

# Being There Together and the Future of Connected Presence

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## Abstract

*Research on virtual environments has provided insights into the experience of presence (or being there) and copresence (being there together). Several dimensions of this experience, including the realism of the environment and of the avatar embodiment, have been investigated. At the same time, research on a number of new media has begun to use concepts that are similar to copresence, such as mutual awareness, connected presence, and engagement. Since digital environments can be reconfigured and combined easily, and since an increasing number of such environments are used to connect people in their everyday lives, it is useful to think about the various modalities of connected presence as a continuum – with shared virtual environments in which people are fully immersed as an end-state. This paper proposes a model for the different modalities of connected presence whereby research on shared virtual environments can be integrated with research on other new media - and vice versa. It is argued that this model can improve our understanding both of the uses of shared virtual environments and of their future development among a variety of media for ‘being there together’.*

*Keywords: virtual environments, presence, copresence, computer-mediated communication.*

## 1. Shared Virtual Environments as an End-state

Shared virtual environments (SVEs) have made it possible for people to experience ‘being there together’ in the same computer-generated space. The experiences of ‘presence’ in a virtual environment and ‘copresence’ with other people have been explicated in a number of studies. At the same time, a number of studies of new media technologies have begun to use concepts of ‘presence’ and ‘copresence’ and related concepts such as ‘awareness’, ‘engagement’ and the like. These media include mobile telephones, instant messaging, and online games. The main aim of this paper is to relate research on virtual environments to research on new media and to ask, what can we learn about SVEs learn from other new media, and vice versa?

A useful way to do this is to think of SVEs as an end-state – a purely mediated relationship in which the user of SVE technology experiences copresence with others in a fully immersive environment. Various technologies are now

available whereby users and environments are represented to each other in fully immersive displays, either in the form of computer-generated embodiments and scenes, or in the form of the 3D video capture of people and scenes. Despite current technical limitations, these immersive displays represent an end-state in the sense that – barring direct sensory input into the brain (in the manner of science fiction novels such as William Gibson’s *Neuromancer* and Neal Stephenson’s *Snow Crash*), synthetic environments for ‘being there together’ that are displayed to the users’ senses cannot be developed further than fully immersive VEs. Nevertheless, even fully immersive SVEs will, like other new media, have certain possibilities and constraints. It is argued here that relating these possibilities and constraints of SVEs to other media will provide us with a better understanding of technologies for being there together and their potential future uses.

It is proposed here that SVEs and other new media should be seen as varying on three dimensions: presence, copresence, and the extent of one’s connected presence (the term ‘connected presence’ was coined by Licoppe [1]; this concept will be explained in the following section). The third dimension, as we shall see, captures a number of different elements, but the main reason for this dimension is that we not only want to know about presence and copresence in abstract terms (the experiential state of the user at a particular point in time), but also in terms of the actual *extent* to which our relationships are mediated in this way. This yields a ‘connected presence’ cube (see figure 1 at the end of the paper).

The next section of this paper will elaborate the connected presence cube. A longer version of the paper will give an overview of the relevant findings about ‘presence’, ‘copresence’ and connected presence, and also compare SVEs with other media in relation to these three dimensions. The concluding section spells out the lessons we can learn from an integrated model of connected presence and how these can inform the design of SVEs.

## 2. Presence, Copresence, and Connected Presence

Research on VEs has produced a range of studies about ‘presence’ and to a lesser extent about ‘copresence’. There are still debates about how to define and measure presence and copresence. Here it is not necessary to go into these debates in detail (for overviews, see [2, 3]). It is, however, important to provide a precise definition of SVEs

which will allow us to compare them with other media: virtual environments provide ‘the user(s) with the sensory experience of being in a place other than the one you are physically in, and being able to interact with that place’, or simply ‘being there’ [4,5]. Copresence can then be defined as ‘being there together’.

*Shared* VEs have three dimensions ( $x,y,z$ ), which can be represented as being related to each other. On all three dimensions, we can take the individual’s presence in a real physical environment and a face-to-face encounter as our starting point (0,0,0). On the first dimension, being in physical world is at one end of the  $y$  axis and having a sense of being there (alone) in a purely media-generated place is at the other end of the end (0,1,0). This dimension is discussed in virtual environments research under the rubric of ‘presence’ or ‘being there’. On this dimension, highly immersive environments such as Cave-type [6] environments are at the top end of the  $y$  axis (0,1,0), but simulators and IMAX screens also provide the user with the experience of ‘being there’(though with limited possibilities for interacting with the environment).

On the second dimension, again with our point of departure face-to-face encounters in the physical world at one end, mediated relations with persons whom we encounter only virtually are at the other end (1,0,0). In virtual environments research, this is called ‘copresence’, but it could equally be called ‘being there together’. Telephones minimally provide us with this sense, though they lack the spatial component (not entirely, as we shall see), with instant messaging providing more of a spatial sense of copresence. So these two technologies are somewhere along the continuum of copresence, with the telephone providing some experience of copresence ( $>1,0,0$ ) and instant messaging a somewhat spatial experience of copresence ( $>1,>1,0$ ).

‘*Completely*’ mediated relationships then constitute a third dimension (the  $z$  axis). This is the *extent* to which one’s relationships are mediated through environments in which presence and copresence are experienced. This dimension has several subcomponents: the ‘affordances’ or ‘constraints’ of the mediation, the extent to which one’s relationships with others are *exclusively* mediated in this way, and third and finally the extent of time spent in these mediated encounters compared with one’s face-to-face relationships. Together these constitute ‘connected presence’ or the extent to which ‘being there together’ is mediated. Once we add this third dimension, some everyday technologies like the telephone will receive a much higher value for this dimension (0, $>1,>1$ ) than SVE systems which typically have a low value for this dimension.

## 2.1. The End-State of SVEs and the Third Dimension

These three dimensions allow us to picture SVEs with completely immersive networked VR systems - systems in which the user exclusively has a sense of being there with others - as an end-state. This end-state is one in which users would live entirely inside immersive virtual

worlds (1,1,1), and this allows us to plot all experiences of connected presence as approximations towards this end-state (see figure 2 at the end of this paper).

Before we elaborate and compare these experiences further, however, three points need to be made about figure 2: Of course it is true that all forms of mediated environments only complement – and do not replace - physical, face-to-face environments and relationships. Here, however, the focus is on *mediated* relationships. The balance between mediated relationships and face-to-face relationships in the physical world will be discussed below. The point of envisioning living together in virtual worlds is that – as we shall see – this will provide a useful model to think about and study SVEs and other media.

Another problem is that this plotting exercise is highly imperfect: the extent to which people experience a sense of being there with others in, say, telephone conversations, online chat rooms, and different types of virtual reality systems will vary considerably according to context. As long as we bear this variation in mind - an easy solution would be to plot areas of various sizes rather than points on the three axes – these three dimensions will allow us to make useful comparisons.

Being there together in different SVEs will vary considerably on the first two dimensions. One reason to go beyond these two dimensions and add comparisons on the third dimension is that the end-state of the first two dimensions (remembering that this is a single point in time) will be influenced by the third; in other words, presence and copresence will be affected by the extent of experience with the medium.

Some brief examples can illustrate this point: One is that users must learn to cope with the other person’s avatar - sometimes it is easy to walk through another person, at other times users will maintain interpersonal distance to a similar extent as in face-to-face encounters. This depends on the type of SVE system used (see the comparison of three systems in [7]) but also, in immersive SVEs, on the stage of the task people are in, or how habituated to interacting with an avatar they have become [8]. Note that presence and copresence are inescapably affected by ‘connected presence’ – whether one walks through or maintains a conventional face-to-face distance from another avatar is bound to influence the experience of being in the environment and interacting with an avatar.

Another example from the same immersive SVE trial is that users point out objects to the other person with an untracked arm or they ‘lean’ to hear the person even when there is no spatial sound; yet at other times, they use the devices appropriately [8]. Again, this depends on the amount of time they have spent on the task and how ‘used to’ the system they have become.

Similar phenomena can be identified for other new media. For example, people can treat places at the other end of a mobile phone conversation as if they were sharing the remote space – as when they gesture to the other person (even though the gesture cannot be seen) [9]. Or again, instant messaging (IM) can, with routine use, create the sense of the other person’s copresence in the sense that

people will treat IM as a shared space in which people can step and out of each other's awareness.

Another example is when, in networked immersive projection technology (IPT) systems, people use their bodies as reference point in interacting with objects, using verbal and non-verbal communication to do spatial tasks together. They need more verbal communication in networked desktop systems for the same task because they need to describe in words where they would otherwise have used gestures and their bodies [10]. Again, this takes getting used to in both cases. Notice again that people also do this in mobile phone conversations, for example giving an indication of their location to let their partner know how they are coping with the space around them [9]. Or, to take a non-spatial example, the absence of eye gaze to indicate who one is speaking to can be compensated for in both telephone and SVE situations by means of words (or in SVE's also by gestures, see [11]).

## 2.2. Two End States of Being there Together

SVE technologies range from immersive projection technology systems or IPTs (also known as Cave-type displays) and head-mounted displays to desktop systems. Two types of technologies currently occupy the furthest points on the dimensions of presence and copresence (1,1,0): Networked IPT systems that display computer-generated avatars and spaces, and environments that allow users to share the same 3D video space with video avatars (blue-c is currently the only example of the latter, see [12]).

The difference between video- 3D environments (essentially holographic videoconferencing systems) versus computer-generated 3D environments is important for the discussion to follow and therefore deserves to be spelled out: Both are end-states of people completely immersed in mediated communication environments interacting with each other, but they have quite different capabilities: video environments *capture* the appearance of real users and real places, while virtual environments *generate* user representations (avatars) and virtual places or spaces. The two technologies also allow the user to *do* different things: video environments are realistic and are constrained by this realism, virtual environments allow manipulation but they do not capture real scenes. The two environments therefore represent two quite *different* end-states – even though *both* are on the same top right hand corner in figure 1 terms of presence and copresence (1,1,0).

To appreciate the difference between these two immersive VEs, picture your body (and those of others), as well as the real place around you, captured by cameras and reproduced in full - and now add the fact that, although this capturing has been done digitally, the digital environment of 3D video images is designed such that objects (including people) can only behave according to the laws of the physical world. In other words, this is a 3D videoconferencing scenario in which the space around the users is included.

Now picture, by contrast, your body controlling a computer-generated avatar along with other such avatars in a computer-generated environment - the appearance and

behaviours of which are unconstrained by real-world laws (for example, flying around together). Note that the difference between the two scenarios is not just 'realism', but also what control is exercised over one's body – is it captured or tracked? – and over the environment – are objects captured or can they be manipulated? The Rubik's cube task, for example, which involves collaboratively putting together cubes that a suspended in space and that snap together (described in [8]), would be impossible to implement in a video-captured environment. (In fact, the two endstate scenarios may be mixed in practice – for example, capturing the user on video but putting them into a computer-generated environment, or putting a computer-generated avatar into a video-captured environment - but in their pure forms they are quite different.)

If they are fully realized in the way described here, they are also, as mentioned earlier, the furthest possible extensions of technologies for 'being there together' or of shared synthetic environments - since no conceivable system could go beyond providing a more fully immersive experience of being there together (perhaps, again, neuro-physiological 'mind-melting' is conceivable, but this falls outside the definition of displays for the senses). Mixed or augmented reality devices, where the user is partly inside a VE and partly engages with the physical world, will constitute approximations to these two ideal end-states.

It is important to emphasize that the experience of presence is a sensory one – primarily visual and also audio (and sometimes haptic). This is important because there are debates about whether media which do not afford sensory experiences of another place or person – a book, say, or a text-based MUD – can be discussed in the same context as VEs (see the discussion in [13]). This is ruled out by the definition of VEs given earlier: unless the experience is a sensory one, one based on perception of a place or person via our sensory apparatus, the experience 'mediated' by books and the like is excluded. Thus a complete end-state will provide an environment for being there together for *all* the senses, but since sensory inputs and outputs apart from vision, sound and haptics (such as smell and taste) are rather remote, we can concentrate on the audio-visual environments that are currently available.

## 3. Shared Virtual Environments, the Multiple Modes of Connected Presence, and the Future of Mediated Relationships

SVEs can be compared to other environments for 'being there together' which raise issues pertaining to the immersiveness and interactivity of graphical plus audio environments (again, interfaces for the other senses could be mentioned here, but interactive and immersive graphics with audio is the most common type of VE system and environment). And they allow us to compare an end-state of full and constant immersiveness with various other conditions of connected presence. SVEs can thus be used to investigate a range of communications conditions along the presence, copresence and connected presence dimensions. The end-state of SVEs represent a valuable research tool for the study of the role of (computer-)

mediated communication in society. In addition, this end-state can be used to advance social science research, with experiments in SVEs that are difficult or impossible in face-to-face situations because various conditions of presence and copresence can be manipulated [14,15]. ('Manipulating conditions' may bring to mind social psychology, but it needs to be remembered that all kinds of conditions can be manipulated in SVEs, such as the means by which users can contact each other, how they can shape the built environment, etc.). In short, they offer a laboratory for studying face-to-face encounters and other media by allowing an array of conditions towards an end-state.

What brings all the issues around the different types of presence together into a coherent whole, from the point of view of taking mediated relationships rather than face-to-face encounters in the physical world as the baseline, is the focus of attention *inside* the environment (exclusively, away from the physical world and its face-to-face encounters) – which consists of the forms of attention on the other person(s) or mutual focus on one side - and on the environment on the other. And this focus can be on seeing or hearing – the environment and the other person(s). But the focus can also be on what you can *do* in the environment, and *do* there together – how one can interact with each other and with the environment [5].

This notion of interaction, however, is too passive for gauging connected presence. What is also needed is a more active notion of how relations can be maintained – or how they are enabled and constrained – in different media. Apart from the control over the immediate activity or what holds ones' attention, we could ask about the extent to which people have control over the environment in different media or mediated environments - how much they can be modified, what control over their appearance users have, what level of interactivity the displays and tools provide, and the like (all these have already been mentioned in passing.) And we should add the nature of the relationships – their depth, which encompasses the extent in time and the immediacy or exclusivity - that these media afford for 'being there together' and for making the environment one's own.

Debates about our 'mediated' relationships with others have arisen previously in relation to new media. Recently, the debate has been about whether the internet contributes to fewer offline relationships and the like [16]. If we think of these debates in terms of copresence and connected presence, they can be put into perspective: it is not that purely mediated interpersonal relations should be seen as causing loneliness or being inferior to face-to-face relations and the like; rather, different media provide different possibilities for being there together in the changing landscape of interpersonal connected presence.

Relationships are thus shaped not only by the 'medium', but by its 'affordances'. And, these affordances apply not just to the relationship with people, but also relationships to the environment and our control over it. Even if, as mentioned earlier, our relations in these media technologies should be described in terms of areas rather than as points on the three axes in the two figures, certain technologies and their uses nevertheless remain clustered in

particular areas in relation to each other. This is an obvious point, but one that is not often made (Hutchby [17] is an exception): different technologies provide different constraints and possibilities for 'being there together', and if we put these on our three axes, we can begin to see what the futures of different media might look like.

This leads to what is perhaps the most comprehensive question that can be raised in relation to the intersection between the three dimensions of presence: Given that our relationship to the world mediated is by information and communication technology, what affordances, physical and social, do the various technologies for 'being there together' provide? This is the question to which the end-state presented here can begin to give some interesting answers. The end-state of SVEs points to a particular form of the mediation of our physical and social worlds and particular forms of living in immersive virtual worlds. If, however, we do not take face-to-face relationships as a baseline but approximations to this end-state, then we can ask: what do SVEs, in contrast with other less immersive relations, 'afford'? How do the levels of immersiveness and togetherness compare – with each other, rather than compared with face-to-face relations in the physical world?

Many SVEs provide a rich modality for 'being there together' compared to other media and they offer more control. Yet, as can be seen in studies of related media [1,18], other media also provide a strong sense of mutual awareness and availability on an everyday basis. With the changing landscape of mediated relationships and new media technologies, the line between SVEs and other new media technologies (which often include images and sounds of the other person and of the environment) that are shared over interpersonal networks are becoming increasingly blurred. Hence a research programme will be required which takes SVEs beyond the laboratory and early uses, and beyond online gaming and social spaces, and put 'being there together' into the context of our multiple modes of connectedness in everyday settings.

The connected presence cube allows us to do this; to see individuals connected to others via various communication and interaction modalities, with face-to-face communication only one among other possibilities. People are either immersed in the physical world or in the virtual world, stepping in and out of these constantly, and sometimes participating in several such worlds, limited only by the fact that sensory attention needs to be focused on a limited set of people and features of the environment, which makes multiple simultaneous channels (communicative multitasking) difficult. Increasing communication means that we are continuously connected to others who are aware of our presence and copresence to a greater or lesser extent. If we think of the multiple devices for connected presence that we use constantly throughout the day, it is possible to see that we need to manage our accessibility, mutual awareness and focus of attention continuously with different affordances (or constraints and possibilities) in different technologies for mediated interaction. The design of SVEs should therefore be informed by how best to combine different levels of

presence, copresence and connected presence in our everyday lives.

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