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Presence, Explicated

This article reviews previous literature on presence, with a particular focus on its conceptualization and typologies. It first compares various types of presence-related terms (e.g., telepresence, virtual presence, mediated presence, copresence, and presence) and suggests that of those terms the term presence works best for the systematic study of human interaction with media and simulation technologies. After an extensive explication process, presence is newly defined as "a psychological state in which virtual objects are experienced as actual objects in either sensory or nonsensory ways." Three types of presence—physical, social, and self presence—are defined based on the general definition of presence and the corresponding domains of human experience. Finally, implications of the current explication to the study of presence are discussed.

The extent to which media represent the world (both physical and social environments) as it really is has been a central question for many scholars since communication research first began. There are literatures concerning perceived reality, social reality, virtual reality, pictorial realism, reality programming, and so on. Recently, researchers have begun to realize that the feeling of *presence* (Biocca, 1997; Lombard & Ditton, 1997; Lombard, Reich, Grabe, Bracken, & Ditton, 2000; Tamborini, 2000) lies at the center of all mediated experiences, from reading a novel (Gerrig, 1993) to riding an immersive virtual reality (VR) simulator (Heeter, 1992). The ancient desire to overcome the limit of human sensory channels through the use of technological devices is the major impetus for the development of media and reality-simulation technologies (Biocca, Burgoon, Harms, & Stoner, 2001; Biocca, Kim, & Levy, 1995; Lombard & Ditton, 1997; Rheingold, 1991).

The concept of presence has great practical relevance to the design and evaluation of media products and computer interfaces, especially in entertainment (e.g., movies, reality television programs, computer and video games), telecommunications (videoconference, computer-supported collaborative work, etc.), education (on-line education, virtual campus,

simulation training, etc.), and health care (telemedicine, telesurgery, etc.). As technologies for simulating interactions with people and places have become more sophisticated, computer scientists, psychologists, and communication scholars have paid even greater attention to this concept. Consequently, presence has become central to theorizing about advanced human–computer interfaces such as virtual reality (VR) systems (Biocca, 1997; Held & Durlach, 1992; Lombard & Ditton, 1997; Loomis, 1992; Sheridan, 1995; Snow, 1996; Steuer, 1992; Whitmer & Singer, 1998), as well as traditional media, such as television, film, and books (Ditton, 1997; Kim & Biocca, 1997; Lombard et al., 2000).

As a consequence of the intense interest in this concept, many attempts (e.g., Biocca, 1997; Lombard & Ditton, 1997; Steuer, 1992) have been made to provide a clear conceptual definition of it. Despite these attempts, there are three unresolved issues in the conceptualization of presence. First, scholars from different fields use different terms (e.g., telepresence, mediated presence, virtual presence) to refer to the same concept, sometimes in noninterchangeable ways. Second, although the study of presence is about the study of virtual experience, there have been few theoretical attempts to explain carefully what virtual experience is and how it is different from other types of human experience. Third, as a result of the poor explication of virtual experience, the existing literature lacks coherence when it tries to define three types of presence—physical, social, and self—which are closely related to the three domains of human experience.

In this article, I try to resolve the aforementioned shortcomings. I examine various presence-related terms and argue for a unified use of the term "presence." Based on the previous literature and an extensive explication of human experience (see Chaffee, 1991, for the explication procedure), I offer a new conceptual definition of presence.

Telepresence, Virtual Presence, Mediated Presence, and Presence

Presence is often referred to as telepresence, virtual presence, or mediated presence. This lack of unified terminology often makes it hard to successfully communicate among scholars, especially when they are from various and often unrelated fields such as business (e.g., Klein, 1998, 1999), communication (e.g., Biocca, 1997; Lombard & Ditton, 1997), computer science (e.g., Minsky, 1980; Slater & Usoh, 1993), industrial engineering (e.g., Draper, Kaber, & Usher, 1998), education (e.g., McLellan, 1996), psychology (e.g., Lessiter & Freeman, 2001), and sociology (e.g., Zhao, 2001). In this section, I will review the origin of each term and propose that the term presence is most desirable for the

development of theory, successful communication among scholars, and the expansion of the research community.

"Telepresence" was first coined by Marvin Minsky (1980) to emphasize the possibility that human operators could feel the sense of being physically transported to a remote work space via teleoperating systems. With more refinements of high quality simulation and sensory feedback technologies, he predicted, telepresence would bring the safe and cost-efficient operation of dangerous works (e.g., mining, nuclear-power generation, etc.), the creation of new medical and surgical techniques, the reduction of transportation costs, and the freedom to stay at home without going to a workplace. Since then, the term telepresence has been used to refer to a sense of transportation to a space created by technology. For example, Sheridan (1992) defined telepresence as "feeling like you are actually there at the remote site of operation" (p. 120). Schloerb (1995) argued that telepresence occurs when a user perceives that he or she is physically present in a remote environment. McLellan (1996) defined it as a feeling of being in a location other than where you actually are. Slater and Usoh (1993) referred to it as "suspension of disbelief that they [users of virtual reality systems] are in a world other than where their real bodies are located" (p. 222). Rheingold (1991) even called it a "form of out-of-the-body experience" (p. 256). In a similar vein, Reeves (1991) used the term "being there" to explain viewers' experience of moving into televised environments.

"Virtual presence" is a term that Sheridan (1992) coined to refer to presence caused by virtual reality technologies. By providing this new term, he believed that we could effectively differentiate virtual presence, the feeling of presence in a virtual environment, from telepresence, which was originally associated with teleoperation systems.

To confine the concept of presence strictly to the realm of mediated perception, communication scholars often use the term "mediated presence" (see Biocca et al., 2001). They argue that nonmediated or natural perception of an environment should not be included in presence research, because its inclusion makes the area of presence research too broad. Steuer (1992) provided a similar distinction between telepresence and presence. He argued that telepresence is the mediated perception of an environment in which users are being transported via technologies, whereas presence refers to the natural perception of an environment.

In order to eliminate unnecessary confusion, the term presence will be used throughout this article. There are four reasons for this:

First, unlike telepresence and virtual presence, presence is a general term that does not specify any technological domain. Therefore, it can be applied to the analysis of future technologies whose domains have not yet been determined.

Second, a technology-specific differentiation of presence (telepresence vs. virtual presence) is meaningless, because presence, by definition, is not about the characteristics of technology—it is a psychological construct dealing with the perceptual process of technology-generated stimuli.

Third, the generalization of the term into presence allows theorists to investigate various presence-related phenomena that do not necessarily include the feeling of *transportation* into a physically *visualized* virtual environment. For example, without feeling that they are moving to a virtual conference room, teleconference users can feel the presence of conversation partners to a great degree. Because telepresence, from its origin, is about the users' feeling of transportation to a remote location and virtual presence usually concerns users' feelings about virtual environments physically constructed by virtual reality engines, both terms cannot effectively deal with other types of presence that include neither the sense of transportation nor the perception of physically visualized virtual environments.

Finally, the attempt to strictly differentiate mediated perception from natural perception might be futile because natural perception can, in a sense, be regarded as mediated. The conceptual distinction between sensation and perception clarifies this point well. Sensation is the simple detection of sensory stimuli materialized by some sort of physical energy. Perception, on the other hand, is the subjective interpretation of sensory stimuli affected by both sensation and other subjective factors such as previous experience, expectations, emotion, and cognitive processing (see Baron, 2001). From this perspective, the natural perception of the real world is mediated in the same way that the perception of a technology-generated virtual world is (see Loomis, 1992, p. 113). For this reason, scholars define natural perception as the first-order mediated experience and technology-mediated perception as the second-order mediated experience (see Lombard, 2000).

Previous Explications of Presence

There have been various attempts to explicate the concept of presence. For example, Steuer (1992) defined it as "the extent to which one feels present in the mediated environment, rather than in the immediate physical environment" (p. 76). Similarly, Witmer and Singer (1998) referred to it as "the subjective experience of being in one place or environment, even when one is physically situated in another" (p. 225). Based on the Heideggerian/Gibsonian view of the ontology of being, Zahorik and Jenison (1998) proposed that "*presence is tantamount to successfully supported action in the environment*" (emphasis in original; p. 87). Successfully supported action occurs when environmental reac-

Table 1. Previous Conceptualization of Presence

Conceptualization	Definitions
Subjective or objective social richness	The warmth or intimacy possible via a medium. "Media having a high degree of social presence are judged as being warm, of a medium personal, sensitive, and sociable" (Short et al., 1976, p. 66).
Perceptual or social realism	Social realism: realistic or plausible portrayal of the real world in that it reflects events that do or could occur in the real world.
	Perceptual realism: life-like creation of the physical world by providing rich sensory stimuli. (Users perceive that the people and objects that they encounter in a virtual world look, sound, smell, and feel like real people and objects.)
Transportation of self, place, or other selves	Telepresence in its original meaning—"being there" (Minsky, 1980; Reeves, 1991; Sheridan, 1992).
	The feeling that you are actually transported to a virtual world ("You are there"), or the feeling that the virtual world comes to you while you are remaining where you are initially ("It is here"), or the feeling that you and your interaction partners are sharing a space in a virtual world ("We are together [shared space]").
Perceptual or psychological immersion	Perceptual immersion: "the degree to which a virtual environment submerges the perceptual system of the user" (Biocca & Delaney, 1995, p. 57).
	Psychological immersion: the degree to which users of a virtual environment feel involved with, absorbed in, and engrossed by stimuli from the virtual environment (Palmer, 1995).
Social interaction with an entity within a medium	The degree to which users illogically overlook the mediated or artificial nature of interaction with an entity within a medium (Lemish, 1982; Lombard, 1995).
Social interaction with a medium itself	The degree to which users illogically overlook the mediated or artificial nature of social interaction with a medium itself (Nass & Moon, 2000).

tion to user action meets user expectations. That is, when environmental reaction to a user action is perceived as legitimate, users feel that their actions are supported in the environment. Biocca (1997) traced the origin of the term and concluded that presence has been generalized to the illusion of "being there" whether or not "there" exists in physical space. He proposed that this sense of presence oscillates around physical (i.e., real environment), virtual (mediated

environment), or imaginal (e.g., daydreaming) environments (see also Kim & Biocca, 1997).

As an attempt to synthesize previous conceptualizationa of presence, Lombard and Ditton (1997) conducted an extensive literature review of the concept. They identified six conceptualizations of presence, which I have summarized in Table 1.

After the extensive review of previous conceptualizations, Lombard and his colleagues defined presence as "the perceptual illusion of nonmediation" (Lombard & Ditton, 1997; Lombard et al., 2000, p. 77). The term "perceptual" means that the feeling of presence "involves continuous (real time) responses of the human sensory, cognitive, and affective processing systems to objects and entities in a person's environment" (Lombard et al., 2000, p. 77). By illusion of nonmediation, they refer to a phenomenon in which "a person fails to perceive or acknowledge the existence of a medium in his or her communication environment and responds as he or she would if the medium were not there" (p. 77).

Most recently, scholars participating in the on-line discussion of Presence-L Listserv during spring 2000 agreed on the following explication statement of the concept (see Lombard, 2000, for a summary of the on-line discussion):

> Presence (a shortened version of the term "telepresence") is a psychological state or subjective perception in which even though part or all of an individual's current experience is generated by and/or filtered through human-made technology, part or all of the individual's perception fails to accurately acknowledge the role of the technology in the experience. Except in the most extreme cases, the individual can indicate correctly that s/he is using the technology, but at "some level" and to "some degree," her/his perceptions overlook that knowledge and objects, events, entities, and environments are perceived as if the technology was not involved in the experience. Experience is defined as a person's observation of and/or interaction with objects, entities, and/or events in her/his environment; perception, the result of perceiving, is defined as a meaningful interpretation of experience.

Presence, Redefined

I begin my discussion by tentatively defining presence as "a psychological state in which the virtuality of experience is unnoticed." This initial definition will be explicated and developed further in the following sections.

Unlike previous definitions, the terms "failure" or "illusion" are not used in this definition, because those terms connote a normative judgment that the feeling of presence is somewhat undesirable. Presence, however, is a common and mostly desirable psychological phenomenon caused by special cognitive mechanisms such as the automatic and modular processing of information (see Cosmides & Tooby, 1992, 1994; Sherry & Schacter, 1987, for modularity of human minds). It is a common

phenomenon in the sense that human perception is always more or less a distorted version of human sensation. It is desirable, because the special information-processing mechanism enabling subjective perception of the world out of pure sensation has given humans enormous survival advantages in the course of human evolution (see Plotkin, 1998; Reeves & Nass, 1996). In this context, the term "unnoticed" is used to eliminate any normative connotation.

The current definition does not confine the feeling of presence to mediated perception only. There are two reasons. First, as explained above, the attempt to strictly discriminate between mediated and nonmediated perception can be futile. Second, confining presence to mediated situations excludes the possibility of feeling presence during nonmediated experiencing. For example, while interacting with an anthropomorphic robot, people can strongly feel that they are interacting with an actual human. In this case, social presence (a psychological state in which nonhumanness of artificial objects is unnoticed; see later sections for the explanation of social presence as a subconcept of presence) occurs even when the act of experiencing is not filtered through any media technology. That is, people can feel the existence of another human or humanlike intelligence, even when no human is actually mediated by the robot. In this case, the robot becomes a new type of a social actor that automatically elicits social responses (i.e., people's use of social rules and heuristics usually directed at other people) from its users. It seems that Lombard and his colleagues (Lombard & Ditton; 1997; Lombard et al., 2000) manage to solve this dilemma by widening the meaning of mediation from experience filtering to object creation; nevertheless, the use of the term "mediation" is potentially confusing. Another justification of the use of mediation in the above situation is the claim that people's interaction with a robot is in fact a mediated experience, because the robot can be regarded as a medium that connects users to creators who made it. This argument is based on the belief that people's social interaction with an artificial object is directed toward the people (e.g., programmers, manufacturers, etc.) who made the object. A recent study by Lee (2002) directly tested the validity of this argument. In his study, Lee (2002) showed that people's social responses to computer-synthesized speech are directed toward imagined virtual speakers, not programmers. In this article, thus, I do not confine the realm of presence within mediated experience only. Instead, I propose that presence is related to a wide range of virtual experience, which will be explained below.

Virtual Experience, Explicated

Technology users can engage in three types of behaviors—perception, manipulation, and interaction—when experiencing mediated/simulated objects/environments. Through perception, users identify and interpret

objects that they are experiencing. For example, television viewers identify and interpret objects and entities mediated by visual signals from television. If users can make changes to objects that they are perceiving, manipulation, a higher level of experience, occurs. For example, changing the location of an object in a virtual environment is a higher level of experience than the mere act of perceiving the object. When users and experienced objects mutually affect each other, the domain of user experience goes beyond the physical world and an even higher level of experience—interaction—occurs. For example, when users respond to computer agents that request certain types of user actions based on previous user inputs (see Rafaeli, 1988, for a similar definition of interaction), the domain of user experience extends to the social world and the experience becomes truly interactive.

Experience can be virtual in two ways. First, experience becomes virtual when the act of experiencing is mediated by, or is made possible by, human-made technology. In this case, what technology users experience is not an actual object but the mediated version of it. Regardless of the vividness of its representation, a mediated object holds some kind of valid connection with the actual object that it represents. For example, the virtual 4H Children's Garden developed by Michigan State University (http://4hgarden.msu.edu/kidstour/) closely represents the actual 4H garden. The nodes and the panoramas of the virtual garden correspond to exact physical locations of the actual garden. Users' spatial knowledge (e.g., direction) of the virtual authentic garden is valid information for their spatial navigation of the actual garden. For this reason, I will call this type of virtual objects *para-authentic* objects. Again, I do not use the term mediated to describe this type of virtual objects because the term implies that all nonmediated objects are actual. That is, whereas it is true that mediated objects are always virtual according to my definition, nonmediated objects can be either virtual or actual. Therefore, the use of the mediation vs. nonmediation dichotomy creates unnecessary confusion.

Vividness (e.g., realistic picture or realistic voice) of virtual objects is not a main determinant of authenticity. Authenticity, by definition, is more likely to depend on prior cognition of the valid connection between virtual and actual objects. An extreme case can clarify this relationship. Assume that a blind person wears special glasses that convert infrared signals into brain waves and transfer them to the brain. In that case, the infrared version of an actual object, regardless of its poor vividness, is authentic, because the blind person is aware that the infrared signals that he or she receives authentically represent the actual object. An interesting point is that the more the glasses become an everyday companion of the blind person, the higher the feeling of presence. That

is, the blind person will no longer feel the existence of the medium in his or her visual experience as the medium becomes the extension of his/her visual senses (see McLuhan, 1964, for the origination of this idea). Human experience becomes more virtual as the coupling of media to our sensory systems becomes more pervasive thanks to the rapid development of wearable computers (see Barfield & Caudell, 2001, for a general introduction) and ubiquitous computing (see Weiser, 1991).

Second, experience becomes virtual simply when experienced objects are artificially created or simulated by technology. That is, experienced objects do not actually exist in the real world, yet are experienced as if they would exist in the real world thanks to human-made technology. Without technology, the experienced objects would no longer exist and the experience itself could not occur. For this reason, I will call this type of virtual object an *artificial* object. No matter how vivid the simulation is, artificial objects do not have any authentic connection to actual objects from technology users' perspectives. That is, artificial objects do not represent any specific actual objects to users. For example, there can be many artificial gardens on the Internet. All of them, however, lack ontological validity in that there are no actual real-life counterparts. Users' spatial knowledge of virtual artificial gardens cannot provide any valid information for their physical navigation of the 4H Children's Garden located in Michigan. Computer-generated agents are another example of artificial entities. For example, users cannot find any real-life correspondence to Microsoft Office agents. Of course, the agents metaphorically represent the role of human secretaries, but they are by no means the authentic representation of specific human secretaries.

Artificiality should be determined according to the domain to which experienced objects belong (see the next section for a discussion of the three domains to which virtual objects belong—physical, social, and self). That is, an object can be actual in one domain, yet artificial in another domain. For example, it is obvious that computers are actual objects in the physical domain. In the social domain, however, they become artificial when people start responding to them as if they were actual social actors (i.e., humans). In other words, computers are not actual humans, but can be treated as if they were actual ones. If users' social responses to computers are oriented toward people (e.g., programmers) behind computers, although unlikely, computers become para-authentic in the social domain of experience.

Artificiality is not a fixed state. Objects can be artificial at one point and then can become para-authentic at another point. For example, an artificial house (e.g., a cyber model house) becomes para-authentic when an actual house is constructed according to the cyber model's specifica-

tions and users of the cyber model are clearly aware of the existence of the actual house.

Actions done to para-authentic entities sometimes have real-life consequences. For example, if a teleoperator turns on a switch of a remote power generator, the power generator is actually turned on at the remote site. Whatever you say or do in a videoconference has real-life social consequences (e.g., agreeing on a contract, making an appointment). You and your conversation partners all share the social consequences of the conference (e.g., honoring the deal, changing one's schedule, etc.). In contrast, actions done to artificial entities in the virtual world have few real-life consequences. For instance, the consequence of user action directed toward artificial agents remains only in the virtual world and has few real-life implications.

In sum, virtual experience is the experience of either para-authentic or artificial objects (see Heim, 1993, p. 160, for a similar definition of "virtual"). Presence, therefore, occurs when technology users do not notice the para-authenticity of mediated objects or the artificiality of simulated objects.

Virtual Experience, Real Experience, and Pure Hallucination

The above definition automatically calls for a question, "What is real (experience)?" This serious philosophical question has been an issue for Greek philosophers, Descartes, and modern phenomenologists such as Heidegger. Because this question is far beyond the scope of this article, I will not attempt to resolve this issue. Instead, I will provide the following short working definition for the development of the paper: "Real experience is the sensory experience of actual objects."

I do not use the term "real" to describe the objects of real experience because it implies the existence of an outside physical world of objective reality independent of the subjective mental world. This Cartesian dualism has been seriously and quite correctly questioned by Heideggarian scholars (e.g., Dreyfus, 1992; Heidegger, 1977; Winograd, 1995; Winograd & Flores, 1986). In the context of presence research, some scholars (Mantovani & Riva, 1999) correctly criticize the Cartesian attempt to differentiate between subjective and objective presence (e.g., Schloerb, 1995). They correctly argue that viewing telepresence as essentially a physical—thus, objective—location in a different place creates a logical problem because objectively existing somewhere else while physically sitting in one place is not possible. They also argued that the attempt to overcome this logical dilemma by defining objective presence as a possibility to successfully complete a certain task in a location is futile, because the failure of the given task does not mean the nonexistence in the location (Schloerb, 1995, p. 68). By using the term "actual,"

I attempt to eliminate any connotation of the existence of distinctive physical (objective) vs. mental (subjective) realities. The term actual simply means that something can potentially be experienced by human sensory systems without using technology. It does not require the existence of something independent of human mentality; instead, it requires only the possibility of experiencing something without using any human-made technology. Therefore, the categorization of objects according to virtual and actual criteria is not concerned with the validity of rationalistic assumption that the subjective mental world exists independent of an objective physical world (the assumption behind *cogito ergo sum*). Nor does the categorization succumb to solipsism, which denies the existence of any objective reality and maintains only purely subjective reality, because it acknowledges the existence of actual objects independent of subjective reality.

The distinction between virtual and real experience effectively explains why pure hallucination (e.g., daydreaming) is neither virtual nor real. It is not real because objects in pure hallucination are not experienced by human sensory systems; it is not virtual because no man-made technology is involved in experiencing or creating objects in pure hallucination. Objects experienced in pure hallucination are simply imaginary. Experience of a simulated world created by written narratives is virtual because even though no sensory perception is involved, the simulated world is created by human-made technology—written language.

To sum up, human experience can be categorized into three types—real experience, hallucination, and virtual experience—according to the ways of experiencing (sensory vs. nonsensory) and the objects that are being experienced (actual vs. imaginary vs. virtual [para-authentic vs. artificial]). Real experience is the sensory experience of actual objects. Hallucination is the nonsensory experience of imaginary objects. Virtual experience is the sensory or nonsensory experience of virtual (either para-authentic or artificial) objects. Presence research is about virtual experience and has nothing to do with real experience or hallucination (see Figure 1).

Presence, Redefined

Based on the discussion so far, presence can be further defined as "a psychological state in which virtual (para-authentic or artificial) objects are experienced as actual objects in either sensory or nonsensory ways." I will use this definition when I define the three subtypes of presence—physical, social, and self-presence—in the later sections. There are three reasons. First, even though this definition is not as parsimonious as the previous one, it provides a more sophisticated explanation of the con-

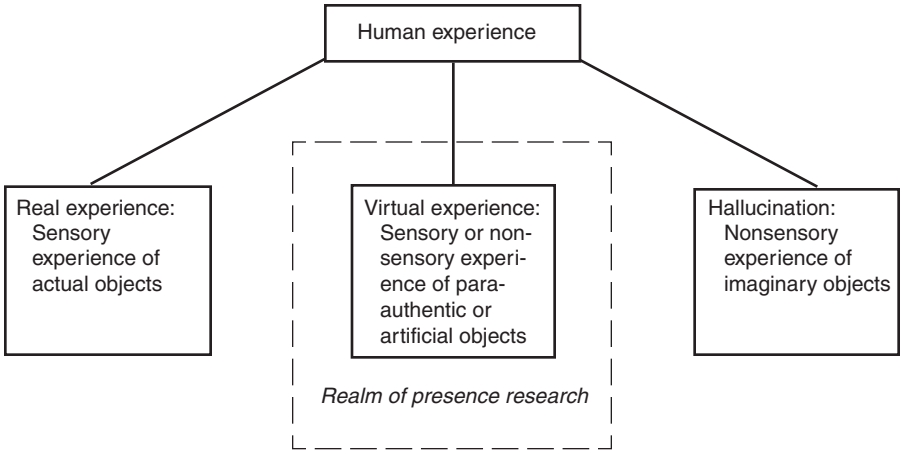

Figure 1. Typology of Human Experience for the Study of Presence

cept. Second, this definition provides a clearer guideline for concept operationalization than the previous one does. Unlike our previous definition, the current definition defines presence in terms of a bivariate relationship between virtual objects and actual objects. That is, presence is defined as psychological similarities between virtual and actual objects when people experience—perceive, manipulate, or interact with—virtual objects. Therefore, it implies that presence should be operationalized in a psychological way rather than in an objective or a phenomenological way. Empirical research on presence should thus measure degrees of psychological similarities between virtual and actual objects in terms of (a) sensory perception, (b) physical manipulability, and (c) interaction quality. Both off-line (e.g., paper and pencil questions) and on-line (e.g., physiological and/or behavioral responses to virtual objects) measures can be applied to test presence. Third, by including both sensory and nonsensory experience in the definition, the current definition is able to explicitly justify the measure of possible feelings of presence during the use of low-tech nonsensory media such as books. For example, possible feelings of presence experienced when reading a good novel can be measured by off-line questions (e.g., paper and pencil questions) about psychological involvement and/or by on-line measures of behavioral (e.g., eye movement) or physiological (e.g., skin conductance, heart rate) responses, even when direct questions about the quality of sensory experience are not asked.

Domains of Virtual Experience

The para-authenticity vs. artificiality distinction of virtuality provides a useful tool to categorize virtual experience. Another way of categorizing virtual experience is to focus on three domains of experience: physical, social, and self.

Physical experience refers to the experience of physical objects (both entities and/or environments). Physical experience becomes virtual either when the act of experiencing actual physical objects is mediated by technology or when the experienced physical objects are artificially created by technology. Actual physical objects are experienced through subjective perception of multisensory cues stimulating almost all human senses. Virtual physical objects, however, are usually experienced through visual or audible stimuli, or both, due to the unequal development of media and human sensory technologies. If sensation is the sole basis for the perception of physical objects, the feeling of compelling reality will not be possible unless all human sensory cues are provided. Thanks to the subjective nature of the perception process, however, people can sometimes have the feeling of presence despite the poverty of sensory stimuli in current media. That is, imagination and other information-processing mechanisms simulate the remaining sensory cues and create a compelling sense of reality. That might be the reason people can sometimes feel a strong sense of presence based solely on cognitive stimuli for imagination (e.g., written narratives) without receiving any direct sensory stimuli.

Social experience refers to the experience of social actors (humans and human-like intelligences). Again, social experience becomes virtual either when other humans are experienced through media or when the experienced social actors are artificially created by technology. Experiencing social actors is a subcategory of experiencing physical objects, because experiencing humans or human-like intelligences is a part of experiencing physical entities. Detecting and interacting with other social actors, however, is so important to humans—throughout evolution, other humans could be either the most dangerous enemy or the most desirable friends—that humans have developed special mechanisms to recognize and respond to other humans (or cues manifesting humanness) out of the myriad of all physical objects. Just as people pay special attention to other humans more than any other physical objects, technology users pay great attention to technology-generated stimuli manifesting humanness both in physical (e.g., voice, face, anthropomorphic shape, etc.) and psychological (e.g., personality, reciprocity, interactivity, social roles, understanding language, etc.) ways. In the same way as people mentally simulate virtual physical objects based on sensory cues provided by technology, people automatically simulate virtual social actors upon receiving cues manifesting humanness. It can be argued that the tendency of simulating virtual social actors is stronger than that of simulating nonhuman physical objects because the awareness of other humans has greater importance on human survival—after all, humans are social animals.

In addition to physical and social experience, people experience their

own selves in their everyday lives (see Goffman, 1963). The experience of one's own self becomes virtual either when the act of experiencing one's actual self is mediated by technology (see Biocca, 1997, for the origin of the claim), or when the experienced self is artificially constructed by technology (see Mantovani, 1995, for a general discussion of identity construction in VR). A virtual self thus can be defined as either the para-authentic representation of a technology user, or an artificially constructed alter-self (or selves) existing inside a virtual environment. Users' self-identification with either the whole (e.g., avatars, remote robots in teleoperating systems) or the partial (e.g., projected hands in a shooting game) representation of themselves inside a virtual environment plays a key role in the feeling of the existence of a para-authentic virtual self. Other social entities' reactions to artificially constructed selves (e.g., responding to users according to their virtual identities) play a key role in eliciting the feeling that alter-selves exist inside a virtual environment. For example, a Multi User Dungeons (MUD) user can strongly feel the existence of a unique alter-self when other users respond to him or her according to his/her virtual identity (Turkle, 1995). Although the act of experiencing an actual self can be neither explicit nor usual in real experience, the act of experiencing a virtual self is both explicit (e.g., perceiving, manipulating, and interacting with your avatars) and quite common in virtual experience. Virtual self can be either physically manifested or psychologically assumed inside a virtual environment. In the case of physical manifestation, users can see either the whole (e.g., avatars) or the partial (e.g., projected hands in a shooting game) physical representation of themselves. In the case of a psychologically assumed virtual self, users cannot see physical representation of themselves. Instead, a virtual environment reacts to users as if they were in there (e.g., first-person viewpoint game, other people greeting you by name).

Typology of Virtual Experience

A thorough typology of virtual experience can be made by mixing two characteristics of virtuality (para-authentic vs. artificial) and three domains of virtual experience (physical vs. social vs. self). Table 2 explains the six types of virtual experience that technology users can have.

Presence Typology

The existence of six different types of virtual experience calls for a multidimensional approach to the feeling of presence. In this section, I will review previous typologies of presence and their limitations. Then, I will propose three types of presence based on the three domains of virtual experience that I explained earlier.

Table 2. Typology of Virtual Experience

Domains of virtual experience	Characteristics of Virtuality	
	Para-authentic	**Artificial**
Physical	Experience of para-authentic objects: experiencing virtual physical objects and environments that have authentic connection with the corresponding actual physical objects and environments.	Experience of artificial objects: experiencing virtual physical objects and environments artifically created or simulated by technology.
	Examples: remote exploration of a teleoperating system; telesurgery; broadcasting of sports events; television news.	Examples: exploration of a prehistory battlefield depicted by "Dungeons and Dragons" games; watching science fiction movies; reading nonfiction.
Social	Experience of para-authentic social actors: experiencing the representation of other humans who are connected by technology.	Experience of artificial social actors: experiencing artificial objects manifesting humanness.
	Examples: CSCW (computer-supported cooperative work); videoconference; Internet chatting; seeing a person on a television; seeing a photographed image of someone.	Examples: conversation with a talking machine; social interaction with computers; social robots; software agents.
Self	Experience of a para-authentic self: experiencing the representation of one's own genuine self—either physically manifested or psychologically assumed—inside a virtual environment.	Experience of an artificial alter-self(selves): experience an alter-self(selves) constructed—either physically or psychologically—inside a virtual environment.
	Examples: seeing oneself in a videoconference; exploring environment reacting to user inputs; using a robot representing a user in a teleoperating system.	Examples: readers' identification with novel or movie characters: gender-swapped avatars in MUDs; user-chosen characters in a role-playing game.

Previous Typologies

There have been a series of attempts to classify different types of presence. For example, Heeter (1992) proposed three types of presence: personal, social, and environmental. "Personal presence" means the extent to which you feel you are in a virtual world. Many factors, such as seeing the partial or whole representation of oneself, the breadth and depth of human sensory channels engaged in virtual world, and the perceptual realism of virtual world, contribute to the feeling of personal presence. "Social presence" refers to the extent to which other beings (living or synthetic) coexist and react to you. According to Heeter, interaction with other social entities (real human or computer-generated be-

ings) inside the virtual world and even the mere existence of them contribute to the feeling of social presence. The feeling of social presence, in turn, provides strong evidence of the existence of the virtual world. The extent to which the environment itself appears to know your existence and react to you is referred to as "environmental presence." The more responsive to user input the virtual world is, the more the feeling of environmental presence occurs. It is hypothesized that a hyperresponsive virtual world can induce more feeling of presence than a virtual world that provides responsiveness similar to the real world.

Biocca (1997) identified three types of presence: physical, social, and self presence. Physical presence refers to the sense of being physically located in a virtual environment. He proposed that at any given moment of technology use, users feel being present in any one of the following environments—physical environment, virtual environment, or in the imaginal environment. By defining physical presence as a subjective feeling of being in a virtual environment, Biocca emphasized the feeling of transportation into a virtual environment from the real physical environment as an integral part of physical presence. In a recent article, Biocca and colleagues (2001) defined social presence as "the sense of being together with another and mental models of other intelligences (i.e., people, animals, agents, gods, etc.) that help us simulate other minds" (p. 2). It is important to note that social presence is defined as simulation, because the simulation occurs whether or not the perceived intelligence is another human or nonhuman intelligence, including artificial beings (Biocca, 1997). The simulation also implies that it does not matter whether the perceived intelligence has real intelligence or not. Therefore, even simple moving objects such as lines and boxes could be perceived as having purpose and intention (see Heider & Simmel, 1944, and Bloom & Verse, 1999, for a wide discussion of this phenomena). Self presence refers to a user's mental model of himself/herself or simply the awareness of self-identity inside a virtual world. Biocca proposes that the close mapping of a user's real physical body to a virtual body might influence the user's body schema or image. He also notices that there can be a discrepancy between a user's real body and a virtual body in terms of social meaning (i.e., social role).

Other researchers (Ijsselsteijn, de Ridder, Freeman, & Avons, 2000) omit the self-presence dimension and suggest that the physical and social presence can encompass all six conceptualizations of presence that Lombard and Ditton (1997) listed. Following Biocca (1997), they define physical presence as the sense of being physically located in a virtual world and social presence as the feeling of being together with someone.

Somewhat different from the above researchers, who seemingly focus on different domains of experience, Schloerb (1995) emphasized the

objective validity of experience itself by differentiating two types of telepresence: subjective vs. objective. Subjective telepresence is defined as users' feeling of presence in a remote environment. Applying the signal detection research paradigm, he operationally defined subjective presence as the probability of users' responding that they are physically located in a virtual environment when they are actually not. Objective telepresence refers to the ability of teleoperators to successfully manipulate a remote environment, which can be objectively confirmed by actual changes in the remote environment. The probability of successfully performing a teletask determines the degree of objective telepresence. Zeltzer (1992) also emphasized the objective criterion for presence and proposed that the number and the fidelity of sensory input and output channels supported by a virtual reality system should be the prime measure of presence.

Limitations of Previous Typologies

Even though the previous typologies provide useful tools to differentiate various types of presence, they are not based on the systematic explication of virtual experience. Consequently, they have some conceptual limitations and do not include all possible types of virtual experience in their classifications.

There are two limitations in the previous domain-based typologies. First, they explain virtual physical experience always in connection with virtual self-experience, which is not applicable to a possible feeling of presence caused by low-tech media. For example, the definition of physical presence by Biocca (1997) and Ijsselsteijn et al. (2000) and the definition of personal presence by Heeter (1992) focus on the sense of the existence of para-authentic self inside a physically visualized virtual world in order to explain technology users' physical experience. This is because previous typologies were made in the context of advanced media or simulation technologies such as teleoperating devices or VR systems. If a virtual physical experience is mediated or created by advanced technologies, connecting virtual self-experience to virtual physical experience is almost always valid. The connection, however, is not usually valid, especially for virtual physical experience created by low-tech technology such as television. For example, television viewers can feel that virtual objects depicted in a television set are actual without feeling that they are being transported into a television world. There are two possibilities. First, instead of feeling that they are being transported into a television world, television viewers might feel that the virtual physical objects in a television set are being transported to their world; Lombard and Ditton (1997) describe this situation as "it is here." Second, and more likely, television viewers might feel that virtual physical objects are actual without feeling any sense of transportation. Although it is quite

plausible that first-time television viewers might feel the sense of coexistence with objects in a television set, it is very unlikely that experienced television viewers might feel a similar sense of coexistence with objects in a television set. Therefore, experienced television viewers' responses to virtual physical objects as if they were actual—e.g., attention to moving or big objects in a television—cannot be explained by the feeling of self-transportation.

The second limitation of the above typologies is that their classifications are not mutually exclusive. For example, the conceptual distinction between physical presence and self presence, as defined by Biocca (1997), is fuzzy. That is, it is hard to conceptually differentiate the awareness of self-identity inside a virtual world—"self presence"—from the sensation of the physical location of a self inside a virtual world—"physical presence." This is mainly because the previous domain-based typologies explain virtual physical experience based on a feeling of the existence of a para-authentic self inside a virtual world. Heeter (1992) tried to avoid this dilemma by including environmental presence in her typology. The inclusion, however, still cannot solve the problem of nonexclusiveness, because environmental presence—"the extent to which the environment itself appears to know your existence and react to you"—is more likely to be a contributing factor for personal presence—the extent to which you feel you are in a virtual world—rather than a distinctive dimension of the feeling of presence.

As explained before, Schloerb's (1995) attempt to classify presence according to the subjective-objective dimension has two serious limitations—the impossibility of objective telepresence and the illogicality of the success or failure distinction. Because I have already explained the above limitations, I will not explain them again here. Another limitation of Schloerb's typology is that it explains virtual experience only in the context of teleoperation systems. Therefore, other possible types of virtual experiences created by other technologies cannot be effectively explained by this typology.

The Current Typology

In this section, I define three types of presence—physical, social, and self presence—based on the three domains of virtual experience. Although I am using the same terms as in Biocca's (1997) typology, my explication of each type of presence will be substantially different from that of Biocca. Moreover, the current explication will deal with the limitations of the previous typologies by providing a systematic and concise definition for each type of presence.

Physical presence is defined as "a psychological state in which virtual (para-authentic or artificial) physical objects are experienced as actual physical objects in either sensory or nonsensory ways." In other words,

physical presence occurs when technology users do not notice either the para-authentic nature of mediated objects (or environments) or the artificial nature of simulated objects (or environments). Unlike the definition of telepresence, the current definition does not require the feeling of self-existence inside a virtual world (or the feeling of remote location) as a necessary condition. Therefore, no sense of transportation is required for physical presence to occur. This approach makes it possible to encompass virtual experiences created by low-tech media.

Social presence is defined as "a psychological state in which virtual (para-authentic or artificial) social actors are experienced as actual social actors in either sensory or nonsensory ways." Social presence occurs when technology users do not notice the para-authenticity of mediated humans and/or the artificiality of simulated nonhuman social actors. Social presence is different from copresence—the feeling of being in a virtual world with other people (Durlach & Slater, 2000; Ijsselsteijn et al., 2000)—in that copresence requires sharing of a space with other humans (Zhao, 2001). The emphasis of copresence on colocation of self and others requires mutual awareness in which individuals become "accessible, available, and subject to one another" (Goffman, 1963, p. 22) as a necessary condition for copresence. Therefore, it cannot explain well a possible social experience occurring when users engage in one-way communications (e.g., reading a letter, hearing a prerecorded voice message) in which no mutual awareness is involved. For example, reading a well-written letter from a friend is sometimes a more socially engaging experience than having a boring conversation with someone. The current definition of social presence explains both one-way and two-way communication situations.

My definition of social presence is also conceptually different from the definition provided by Short, Williams, and Christie (1976), which is "the degree of salience of the other people in the interaction" (p. 65). As explained before, Short et al. used the concept of social presence in order to judge how much socially rich interpersonal interaction a particular medium could bring—social presence as social richness of a medium. Therefore, it is different from the social presence defined in this article, which is about technology users' experience of virtual social objects. Short et al.'s definition of social presence is applicable to technology users' experience of para-authentic humans only. A possible social interaction with artificial social actors cannot be explained by their definition. There is a theoretical link between my definition and Biocca's (1997) definition of social presence as "mental simulation of other intelligences." Similar to Biocca, I argue that social presence occurs when technology users successfully simulate other humans or nonhuman intelligences. I add the following condition to Biocca's definition: Success-

ful simulation of other intelligences occurs when technology users do not notice either artificiality or para-authenticity of experienced social actors (both humans and nonhuman intelligences).

Finally, self presence is defined as "a psychological state in which virtual (para-authentic or artificial) self/selves are experienced as the actual self in either sensory or nonsensory ways." In other words, self presence occurs when technology users do not notice the virtuality of either para-authentic representation of their own selves or artificially constructed alter-selves inside virtual environments. Physically (e.g., realistic change of field of views according to the head movement of users or avatars) or socially (e.g., prompt and valid response to user questions) appropriate responses to user input play a main role in the feeling of self presence, because self is experienced and constructed through interactive social exchanges (see Goffman, 1963). Feelings of self presence can be either good or bad. Based on the social learning theory of Bandura (1977, 1997), Lee (2000) proposed that self presence during MUD playing can increase game users' general self-efficacy and domain-specific computer self-efficacy. Intense feelings of self presence during virtual experience, however, might create some types of identity or reality confusion, which might be harmful, especially to nonadults (see Turkle, 1995). In addition to the identity or reality confusion, distortions in body schema—the mental model of one's own body—could occur after exposure to both immersive (Biocca & Rolland, 1998) and nonimmersive (Meyers & Biocca, 1992) technologies.

Concluding Remarks

Concept explication plays a major role in successful communication among scholars and thus is the key to the advancement of science (Chaffee, 1991). Given that the study of presence is still in its infancy, a careful explication of presence is even more important for a systematic study of presence-related phenomena. Many fascinating and fundamental issues of human interaction with media and simulation technologies can be uncovered through the study of presence. I hope that this explication contributes to the study of presence by (a) broadening the domain of presence research, (b) eliminating the irregular use of various presence-related terms that have been defined in the specific context of individual research projects, (c) providing a general definition of presence, and (d) systematically defining three types of presence around which future studies should evolve.

The process of explication is an ongoing dialectic between the conceptual world and the real world. This is an iterative process in which an initial conceptual definition is applied to operational procedures, closely

evaluated throughout the research process and finally, modified to reflect the empirical reality (Chaffee, 1991). Existing empirical studies on presence suffer from nonsystematic and inconsistent operationalizations of the concept across the studies. The main reason for this is the lack of careful explications on the conceptual level. I hope this article provides a useful guideline or at least a good starting point for future operationalizations of presence by defining the concept in terms of a bivariate relationship between virtual and actual objects.

Future attempts to operationalize the concept of presence should focus on three separate issues. First, we need to develop standard measures of presence so that comparisons between and among studies and generalizations across studies are possible. Second, new measures of presence should be created and tried in future empirical research. In addition to usual pencil-and-paper measures of presence, we need to develop novel and unobtrusive measures of presence based on physiological responses, behavioral reactions, brain waves, and so on. Finally, future studies should test how feelings of presence further affect other psychological and social response variables (e.g., attitudes toward characters inside virtual worlds, attitudes toward artificial social actors, evaluation of technologies, recognition and factual memory, buying intention, credibility, parasocial relationships with avatars or agents). That is, the concept of presence should be theorized not only as a dependent variable but also as a mediating variable (cf. Lee & Nass, in press, is one of the first studies that uses presence as a mediating variable).

There are many unanswered issues in the study of presence. I believe one of the most important issues is the explanation of a mental mechanism that enables humans to feel presence when they use media or simulation technologies. In addition, the possibility that both experienced and novice users of technology feel various types of presence even with low-tech media calls for the following fundamental question regarding the fundamental presence-enabling mechanism: "What makes human minds not notice the virtuality of incoming stimuli?" Is it due to the willing suspension of disbelief consciously orchestrated by technology users? Or is it simply due to the evolutionary tendency to accept incoming stimuli at face value without close scrutiny? According to the willing suspension argument, active and conscious mental efforts to suspend one's own disbeliefs about the authenticity of incoming stimuli are the major prerequisite for the feelings of presence to occur (for the origin of this argument, see Coleridge, 1847, as cited by Holland, 2003, and Reeves & Nass, 1996; also see Laurel, 1993; Wiley, 2000). The evolutionary tendency argument, however, proposes that conscious mental efforts to suspend one's disbelief are not required, and are sometimes even an obstacle, to feeling presence, because humans have an evolutionary ten-

dency to accept any incoming stimuli as authentic unless there is very strong counterevidence (see Gerrig, 1993; Gilbert, 1991). A thorough explanation of each argument is, unfortunately, beyond the scope of this article. As a final remark, however, I want to emphasize the importance of this question. The explanation of the fundamental presence-enabling mechanism is critical to the study of presence because it will give us an opportunity to investigate the complicated relationship between the brain and its responses to virtual objects. In doing so, the study will provide many new insights in regarding how people use and respond to media and other simulation technologies in their everyday lives. Our next explication step should focus on this question (see Lee, 2003, for an initial attempt to tackle this issue).

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