. Also, the fallacy of immersion is often supported by the assumption that at a level of engagement and involvement, players self-identify completely with the game's main character, so that the frame of the play fades away, losing themselves totally inside the diegetic dimension. However, the authors claim that the relationship between player and character is not a type of self-identification, but it is based on the double-consciousness of play. The main character is a person through which a player engages in a fictional world. This relationship may be deep and emotionally immersive; nevertheless, at the same time, the character is a tool, a puppet, an object that the player manipulates according to the rule of play. In this sense, the player is aware fully of the character as an artificial device.

Of course, not everybody agrees with the immersive fallacy's thesis. Game designer Ernest Adams (2003), for example, claims that there are three types of immersion: 1) tactical immersion, a gameplay based on the immediate and physical flow of events, demanding reflexes and hand-eye coordination; it is what people call being "in the zone" or "in the groove", and arises from challenges simple enough to allow the player to solve them in a fraction of second, while it is destroyed by sudden changes in gameplay (e.g., challenging boss who brakes the continuous flow of event; awkward controls); 2) strategic immersion that arises when the gameplay demands a search for successful strategies within a wide range of possibilities by using logic deduction in order to achieve the wished goal, it is caused by enjoyable mental challenges and broken by awkward or illogical gameplay; 3) narrative immersion is a gameplay that provokes a player's emotional attachment towards story's characters and a deep interest about how the story is going to end – the player who is immersed in the narrative can tolerate an amount of low-quality strategic or tactical gameplay, while it is created by good storytelling and destroyed but bad one (e.g., stupid characters; inconsistent plot; clumsy dialogues).

Gordon Calleja (2007) reinterprets the immersion in terms of incorporation. The incorporation is the subjective experience of inhabiting a virtual environment facilitated by the potential to act meaningfully within it while being present to others. It occurs when in the gameplay the distance between player and virtual environment fades way, so that the space of game is experienced as surrounding environment and the avatar's actions as own acts. The incorporation takes place by two steps: (i) the incorporating, which is the assimilation or internalization of tactics (tactical involvement), personal or designed narratives (narrative involvement), communication and presence of other agents (shared involvement), movements (performative involvement), within a habitable domain (spatial involvement); (ii) the re-incorporating, that is to say the inclusion of the player's bodily representation in the virtual environment through the avatar.

Still, according to Yellowless Douglas and Andrew Hargadon (2000), the immersion arises from the pleasure that the player feels when involved in the flow of familiar schemas. Schemas are data structures that represent general concepts, knowledge about states of affairs, which allow agents to perceive and comprehend local data, and eventually to act accordingly. Therefore, schemas are perceptual expectations about what the agent perceives in the surrounding environment. The authors claim that the pleasure felt in the storytelling derives directly from schemas, especially when the text matches a familiar conceptual structure. Agents build schemas about books or movies encountering frequently these genres, as well as reading the critics. Schemas employ the local details to recognize the genre of the work informing the agents about how interpreting them.

In computer games, the pleasure of immersion arises when both narrative and interface are perceived by the player through familiar schemas allowing her to enjoy the virtual experience. The pleasure of engagement derives from our ability of recognizing a overturning or conjoining of conflicting schemas from a perspective outside the text. It lies in our ability to remind a set of schemas which can direct us towards the authorial intention. Finally, the engagement brakes the matching between text to interpret and interpreter's schemas, making decrease the immersion.
Nevertheless, according to Douglas and Hargadon, some computer games can be both immersive and engaging. In some of them, where the narrative immersion dominates, it is possible to find some features of the engagement as they demand to gamer/reader to search for the schemas more appropriate to progress across the text. For example, *L.A. Noire* (Team Bondi, 2011) has features typical of thriller books, but the player is not only immersed in the narrative to the extent that she must use detective intuition and logical deduction to query the suspects, understanding who is lying, combining the clues, and choosing who to accuse of murder. At the same time, even some engaging computer games show immersive elements such as dramatic suspense, chronological and causal sequences of events. The pleasure of reading an interactive medium is much strong when there is a balance between immersion and engagement.

Immersion as a graded experience

As we have seen, there are different points of view on what is immersion. However, I think a good starting point can be the model of immersion as a graded experience (Brown and Cairns, 2004; Jennett, Cox, and Cairns, 2009). While in virtual reality systems the immersion is immediate, in computer games takes more time and discloses gradually through three progressive levels – where “progressive” means that the player can experience a lower level without experiencing the higher ones:

1. engagement: the user invests time, effort and attention in order to learn how to play and master game's controls;
2. engrossment: player's emotions are directly affected by the game (it depends on how the game has been designed: plot; graphics; interesting targets);
3. total immersion or presence: the player feels like “being there”, in a synthetic environment, like it was immediate, therefore she is detached from everyday reality and responds only to what occurs in the game world (it demands a high level of attention, and it is harder to reach than the previous two).

The first step of immersion is engagement that consists in investing time, efforts and attention in order to learn and master game's controls. This phase ends when the player is able to achieve a flow-like state characterized by temporal dissociation, sense of control on the game, sense of challenge, emotional involvement, attentional focus, balance between challenges and skills (Csikszentmihalyi, 2009). Nevertheless, unlike the flow, the immersion is not an extreme experience (Cowley *et al.,* 2008), but arises mainly when there is a full matching between the level of challenge and the player's skills. The experience of engagement thus starts from a phase of detuning between player and rules of game and ends in a phase of full tuning, which is a flow-like state. The phase of tuning is broken only when the player meets a new challenge that demands the extension, improvement, and enhancement of skills.
This phase unfolds as a process of *assimilation* or *internalization* of game's controls in the body schema. The body schema includes the proprioception, i.e. semi-automatic mechanisms that adjust steadily the posture, and a system of sensorimotor skills that allows to control and perform the intentional actions (Gallagher and Zahavi, 2008). Learning a sensorimotor skill, such as controlling the avatar's movement in a 3D environment, takes place gradually. Initially, the player focus on sensorimotor correlations produced while she is performing a task in the game. For example, the

perceptual system of player detects that the pressure on the handle's joystick toward the left of her body (proprioception) makes a recurrent sensory variation, such as the kinematics of images on display. When the regularity in these correlations has been detected and assimilated, the player does not pay more attention on action's control, so that her body tends to disappear, turning transparent. Most of everyday actions are performed without focusing attention on body's performances, because the agent is using sensorimotor skills assimilated by the body schema. The same is true for those skills demanded by computer games.

The assimilation of game's controls is constrained by two factors (Jennett, Cox, and Cairns, 2009). First, submission to the game, namely in computer games the interaction with the virtual environment is limited to a number of pre-set gestures that due to arbitrary nature (e.g., pushing A button to kick an opponent) need a full internalization of controls in order to become transparent: the player must submit to game's mechanics, accepting limits and the bounds fixed by the *medium*. Computer games try to overcome these limitations by the pleasure of play felt by player when she experiences a great sense of control on the virtual environment.

Second, during gaming it seems to take place two forms of disembodiment. The player begins to ignore her physical body (i.e., body that pushes the button on the keyboard, moves the mouse allowing the images on display to unfold) and focus on what happens to her virtual body: the avatar is internalized by the player. Then, the virtual body itself turns transparent as it is overshadowed by intentions and plans that player tries to achieve and realize in the game world.

The second phase of immersion is engrossment. The main feature of engrossment is involvement, which discloses six possible experiences (Calleja, 2007):

1. tactical involvement, brought out by game mechanics demanding action planning based on calculation of interdependent variables (e.g., real-time or turn-based strategy games);
2. performative involvement, provoked by the sense of control on digital agent's movement;
3. affective involvement, elicited by a gameplay that affects player's emotional states (e.g., pleasure, fear, frustration, anger);
4. share involvement, caused by a gameplay that occurs in shared environments (e.g., MMO games), where players' actions are public, she can build a reputation, and join social groups;
5. narrative involvement, put in motion by the emotional attachment to characters and the interest in plot, or by making a personal narrative (i.e., emergent story);
6. spatial involvement, provided by the internalization of a game's area (i.e., maps, levels, regions or worlds) in order to locate oneself within it.

In this phase, three kinds of identity (Gee, 2008) play a role in player's immersion: (i) the real identity, that is all the physical, psychological, cultural and social features, as well as sensorimotor skills, that determine the identity of an embodied person; (ii) the virtual identity, namely the protagonist's identity that is defined by the game design, aims and beliefs prespecified by the designer; (iii) the projective identity that it has to be intended in two ways: the player's values and desires that are projected in the avatar, and the perception of avatar as a tool through which to achieve them. So, in this phase, computer games are nothing else than "action- and goal-directed simulations of embodied experience" (Gee 2007, p. 254). Character's virtual mind and body turn into a surrogate of player's mind and body. The avatars are extensions of player's body through which executes actions and goals that need a digital representation of body to unfold in game environment. Only when the player's purposes coincide with virtual character's designed aims, it occurs an identification of the player with the virtual identity - which, nevertheless, must be not confused with the sense of presence since a player can take hold of virtual character's purposes and, at the same time, does not feel "in the game", using the avatar simply as a prosthetic extension of her physical body.

Presence is not a mere identification or absorption of embodied subject with a virtual agent: when she feels presence, is not *Ezio Auditore, Lara Croft* or *Alan Wake*. Presence concerns the player as embodied agent, that is to say her real identity, and it occurs even without the projective attitude –

which can promote it at best. As I will show, since in order to orientate, locate oneself and drive the behavior purposely in game world the embodied subject uses her body axes instantiated by a virtual body, it is more correct to say that she is there actually by means of avatar's vicarious body. When the player moves and acts in the game world by using her own body axes, she is like “there”, “in the game”, as both proprioceptive and sensorimotor systems are operating in such a experience.
My phenomenological approach has found the conditions of possibility of immersion in three phenomenical features: the transparency of medium, the prosthetic extension, and the (tele-) presence. Only when user-game interaction implements those conditions, immersion discloses.

Transparency of medium

The transparency of medium is the condition of engagement phase. It occurs in gaming when the player is not longer aware of her physical body (i.e., she does not focus attention on bodily movements) and the medium (i.e., computer) as well, turning experientially *transparent*. Player-controlled avatar turns into an extension of player's physical body, a “digital surrogate” of real body through which the player performs goal-oriented actions in the game world. It occurs when the player by interacting with game environment discovers kinesthetic-tactil correlations, recurrent sensorimotor loops which will be assimilated in the body schema.
The transparency of the body arises when the sensorimotor skills, learned during gameplay, are integrated in the player's body schema (i.e., they become automatic or semi-automatic), namely the system of bodily capacities and sensorimotor skills that support our goal-oriented actions and operates without perceptive monitoring (Gallagher 2005, pp. 26-31). The body turns transparent because an implicit sensorimotor and embodied knowledge is employed in the execution of own actions: when a sensorimotor skill is assimilated, which means the agent is well-trained, agent's bodily motion is overshadowed, and the attentional focus is fully addressed to intentions. For example, if I try to reach a water glass with the intention of drinking, my hand and sensorimotor coordination are fully out of my awareness, while I am aware only of my conscious intention. However, my hand conforms precisely and automatically to the shape of glass in order to grab it due to an implicit sensorimotor skill. It occurs in every practical activity. For instance, when I catch a ball, I do not pay attention to the complex sensorimotor coordination enacted by my body, I am just aware of the intentional action of catching it, my attention is fully addressed to that action but not to bodily motion.
Experiential transparency does not concern only parts of physical body, but even physical tools when absorbed in body schema. Think about driving a car. A well-trained driver does not focus attention on the spatial position of the gear shift, steering wheel, accelerator or clutch pedal, as well as to the hand-motion to change gears or foot-motion to push the accelerator. She is not aware of the car as well as her bodily movement, bur rather attention is fully directed to the goal of intentional action (e.g., going to a place): the car turns transparent, just like the parts of the physical body when an intentional project is actualized. For example, when a well-trained driver has to move in a narrow street, she is not longer aware of the distance between the car and the sidewalks, but already knows whether she can go through or not, just like she already knows whether her body can go through a door or not. This means the car is turned into an extension of the body of the well-trained driver, so that concurs to determine a range of new skills that may be used to achieve many intentional projects.
User-tool assimilation concerns the graded experience of immersion too. First, user discovers lawful sensorimotor correlations between her body, interface, and game environment. At a first stage, when she interacts with the tool (e.g., press controller's knob by a thumb), the player experiences kinesthetic-tactil links between body motion (i.e., finger's movement) and sensory variations (e.g., the knob that bends to the finger's pressure). That kind of sensorimotor correlation is recurrent, as anytime that is enacted a class of movements will produce a class of sensory variations coming from the controllers. At the same time, the same class of movements is always coupled with another

class of sensory variations, that is the avatar's locomotion toward a direction of game environment. At a second stage, therefore, the user discovers lawful correlations between such a class of bodily movements and such a class of in-game sensory variations, which operates as sensory feedbacks that accordingly will affect the next player's movements.

Second, by the practice, the player will be progressively less aware of sensorimotor lawful correlations, until they will completely turn transparent while she can focus totally on the conscious intentions achievable just by virtue of them. In computer games with 3D graphics in which the avatar is a first-person perspective, such as *Half-Life 2* (Valve Corporation, 2004), the transparency is achieved gradually when the player discovers the sensorimotor laws between the fingers' motion on the keyboard and the sensorimotor variations produced by the avatar's locomotion. She uses some fingers of the left hand to press keys on the keyboard (usually W-A-S-D) and the right hand to move the mouse. While left hand moves the avatar's head, the right hand the whole digital body. By exploring, manipulating and moving in the virtual environment, the player uncovers the laws inherent to the correlations between the hand motion and the sensory variations (i.e., visual outputs). When these laws are assimilated in player's body schema, the transparency occurs. I guess that the lawful correlations in computer games are well encoded in game code by programmers, whereas in real life they are nested in the interaction between the animal and ambient.

Howsoever, in gaming, when the transparency of medium arises, the player is not longer aware of computer game as an interactive medium, but feels a virtual environment rich of affordances and obstacles for goal-directed actions. What she experiences is not her own physical body, the interfaces (i.e., controller, console, display) or the computer game as an object, but she perceives a world with things to do, goals to achieve, and dangers to avoid. This is possible because the assimilation of avatar's limitations and skills in the body schema discloses a new range of possibilities and choices that could not be achieved by the physical body. When it happens, the experience of immersion evolves in the second phase: the prosthetic extension.

Prosthetic extension

Prosthetic extension is the embodiment in the body schema of tools and objects located outside the physical boundaries of the body in order to achieve goals and perform actions. It is well known that our body schema is really plastic and dynamic, as it can be reshaped during the experience and extended beyond the body's boundaries through the embodiment of external objects or everyday tools (Merleau-Ponty, 1962; Botvinick and Cohen, 1998; Gallagher and Zahavi, 2008; Noë, 2009): the body schema is a flexible and extendible form depending on the intentional projects, which means its boundaries change in relation to the agent's intentionality.

In computer gaming, the player embodies in the body schema the avatar's digital body. Therefore, the avatar turns into a prosthetic extension whose function is to extend the physical body of the player in the game's virtual world so that she can achieve a number of pre-set goal-directed actions. Since *Spacewars!*, the experience of computer gaming was grounded in the prosthetic extension: through the magic of real-time control, it is like if the player is reaching directly the world of the game by means of a prosthesis, an extended arm (Klevjer 2012, p. 19).

This feature arises only in the engrossment phase when the player uses the prosthetic extension to achieve intentional projects in the game environment. Since she has an implicit sensorimotor knowledge of interface, obtained in the engagement phase, the player feels the avatar to obey directly to her will using it as the effector of action planning. Digital body's designed structure predetermines affordances and obstacles of goal-directed in-game actions, constraining the actions which the player will be able to do in the virtual world. The game world, accordingly, will appear *habitable*, full of familiar things or activities, because the player has embodied in body schema the digital body's constraints: now virtual body's possibilities of action are experienced by the player as her own possibilities. This computer representation of body is turned into the player's extended arm by means of which she can reach the digital world.

Condition for the prosthetic extension is the inherent coherence of kinaesthetic-tactile correlations put in place during gameplay. The basis of this experience is a mechanism of multisensory integration in which visuo-auditory (i.e., game's outputs), kinaesthetic (i.e., hand-eye motion) and tactile (i.e., holding, handling the controller) data are integrated in a whole subjective experience that is the feeling to act in the game. When the player is playing, discovers coherence in the sensorimotor correlations used as expectations about game's events. When a sensorimotor coherence has been uncovered and assimilated, such as “if I move the joystick ahead, the avatar moves forward”, the player awaits that a class of real movements (e.g., finger's movement forward) matches an exact class of sensory feedbacks in the virtual environment (e.g., avatar's locomotion ahead). Therefore, the player experiences the act of controlling the avatar because a set of her real motion is lawfully linked to a sensory experience happening in the game world: this is a practical knowledge that involves the player's expectations on the game's events which can be used in order to drive the avatar's behavior in virtual environment and achieve personal purposes within it, as well as the designed ones. Discovering and assimilating sensorimotor correlations contributes in a decisive way to extend the boundaries of own body and incorporate in the bodily experience even the inanimate objects. Due to the practice, the agent can assimilate inanimate object in body schema so as to be employable as transparent effectors of intentional actions, like they were parts conjunct with the rest of agent's physical body.

The prosthetic extension involves the extension of the *sense of agency* (i.e., the feeling of initiating and controlling the own actions) in the game world. The sense of agency mediated by the prosthetic extension is promoted by two factors. First, *the control of action* in the game's environment. During the phase of engagement, the player apprehends the commands, assimilates them in body schema, and discovers recurrent lawful correlations between hand-eye motion and sensory variations as effects of in-game events. The player therefore comes to an implicit sensorimotor knowledge of the game world that could be employed to drive the intentional actions and achieve the personal/designed goals within it. The second factor is an intentional project encapsulated in the different types of involvement and self-identification with the virtual character. The player feels to be the author of the game's actions because *she is doing something within it*, that is to say because she is achieving an intentional project. The sensorimotor skills are just a function of the player's intentional project and not the other way. This would explain also why the players experience certain in-game actions as own actions even though they use poorer and more limited skills than those in real world. Notwithstanding the actual movement performed to achieve a certain purpose in virtual world is not the same type of that put in place to reach the same purpose in real world, the two movements are experienced in any case as multiple motor modalities employable to achieve *same identical intention*. Consider the relationship between the motor ability of jumping a fence in treal world and the corresponding ability in *Assassin's Creed III*'s world (Ubisoft Montreal, 2012). In the real world, an ability of this kind requires the involvement of the tendons and the muscles of the legs (i.e., they must bend in order to produce the necessary power for elevation), arms (for the leap) and hands (to grab the support). In *Assassin's Creed III*'s designed environment, the only sensorimotor ability required to achieve this goal (i.e. jumping a fence) is to keep pressing forward the controller's knob and the button to which the designer has assigned arbitrarily the action of jumping. Therefore in this type of game world, the intentional action of jumping a fence involves the execution of a very different motor program that includes the tendons and the muscle of the fingers, hands, wrist and arm. However, what enables the agent to experience the execution of the intentional actions in the game environment is not the sensorimotor ability itself rather the fact that the agent is able to fulfill the same intentional project by two different motor programs achieved in two worlds with which she can interact very differently. Therefore the bridge that links those two different sensorimotor skills is the agent's intentional project, they are thus two distinct ways to do the same thing. So, it is possible to experience the intentions in the game world even though we are not performing the same movements that we would do in real world because, on the one hand, due the artificial nature of the medium, the game environment has rules of interaction different from those we find in real world, and on the other hand, because in any case the players are able to achieve intentional projects within it. For this reason, video games allow the player to realize her own intentional projects by developing sensorimotor skills alternatives to those demanded by the normal interaction with the real world. In this sense, when the player has learned the practical knowledge of how to interact with the virtual environment by incorporating the avatar in body schema, the avatar itself turns in a body extension of the player through which to realize intentional projects and achieve goals in the game: *by means of the avatar as a prosthetic extension the player is enabled to do things in the game world*.

The presence, or “being in the game”

All computer games extend the player's sense of agency in the game world, that is the feeling of controlling actions and acting purposely within it. Such extension is the condition for a type of immersion through which the player feels like being in the game with a part of body – the prosthetic extension. However, the player's embodied experience still stays in the physical world. It is like if the player had stretched the prosthetic extension of her arm or finger in the virtual environment, whereas the local space where she is physically located has been broadened. The player is not present in the virtual environment, but it is the latter to be present in the surrounding space: in this case the immersion is not a “being there”, but rather an “it is here” (Floridi, 2005). This kind of immersion masters the engrossment phase whose main feature is the prosthetic extension, but it is not a kind of presence that involves the player's whole body.

In a deeper grade of immersion the player feels like to be in the game, a bodily presence in a virtual environment. This type of presence has been often defined as the perceptual illusion of being in a immediate environment (Steuer, 1992; Lombard and Ditton, 1997; Slater, 1999). This phenomenon involves real-time responses of cognitive, perceptual, sensory, and affective systems with objects and entities located in the virtual environment, and occurs when a person fails to perceive or recognize the existence of the medium in environmental communication and responds to it like there was an immediate physical environment. The presence as a perceptual illusion occurs when the medium appears invisible or transparent, so that the user seems to share the same physical environment with the medium's contents (i.e., objects, entities).

However, is immersion just a player's illusion actually? In my opinion, it is not. According to some scholars (Mantovani, 1995; Zahorik and Jenison, 1998), the thesis of immersion as a perceptual illusion refers implicitly to the ontology of naif realism that conceives the reality as a well-defined set of objects located outside the mind. In the act of knowing, the subject perceives the state of these pre-existing objects. The naif realism explains the relationship between actual and virtual environments as the relationship between actual and simulated states of affairs, where the latter appear like if they were real causing thus a persuasive perception, but illusory too, of actual objects. By the naif realism, the virtual environments are spaces of *consensual hallucinations* in which human perceptual systems fail considering an illusory state of affairs as “real”. Consequently, who endorses this ontology posits a distinction between “natural” immediate and “artificial” mediated experiences (Steuer, 1992). Hence, such traditional approach promotes the understanding of virtual presence as the epistemic failure of recognizing the technologically mass-mediated nature of her own experiences.

Nevertheless, this approach has been criticized from multiple points of view. The first objection is about its ontology. Such approach, in fact, opposes virtual reality and actual reality, as the latter is apodictically indisputable. But this is not true. Since even the experience of the actual reality is *mediated*, to the extent that according to the naif realism there is a gap between subject and object filled by mental representations which mediate between inner and outer world, in principle it is logically possible the solipsism (i.e., physical world does not exist actually, all what exists is subjective, a mental world). For instance, it could be possible that our mental representations are not connected to the outer world but rather to a super-computer that simulates a non-existent world (e.g., Putnam, 1981).

Also, it is been remarked that the distinction between mediated and natural perception is futile, as even the latter is mediated to the extent that the sensory stimuli must be always interpreted by higher cognitive functions (e.g., memory, emotion, cognition) in order to drive the behavior (Min Lee, 2004). Accordingly, the presence is always mediated both by physical (e.g., physical body, technological devices) and culture-dependent conceptual tools, that means the “physical” presence is not more real or truer than immersion in a virtual environment. As the perceptual-motory loop occurs both in an actual and virtual environment, there is not intrinsic difference in the stimuli coming from both (Ijsselsteijn and Riva, 2003). The fact that we can feel the presence in one or other depends on which perception is dominant in a given time: in fact, the computer-generated and local environment compete for subject's limited attentional resources, so that tele-presence (i.e., presence in a virtual world) takes place only when many perceptual and cognitive resources are allocated in the digital environment rather than in physical one (Draper, Kaber, and Usher, 1999). In fact, a perception prevails over another only when the attention focuses on it because of bottom-up or top-down psychological processes (e.g., in a mediated environment, the presence could be strengthened if the environment is perceptually salient).

Other critics have questioned whether the presence is an epistemic failure of not recognizing the mediated nature of the perception. As philosopher Luciano Floridi (2005) remarked, the epistemic failure entails that a participant, who does not fail to recognize the technologically mediated nature of her own experience, cannot be tele-present in a remote or virtual environment. But a doctor may keep to operate a patient with success at distance, even if he is aware of the mediate nature of such perception. Or, a soldier can be tele-present in a minefield by a robot, regardless the possible perception of the artificial nature of his experience. In short, a subject can be tele-present to something both whether she is aware or not of the technologically mediated nature of own experience.

Presence and computer games

Alison McMahan (2003) argues that computer games can facilitate the presence when they fulfill one or more of presence's six dimensions characterizing even the experience of virtual reality too:

1. *the quality of social interaction*: if the game design facilitates the sense of “being together” through a shared environment, namely a space wherein user's actions can be seen by the other participants, and in which it is possible to carry out collaborative activities, the presence will arise during gameplay – in fact, in computer games, shared environments (e.g., multiplayer FPS) and gameplay designed for the social interaction (e.g., MMOs) are heavily used to let emerge the presence;
2. *the environmental realism* (i.e., graphics, sound): in computer games the environmental realism can be promoted by social realism, when the medium reproduces events or activities that usually take place or could happen in the immediate social world (e.g., in *Elder Scrolls v: Skyrim* it is possible to celebrate weddings, coronations, religious rites), and the perceptual realism, which depends on virtual environment's degree of similarity with the real world, indeed as we know nowadays a big amount of computer games manifests graphics tending to the photorealism;

3. *the feeling of "transport"* - the sense of "being there", "here" or "together" - generated by the interface that reproduces the navigation in 3D environments; in computer games there are several interfaces that do that, such as immersive devices for virtual reality (e.g., *Oculus Rift, Project Morpheus*) or mimetic controls that enable to execute in the local environment the same motor dynamics that the player is performing in the virtual one (e.g, *Wii Remote, PS Move*, *Kinect*) – in other words, the presence is much more likely elicited when the game's interface involves the player's proprioceptive and motor system, indeed if the matching between proprioception (i.e., player's actual movements) and sensory feedbacks (i.e., in-game events resulting by player's actions) is coherent, the user will self-identify with the virtual body: the presence is much more strong when the mental model of the participant's body corresponds to the representation of virtual body in the digital environment (Slater and Usoh, 1993);
4. *the grade of immersivity* generated by the interface involving the perceptual and psychological immersion – on the one hand, the perceptual immersion can be favored by blocking the sense organs' access to the external world so that the user can perceive only the artificial world (e.g., headset, gloves, head-mounted display); on the other hand, the psychological immersion depends on the player's ability to perform actions in the artificial world, such interaction produces psychological states (e.g., *survival horror* games can cause heavy emotional state, such as anxiety, stress), also the plot may play a relevant role in such type of immersion;
5. *using social synthetic actors* in the medium, such as computer-controlled characters or game environment's mechanics (e.g., sea's waves);
6. *medium's techniques of responding as a social and intelligent agent*, for example often computer games contain also tutorials that introduce the player the commands, or sometimes arrows or orders indicating a location where to go that set the next goal, in this case the computer game as medium turns in a sort of intelligent and social agent that provide the user advices.

Furthermore, it has been remarked that the sense of presence in computer games is qualitatively different from the presence in virtual reality (Jennett, Cox, and Cairns, 2009). The reasons are two in essence. Firstly, the submission to the game: while in virtual reality systems (VR) the virtual environment (VE) is reached in a total way, in computer games it is limited to small displays. Also, in computer games, the interaction with EV is narrowed to standard poor gestures that, because of their arbitrary nature (e.g, pressing button A to kick an opponent) demands a total internalization of the controls to turn transparent: therefore the player must submit, that is to say accept, the sensorimotor constraints settled by game world's inner mechanics. Computer games try to overcome these limitations with the "pleasure of the game" that the player feels when experiences a great feeling of control in EV playing an active role within in it.
Second, the de-corporation: whereas in RV systems the participant is still herself, in the game an user's de-corporation occur. The player starts to ignore her physical body (i.e., body that presses the buttons on the keyboard, moves the mouse, let the images on screen flow) and focus on what happens to her virtual body: so the player internalizes her own avatar, turning in it. Successively, the virtual body is totally transparent as overshadowed by the in-game actions executed by the player.
In any case, if the presence is not a mere perceptual illusion, it must be a genuine experience that involves the extension of the sense of agency, as the player feels her body (i.e., body schema) wholly in the game. The total immersion manifests an experience of a player's bodily reallocation from the physical to the game world. Also, the presence is not technological-specific because it does not depend on the technology but occurs indiscriminately in local, remote, and virtual environments (Ijsselsteijn and Riva, 2003; Floridi 2005). Not all computer games have mechanics that let arise this kind of experience (Nunez and Blake, 2006). Otherwise, not all players experience the presence, even when they play computer games with 3D graphics, although the participants who deny such experience may be reluctant to admit the sense of presence, perhaps due to social or

cultural biases towards such medium (Jannett, Cox and Cairns 2008).
Only some computer games let arise the presence, why? Some computer games, in particular with 2D graphics, let to spring a type of immersion that we have defined engrossment or involvement that concerns only the prosthetic extension. In 2-D games the player does not feel totally in the game, but she experiences only a part of her own body within it in order to perform intentional actions. I suggest that, in computer gaming, the introduction of 3-D environments, navigable and explorable by a camera, has given rise to a new grade of immersion in which the player feels bodily present. If in 2-D graphics games the player performs intentional actions by an extension of physical body, in 3-D graphics games, the player can achieve purposes by a whole body feeling thus bodily situated in it.

Presence and egocentric spatial frame of reference in computer games

When does such a presence emerge during the gameplay? It occurs when the player represents the game space in a egocentric and situated way. Such a perception involves the reallocation of player's body schema in the virtual world. The egocentric and situated space are essential features of the presence in gaming. We can understand better how this works by referring to three experiences of play.
First, the experience of self-locomotion. In gameplay, the player can experience two types of self-locomotion: passive or active. On the one hand, the passive self-locomotion is an involuntary movement felt when the body's perceived movement has been not caused by ourself but an external agent. On the other hand, the active self-locomotion is a voluntary movement when agent feels to be the author of body's movement. To experience these kinds of self-locomotion the subject must have the *sense of ownness*, the feeling of owning a body that can be put in motion by an external agent, or the experience of being the author of a perceived bodily movement. And this is possible only because we *are* that body.
In computer games we experience the self-locomotion, which means we feel to own a body, that can be put in motion by ourself or an external agent. For example, in *Dead Island* (Techland, 2011), zombies can hit the avatar and make him fall down. When this happens, the player is able to feel this movement as not caused by herself but rather by an artificial agent. From which kind of player's ability does this distinction derive? I suggest this occurs because the player's sense of ownness has been extended in the body's avatar. If this had not happened, the player would be only a passive viewer of what is happening in a fictional world. On the contrary, she is enabled to experience whether a perceived motion seen on screen refers to her as bodily agent situated in virtual environment or to something else, and whether it is a self-locomotion caused by an external agent or herself. It is possible because the player feels to own a body situated in the game world to the extent that her sense of ownness has been extended in it by incorporating the body's avatar in the body schema.
Second, the experience of the spatial navigation in a 3D-graphics environment. Spatial navigation in 3D games involves an egocentric space, as the player explores the virtual environment by means of her own bodily axes. For example, consider *The Elder Scrolls v: Skyrim* (Bethesda Game Studios, 2011) (*fig. 1*). When the player moves in the fantasy world of Skyim, she perceives the objects located in the game space to the left/right, back/forward, here/there, and up/down, that is to say in a space whose point of origin is the player's body. During gameplay, when the player is totally engaged with the in-game actions, she does not think that the dragon is to the left of the avatar, but she localizes the roaring beast to her left. The fact that the player represents the game space egocentrically is more clear when she identifies the positions of items within it.
A well-trained player is able, in fact, to recognize places where she has been, in order to guide smoothly her behavior, even without assistance of external maps. For instance, in the wide world of Skyrim, often the player comes back to the same places (e.g., dungeons) wherein had left some items in order to withdraw them. To do this, she must recognize exactly the place that had visited

before. Now, identifying a place where you have been means to recognize that specific place as a "here", a place "where I was" (Evans, 1982). This involves the employment of a mental map whose space is represented in an egocentric and perspective way, to the extent that the gamer identifies the positions of items in locations wherein had been present not in third person perspective (i.e., she does not think "the place where my avatar has been"), but in first person (i.e, "the place where *I* was"). Indeed, when she enters in a dungeon represents the 3D space by coordinates such as "to the left, then right, forward, and again left".

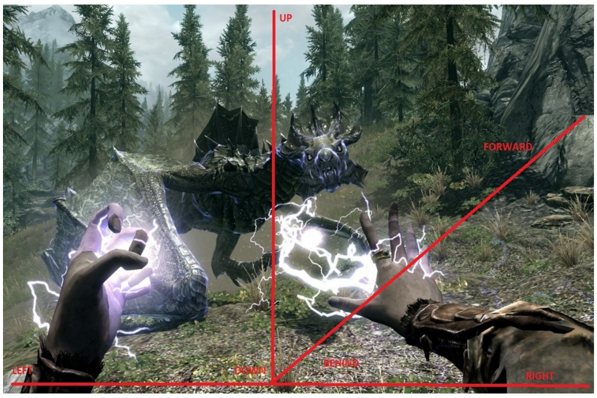

Fig. 1. Egocentric perspective space in a computer game. Game design uses a first person view, but space's axes are specified by the player's body (left/right, forward/behind, up/down). Actually the point of origin is transparent, as grounded in the body schema of the player.

Third, communication among players in multiplayer mode. For example, in *The Last of Us* (Naughty Dog, 2013), the players must communicate each others continuously in order to indicate the local positions of supplies or possible dangers, such as enemies or land mines. In this game, the communication among teammates is essential to succeed to avoid possible ambushes or effectuate coordinate strategies. Frequently, the teams move within the post-apocalyptic scenarios as a single agent with a distributed intelligence. Now, while communicating, they use typical coordinates of an egocentric space, and the accuracy by which the 3D space is represented egocentrically is primary to win the match (fig. 2). They say, for instance, that the sniper is in the upper right, the supplies are up ahead, behind a car, or the medkit is located to the left, in front of a sofa. These are coordinates that have as point of origin the player's body. Otherwise, the player could not understand what the teammate are saying, because spatial terms such as "here", "there", "behind", "forward", "up" are specified only like motor dynamics that our body must execute to achieve situated goals.

Fig. 2. Another example of egocentric (body-centered) space in a computer game. In spite of third-person view, the point of origin of the space is still the player's body, and during gameplay it is transparent. Indeed, the third-person character is experienced as a prosthetic extension of the avatar, which is the digital body (camera), assimilated in player's body schema, by means of which the user access to the game world.

The egocentric space is, in fact, "the perspective space of perception and action that is defined relative to the perceiving or acting body” (Gallagher and Zahavi 2008, p. 141). It represents the position of objects in a space relative to the body's axes of the subject (Evans, 1982; Peacocke, 1992; Gallagher, 2005). So if in game code the items are located in objective positions specified by three dimensional vector (x, y, z), in the gameplay they are located in a egocentric perspective space whose axes have their point of origins in the player's body (i.e., left/right, forward/behind, up/down) and specified by the practical knowledge of the action that the agent must perform to identify them. The player moves thus in a egocentric space for two reasons:

1. the point of origin of 3D game space wherein she acts is her own body, as the coordinates of this space are specified by body's axes – if the 3D game space was not body-centered, the player would locate items in an allocentric space (e.g., objective space and locations encoded in game code), a purely objective space that can be defined in terms of latitude and longitude or in the terms of compass direction;
2. the player has an implicit practical knowledge of the actions that must perform in order to identify objects within it, which means the representation of egocentric space depends on the body schema, structured by the proprioceptive system and sensorimotor skills.

In an egocentric space objects and surfaces are organized around a single and privileged point of origin: perceiver's body. As philosopher Shaun Gallagher remarks, “one of the important functions of the body in the context of perception and action is to provide the basis for an egocentric spatial frame of reference” (Gallagher 2005, p. 59). Also, “every perspectival appearance implies that the embodied perceiver is herself the experiential origin, the indexical 'here' in relation to which every appearing object is oriented” (Gallagher and Zahavi 2008, p. 161).

If the cognitive use of egocentric (body-centered) space implies the presence of own body as point of origin, whose axes are specified by perceiver's body schema, and if the player orientates in 3D game environments by an egocentric space, therefore *she is in the game* with her whole body because such spatial experience is defined by perceiver's body schema. This means that in the tele-presence takes place a spatial relocation of body schema, that is to say the body itself.

Also, the coordinates of egocentric space are specified by the possible actions that the body is able to perform (Briscoe, 2008). The structure of body constraints or provides opportunities for action: the axes of egocentric space are defined by the practical understanding of the possible actions that a body can do, in other words, they depends on the agent's body schema. In a 3-D space, I perceive something to the left because I can move my left arm in order to reach a certain object. Movements of my left arm constrain the left/right axes in a deep way such that if I can reach by my right arm an object located to my left, I will perceive this action as my right arm that grabs an object to my left. From a phenomenological point of view, the intentional action is essential to identify the position of a object within an egocentric space, to the extent that the point of origin of this kind of experiential space is dynamical, it can be the whole body in a undifferentiated way, but even a specific part of body depending on the intentional action in act (Merleau-Ponty, 1962). Sometimes, the point of origin is the body's part involved in the (possible) purposeful action: something is represented to my left because the point of origin of the spatial frame is not my head or torso, but the left arm that is able to reach the object, as I have a practical knowledge of how to grab the object. What does it mean? It means that if the player uses her bodily axes to navigate in a 3-D game space, the dynamical point of origin of her spatial frame has been relocated in the avatar itself, as the latter has been assimilated in her body schema.

In fact, the representation of egocentric space occurs progressively through the assimilation of a practical knowledge, or else through the acquisition of sensorimotor skills to perform specific intentional actions. In computer games with 3-D environments, the construction of egocentric space is possible as the player, in virtue of game interface, is enabled to execute intentional actions (e.g., rotating around a bodily axis to see what there is behind) achievable only if she was physically there, in the game world. Since the player can perform successfully a wide range of intentional actions in the game environment, she feels like being there. What she are experiencing is an embodied presence in a game world, which is explorable by bodily movements (e.g., fingers' movements on controller) different from those demanded by real world, even though they are intentionally identical. In other words, the player apprehends to execute in-game intentional actions in a different way to the sensorimotor dynamics demanded to the usual interaction with the real world. However, what differentiates that experience of game world and real world is not a sort of illusion, but the different range of sensorimotor skills demanded to perform the *same* intentions, which are so achievable in both the worlds. Therefore, the player understands what she is doing or seeing in the game world, because the meaning of simulated actions does not depend on the sensorimotor dynamics, but rather by the agent's intentions which can be achieved in multiple worlds and by multiple ways.

Presence, camera and 3-D environment in computer games

Prima facie, in computer games, the presence seems to be triggered by a specific interactive device: a camera manipulated by the player like it was her whole body, and not just a part of it. In particular, the avatar is a first- and third-person perspective settled by an interface consisting of a camera put on or lightly distant from avatar's body (e.g., on the head, behind). Camera is an user-interface which enables the player to navigate, explore, feel, listen and see a computer-generated 3-D environment. By this device, the avatar's body is not just an object, but it is also an embodied presence who is “there”, “in the game” with a body, whose spatial frames are nested in the player's body schema. Some scholars have argued that the grade of presence in virtual environments is directly proportional to the graphic realism in terms of grade fidelity with the real world (Slater and Wilbur, 1997). Nevertheless, the player can experience the presence regardless the graphics realism, as such feeling is promoted by virtual environments wherein the participant can act ecologically (Mantovani and Riva, 1999): the presence is tied to embodied agent's successfully supported action in the environment, both real or virtual (Zahorik and Jenison, 1998). As Rune Klevjer has underlines, “the point is not to simulate the ‘configuration’ of our real bodies, but to simulate the configuration of *some kind* of body” (Klevjer 2007, p. 149).
In short, when the game interface provides the player a kind of body, a navigable point of view that puts her in condition to explore, inhabit and perceive a 3-D environment, enabling her to do what a body usually does, the presence occurs. Indeed, virtual objects do not appear as indecipherable things located in an alien world, but rather as something familiar, ready to use, affordances relatives to the possibilities of movement and sensorimotor skills of the digital body whose constraints have been assimilated in player's body schema. In this sense, the avatar's body (i.e., camera) is like a “vicarious body” allowing the player to execute intentional actions successfully, making the game world familiar, habitable: “the avatar is the embodied manifestation of the player's engagement with the game world; it is the player incarnated” (Klevjer 2007, p. 10).
We can think about the development of a 3-D enviroment in video games in order to understand how it is relevant the camera-interface for the presence. Developers are able to draw the player's avatars by two interfaces: first- or third-person perspective, where the avatar is nothing else than the interfaces by which the player access to the game world, and where the size of player's gaze is the camera's scope. In first-person perspective, the player's perspective overlaps with the camera (fig. 3), whereas in the third-person the camera (i.e., the avatar) is coupled with the character (fig. 4). However, the character is just an prosthetic extension of the avatar, that is the camera. It is like a muppet tied to the player by an invisible cord. So, the third-person perspective is actually a hidden first-person device, in fact the real avatar is the camera by which the player controls the character. Then, the camera represents a body – really different from a human body – by means which the player's body is placed in the game world.

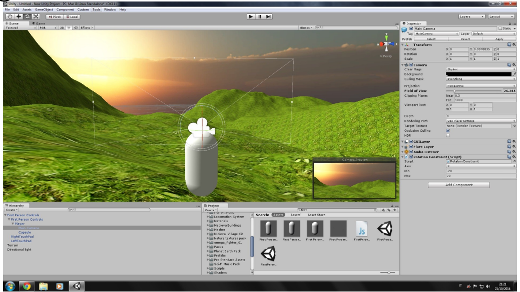

Fig. 3. This is a 3-D environment in developing by Unity 3D. The capsule which you can see is a first-person perspective script, whereas the camera is located upon it. Indeed, the capsule is far from being a human body, but regardless its shape, what is really important is its function: providing the gamer a kind of body which enables her to navigate in the 3D environment.

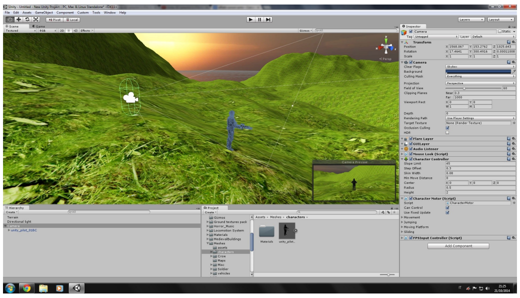

Fig. 4. Another 3-D environment in developing by Unity 3D. As you can see, we have a camera coupled with a 3-D model of the character (camera is behind it). In fact, in Unity the designer can make a game object a child of another one, which means it will move anytime the father will move. The player's perspective is still provided by camera's scope, whereas the character (i.e., child's camera) turns in an its extension.

Even in a really poor 3-D environment, if the user can control an avatar by a camera, she feels presence. Even when she can only perform very simple acts such as moving or jumping. Why? I suggest the user begins to feel presence because, by the navigable camera, she is able to move in a 3-D environment, that means she can cause by movements some sensory effects (sensory feedbacks) detectable in an egocentric space. The player experiences being there because there are an intrinsic coherence between movements and sensory effects. Still, even when the environment is bare, almost immediately the user feels it like familiar, or habitable. This happens because the user finds regular correlations between enacted movements and sensory feedbacks, which can be used, once assimilated in body schema and turned in sensorimotor skills, to realize plans or achieve goals. Of course in an almost-empty 3-D environment, the presence is a weak experience that tends to be broken very easily. For instance, consider this simple interactive 3-D environment designed by myself (fig. 5). The user is an agent who walks and jumps in a 3-D zero-gravity environment, a little sandy satellite orbiting around an exoplanet. In spite of the artlessness of this scenario, I feel presence because of the navigable camera and the real-time control of avatar. Nevertheless, after a while, the presence tends to vanish. Indeed, I suggest this kind of experience must be always, as it were, powered, but how? Probably, more are the things that the user can do in the environment, and more extended is the sense of control on avatar and game world, and more the feeling of being will tend to strengthen and remain. By “more things”, I mean that the player must be engaged by achieving her intentions or plans, while the virtual environment must be responsive to her actions. So, if the camera device is necessary to feel presence, at the same time achievable intentions and plans are equally important to stabilize and enhance it.

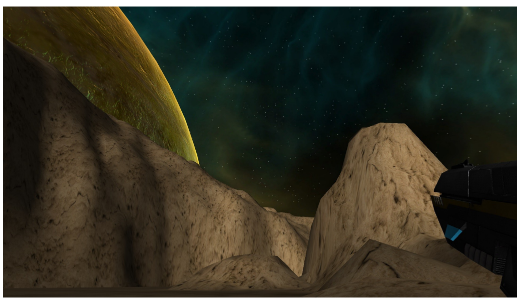

Fig. 5. This is a very poor 3-D environment, wherein the avatar can only walking and jumping. However, the user can feel presence for a while, and this happens for two reasons. On the one hand, the player feel habitable this strange space because finds lawful sensorimotor correlations interacting with it. On the other hands, once they are assimilated, those sensorimotor correlations can be used as sensorimotor skills to realize plans or achieve goals. Unfortunately, the player cannot find goals or activities in this interactive simulation, so the presence tends to disappear very quickly.

Probably, game designers have different strategies to encourage the immersion as presence in their games. One of them is the storyline, where the player has to do many things in order to advance in the story. Another one could be placing in the environment a huge set of activities. So in a simple game where we have nothing to do but jumping and moving probably the presence will fade away soon. Nevertheless, by developing 3-D environments where game designers drive players to do different and subdivided activities, or to read an exacting plot, the experience of presence can be invigorated and extended.

Conclusions: virtualising the embodied experience

How can the player own a body in a game environment and, at the same time, being located in the physical space? How can she experience of being there, in a virtual environment, if her physical body is situated in the real environment? For example, how can she experience of moving in the virtual world if she is physically static and seated?

It seems a paradoxical situation that can be solved by reinterpreting the embodied experience. According to Pierre Lévy, media virtualise the body, that is to say they make it “in potency”, disclosing new undetermined possibilities to discover and create. The lived body is so multiplied, transformed, modified, virtualised in new meaningful shapes (Lévy, 1995): there is not a fixed shape of the body, it is mere potentialities that can be discovered and actualized by interacting with new media. The embodied experience in everyday life is therefore just a particular actualization of the body, one of its ways of being. For, in virtue of new media, such as computer games, the body has discovered new shapes of giving itself, extending, interacting. That's why, on the one hand, computer games, just like any other media that puts in motion the virtualisation, de-territorializes the experience of body. Such an experience does not identify only with the physical body hooked to local environment, but it gives itself also in remote, virtual, or shared environments. The human agent is all of these bodily shapes, shifting the attention on one or other, depending her needs and interests.

Who thinks that embodied experience is reduced to the physical body ignores the fact that media virtualise the experience of body, they make it “in potency” with new shapes that disclose new spaces of interaction and meaning. In this sense, Levy's hyper-body reminds closely Merleau-Ponty's lived body. According to Merleau-Ponty, my body can be an undefined shape that can assume a specific configuration when polarized by one of its tasks: the body exists towards its own purposes and modifies itself dynamically in order to achieve them (Merleau-Ponty, 1962). That means due to interactive interface, the experience of body extends in the game world when the agent tends to realizes goals within it.

The physical presence in an environment is not more “real” than the tele-presence or immersion in a virtual reality. Perceptual-motor loop of the intentional action takes place both in physical and mediated environment, there are not intrinsic differences in the stimuli coming from both kinds of environment (Ijsselsteijn and Riva, 2003). The fact that we can feel being in an environment rather than another depends only on which perception overwhelms the other: the computer-generated ambient and the local environment compete for perceiver's attentional resources, and the tele-presence occurs when more attentional resources are allocated in the perception of mediated environment (Draper, Kaber and Usher, 1999).

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