

Connecting the Presence's Factors for Guiding Measurements

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1. Introduction

What does make us feel present in our real world/environment? It is natural to us to feel present where we are and with others, without being aware or thinking about this. The fact that we can sense everything (multi-dimensional sensing), added to attention and perception, provide to us the experience of presence in the real world, what we will refer as *full presence*.

The communications in distance are increasing considerably through the internet and virtual environments, such as: teleconferencing, learning in distance education, training, chat, e-business, e-commerce, online communities, virtual treatment of phobias, virtual reality, entertainment and others. All these technologies have been designed to give to the users a mediated experience that seems natural, direct and real, aiming to providing a strong sense of **presence**, as similar as possible of the *full presence*. Lombard and Ditton [1] defined formally **presence** as the "perceptual illusion of non-mediation", when the individual fails to perceive the medium throughout a technologically mediated experience.

In order to improve the sense of presence in those remote environments, it needs a strong understanding of presence concepts, its determinants, what encourages and discourages presence, and how these factors relate among them and to the users' minds.

"To identify and test which parameters affect presence, a reliable, robust and valid means of measuring presence is required"[4].

As there is no broadly accepted measurement for presence until now, the major necessity in that matter is the unification of measures to allow systematic comparisons within or across studies [3].

A starting point to allow measurement comparisons is by knowing the boundaries and connections among entities that intervene in presence, and consequently to delimit scopes onto which measures will be applied. This work presents a model, based on the Lombard and Ditton [1] presence definition, as a first insight to discuss the relationships among parameters that affect presence. It is a step in the direction of delimiting the range of causal relationships for the presence phenomenon, as part of an ongoing research towards a framework for measuring presence.

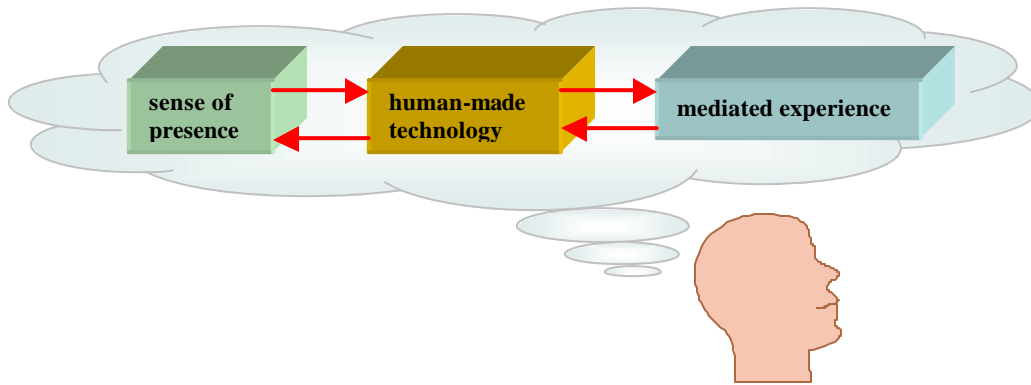
2. Presence, media and mediated experience

Lombard [2] presented: "all experience of the real world is mediated by the human senses and complex perceptual process. This experience, known as "*first order*" mediated experience, refers to the natural way we perceive the real world and give us the sensation of being present in our environment. When part or all of an experience is mediated also by technology at the same time that people can perceive the experience as if it was mediated only by human senses and perceptual process, this is called "*second order*" mediated experience".

So, the "first order" mediated experience corresponds to what we call full presence and the "second order" mediated experience is simply **presence**.

According to this paradigm, we are representing in the diagram below the implicit relation between sense of presence and mediated experience, as a bilateral relationship. This relationship shows the strong interdependence of these factors in order to obtain the presence phenomenon.

The sense of presence allows a person to enrich an experience through a medium.



A mediated experience is successful when a medium can afford the sense of presence.

Figure 1 – Our representation of Presence as a second order mediated experience

This correlation comprises several parameters concerned with presence in a quite complex structure of connections, as we will discuss next.

3. The connections among parameters that affect presence

To start discussing the relationships among parameters that affect presence, we need to evince important associations existing implicitly in the diagram above.

The **sense of presence** has been studied as some **types of presence**. The different conceptualizations of presence are always associated to a sense of presence.

“The conceptualizations Lombard and Ditton identified can be grouped into two broad categories - physical and social. The physical category refers to the *sense of being* physically located somewhere, whereas the social category refers to the *feeling of being* together (and communicating) with someone” [4].

Biocca [3] considers co-presence (co-location and mutual awareness), psychological involvement and behavioral engagement as particular cases of social presence.

This is just to exemplify the main types of presence that have been discussed in presence research. So, the main point is not to unify a type of presence here, but to justify the association we are doing, when sense of presence will be represented as types of presence, in the next diagram's level of details. This association we are referring includes implicitly in it all possible types of presence that can be suggested, doesn't matter if it is to feel at a place, with one another, an agent or a virtual object, they are still an illusion of non-mediation.

Human-made technologies are the applications for that purpose, the **media** itself.

Are the media causing reactions in our senses or are our senses looking for full presence, when using a medium? Both?

Media, as described by Lombard and Ditton [1], can be analyzed under the following aspects: media form, media content and media users. Form and content of media are variables that encourage and discourage a sense of presence in media users, as well as effects of presence.

The **mediated experience** results from that interaction with the media and is a source of **causes and effects of presence**. Causes and effects of presence have been studied in many research and some were identified in [1].

Considering the associations above, we see that they constitute the main entities of the presence phenomenon, based on the paradigm illustrated in Figure 1. The axis between each two of them show the relationships among them. The diagram of Figure 1 becomes the following:

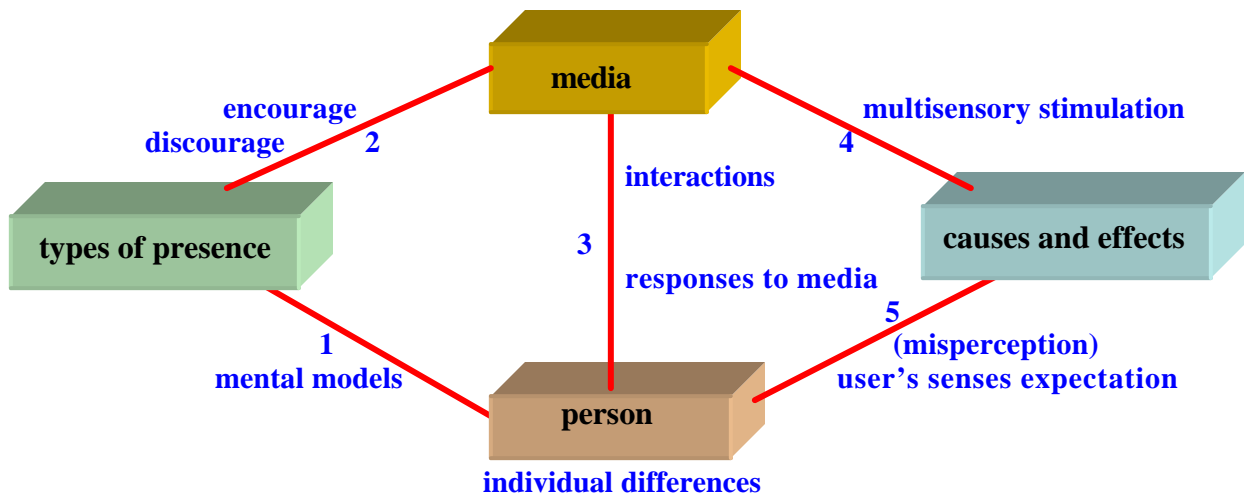


Figure 2 - Relationships among parameters that affect presence

In this level of details we are not focusing on any specific type of presence or media, but emphasizing the connections aiming at delimiting the range of causal relationships among factors that form the phenomenon of presence. These relationships remark what some authors have said - presence is a property of the individual and is a time varying experience, meaning that these connections are a continuum variation along the experience.

4. Analyzing the relationships

In reality all entities and relationships on the Figure 2 are interdependent, but what each axis shows is the direct dependence between the factors connected by it, and the indirect dependence when the factors are not on the same axis.

On axis 1 the mental models are connecting *person* to different *types of presence*, considering the individual differences among people.

“As a product of the individual’s mind, it is highly likely that the presence experience will vary significantly across individuals, based on differences in perceptual-motor abilities, mental states, traits, needs, preferences, experience, etc”[6].

The connection person-types of presence, without the rest of the diagram, corresponds to the first order mediated experience.

Through the axis 2, our model shows the connection between *types of presence* and *examples of media*, and where media can encourage or discourage presence along the experience. A number of different media can support different types of presence; examples of these relationships can be seen in [6], where IJsselsteijn and Riva present a graphical illustration of the relationship between physical presence, social presence and co-presence, with various media examples.

On the *Person-Media* axis 3, all responses to media and interactions evaluation can happen, including mediated interactions to one another – which are frequently embodied by avatars in 3D virtual environments, live web cam images, agents, or simpler representational devices. Reactions from others can give signals to the user of his/her existence in virtual environments. This is the connection where we also can analyze aspects like perceiving the medium as unsociable-sociable, insensitive-sensitive, cold-warm, and impersonal-personal, since these are personal judgments, as said Biocca [3].

Axis 4 means the direct amount of *multisensory stimulation* the media can afford in order to provide the mediated experience, to be as close as possible of the full presence, what will consequently influence on the misperception in axis 5.

Axis 5 - *causes and effects- person* - is where the experience returns the responses to the user’s senses expectation, and when the person can experience the effects of this. This means how invisible the media can be.

Waterworth [7] presented a model of virtual/physical experience comprising the dimensions of *Focus*, *Locus* and *Sensus*, relating breaks in presence with these three factors as follows: focus of attention - between presence and absence, locus of attention - the virtual versus the real world and sensus of attention - the level of arousal, on a continuum from completely unconscious to fully conscious.

Based on Waterworth model, we can add other three invisible axis crossing the line media-person to the representation in Figure 2.

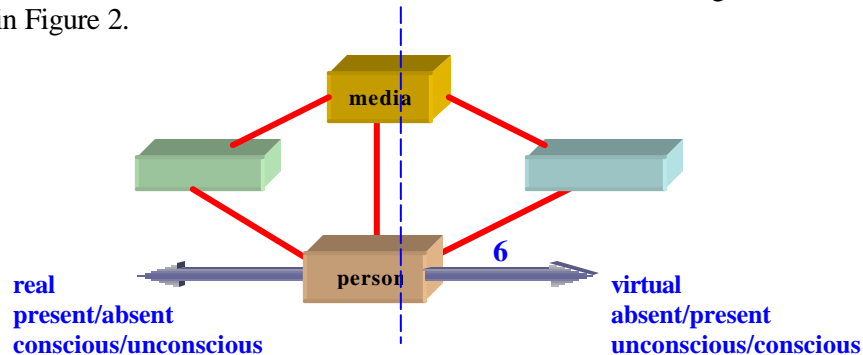


Figure 3 – The continuous transitions a person can experience

We can consider an axis on the person to represent the continuous transitions happening caused by these three factors. For simplicity we represented the three factors on one simple axis, numbered as 6.

“Multisensory stimulation arises from both the physical environment as well as the mediated environment. There is no intrinsic difference in stimuli arising from the medium or from the real world – the fact that we can feel present in either one or the other depends on what becomes the dominant perception at any one time” [6].

4.1. Measurement implications

It is agreed by researchers that presence has multiple determinants since presence is multi-dimensional. The measurements for presence are divided in two broad categories: subjective and objective [4]. But there is no classification among presence parameters relating to measurements.

What we suggest as main contribution, at this level of diagram in Figure 2, is to group the measurement experiments according to the connections presented, such as the following examples:

- measures applied to analyze how the person feels present in this or that way, according to mental models, will happen on axis 1, what means that these factors are directly dependent on the person and on the type of presence that is being analyzed, but indirectly influenced by media and its sensory stimulation outputs;
- responses from users to media as well as interfaces analysis and interactions happen on axis 3, meaning that they are directly dependent on the media form, media content as well as the media users, while the other factors that lie on the others axis have indirect influences on it.
- breaks in presence can be measured under different points of view according to the model: it is important to remark that it can happen on the axis 3 (person-media), directly caused by problems with media interaction, as well on the axis 5 (person-causes and effects), when the experience’s response doesn’t correspond to the user’s senses expectations and on the axis 1 related to the user’s psychological-personal aspects. This induces observations to which case the factors are affecting directly or indirectly the results of an experiment to measure breaks in presence;
- similarly, the amount of sensory stimulation a media can afford, axis 4, will directly influence on which will be the causes and effects of presence, as the result of the experience. Consequently, it will alter the misperception of a user related to the experience, in axis 5. This kind of analysis can vary according to the type of presence in question but it doesn’t have a direct influence from it;
- transitions from real to virtual and vice versa lie on the axis 6 presented in Figure 3. In this case, causes and effects of presence or what encourage or discourage presence will have indirect weight on it, and more directly dependence on individual differences and media interactions;

The model shows that there is no direct relation between types of presence and causes and effects of presence, without media and person involvement.

It will be extensive to describe all possible relations of measurements with the connections presented in Figure 2. At this point, the model can be used to map the measurement of presence determinants (even subjective and/or objective measures) onto these guidelines described above in section 4, giving conditions to visualize in which range of relationships the measures are being applied. This leads to identify which variables are directly or indirectly involved in the experiment under observation, what can help to guide measurement efforts in order to make comparisons across studies under the same range of variables.

It is a start for defining scopes of measures, defining boundaries among factors determinants of presence and a step in the direction of delimiting the range of causal relationships for the presence phenomenon.

Further studies will expand the model in more details to go towards a framework for measuring presence in order to obtain a general model for measurements.

The model presented here is generic and comprehensive to any type of presence, media and for all identified presence parameters.

5. Conclusions

This work presented a new model that shows the relationships among parameters that affect presence, based on the Lombard and Ditton presence definition. At this level, the model can be used as guidelines to delimiting ranges of variables to which presence measures can be applied, based on the connections described.

The model presented is perfectly extensible as much as more kinds of presence or determinant factors can appear. We are conducting a research in the direction of a general framework for measuring presence.

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