Mediated Embodiment in New Communication Technologies

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INTRODUCTION

Becoming someone else in a fantasy or digitally-created world is a daydreaming fantasy often explored in literature and cinema, especially in Cyberpunk. Stories about digital worlds in which characters are transported somewhere else and experience becoming someone new through avatar self-representations -such as in *The Matrix* (1999) or *Avatar* (2009)- create a sort of "meta-transportation" experience to the audience. Viewers are transported into a fantasy world and feel identified with a character which is in turn transported into a new world and transformed into a new character. The possibility of adopting a digital or robotic surrogate body, described in this kind of narratives, is closer to real than ever before thanks to new communication technologies such as virtual reality or last generation robots. As Dyson (2005) argues:

The 'new' of new media such as virtual reality, has been identified by its ability to transcend 'old' media that are based on seeing (film, television), with a state of immersion based on being. By being in, rather than looking at, virtual environments, the immersant is said to occupy the space and time, the here and now, the virtual present of a separate but ontologically 'real' space. In terms of screen culture, the discourse of representation undergoes a strange re-articulation: the 'as if you are there' of screen-based media is truncated to a 'you are there' – one is in cyberspace, not watching it, one is a navigator, not a viewer (p.86).

Traditional media such as cinema or television and literature are characterized by being passive experiences for the body. *Transportation* in these media is an experience of cognitive, emotional, and imagery involvement into a narrative (Green, Brock, and Kaufman, 2004) that can be best explained from a Cartesian dualistic approach of mind-body distinction. The mind is the true active protagonist in the process of transportation. The mind travels, the body stays. One step further, interactive television, classic videogames, or online games, actively involve users in the process of creating or deciding the narrative to increase the feeling of being transported. However, body participation is not a decisive feature in these experiences either.

The principal transformation concerning the experience of transportation in fully immersive systems compared to traditional media is the involvement of the body in the process. In such systems, media interface development is aimed at providing users with fully immersive experiences, with the ultimate goal of making the virtual, real. In these systems, the body plays a central role by becoming progressively embodied in the process. In *the Cyborg's dilemma*, Biocca (1997) describes this pattern as *progressive embodiment*:

Each progressive step in the development of sensor and display technology moves telecommunication technology towards a tighter coupling of the body to the interface. The body is becoming present in both physical space and cyberspace. The interface is adapting to the body; the body is adapting to the interface (para.2).

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While *transportation* in traditional media can be connected to Cartesian Dualism, in fully immersive systems, this experience needs to be framed from a body-subject approach (Merleau-Ponty, 1962) or that of embodied cognition (Shapiro, 2010), in which the body is understood as the medium that humans use for having a world (Merleau-Ponty, 1962). For embodied cognition theorists, as in fully immersive systems, embodiment plays a central role in structuring experience and cognition:

To say that cognition is embodied means that it arises from bodily interactions with the world. From this point of view, cognition depends on the kinds of experiences that come from having a body with particular perceptual and motor capacities that are inseparably linked and that together form the matrix within which memory, emotion, language, and all other aspects of life are meshed (Thelen, Schöner, Scheier, & Smith, 2001, p.1).

Body Ownership Illusions

The Rubber Hand Illusion (RHI) paradigm (Botvinick & Cohen, 1998) is considered as the earliest and most relevant precursor of the works on embodiment. On the RHI experiment, participants are seated with their left arm resting on a table. A screen is positioned beside the arm to hide it from the subject's view and a life-sized rubber model of a left hand and arm is placed on the table directly in front of the subject. The subject stays still, looking at the artificial limb. The rubber hand and the real hidden hand are stroked simultaneously with a paintbrush, either synchronously (illusion) or asynchronously (control condition). When stroked synchronously, participants report a feeling of ownership of the rubber hand and mislocalize the position of their real hand towards the fake hand (proprioceptive drift). Visuotactile correlation has been so far the most expanded method to induce the illusion of embodiment of a fake body or body part.

Recently, as an extension of the RHI paradigm, a series of studies have utilized full-body ownership illusions involving fake and virtual bodies in order to explore the mechanisms underlying self-consciousness and, arguably, as a way to demonstrate that the spatial unity between self and body can be disrupted (Ehrsson, 2007; Guterstam & Ehrsson, 2012; Lenggenhager et al., 2007). Specifically, full-body illusions have been used to displace the sense of self-location outside the bodily borders (Ehrsson, 2007; Guterstam & Ehrsson, 2012; Lenggenhager et al., 2007). Other works have looked into how mannequin bodies can be experienced as the own body (Petkova & Ehrsson, 2008) and how the characteristics of the embodied body influence perception (Van der Hoort, Guterstam, & Ehrsson, 2011). Generally, in these experiments, the illusion is achieved by visuo-tactile correlation and a manipulated visual perspective displayed on a head mounted display (HMD).

However, whereas tactile sensory stimulation plays a central role in classical experiments of body ownership transfer (Botvinick & Cohen, 1998), the existing works on mediated embodiment using avatars and humanoids have preferably used other methods to induce embodiment (Alimardani, Nishio, & Ishiguro, 2013; Aymerich-Franch, et al., 2015; González-Franco, et al., 2010; Maselli and Slater, 2013; Nishio, Watanabe, Ogawa, & Ishiguro, 2012; Slater et al., 2010; Watanabe, Nishio, Ogawa, & Ishiguro, 2011), as it will be explained in future sections.

Related Concepts in Media Studies

Self-presence and *Identification* are the most relevant concepts from the Communication Literature related to mediated embodiment. *Self-presence* is used in Virtual Reality to describe the state in which the virtual self is experienced as the actual self (Lee, 2004; Ratan, 2010). The construct of *self-presence* provides a theoretical framework for the study of how users connect to their mediated