Designing Around Breaks in Presence in Virtual Reality

Supervisors

Jean-Philippe Rivière and Yannick Prié (riviere-jp@univ-nantes.fr & yannick.prie@univ-nantes.fr)
Nantes Université, CNRS, LS2N, UMR 6004, 44000 Nantes, France

Description

In Virtual Reality research, the sense of presence is defined as the sense of "being there'" in the virtual world (Witmer & Singer, 1998), accompanied by the illusion that the events unfolding are actually happening (Slater, 2009). It is a fundamental concept for researchers and design practitioners, as it encourages users to respond as if they were in the real world. However, presence can be disrupted by external (e.g., a phone ringing, a graphical bug) or internal distractors (e.g., disruptive thought), leading to what is known as Breaks in Presence (BIPs): moments when participants become aware of the real world (Slater & Steed, 2000.). Traditionally, BIPs have been viewed as negative experiences to be avoided (Tao et al., 2022).

We still lack a nuanced understanding of what happens for the users when such breaks occur (Pouke et al., 2022), for example, what happened just before they occurred, what may have triggered them, and how users live and manage them, notably how they recover from them. We propose to tackle this gap empirically, by exploring the experiences of BIPs from the perspective of users, in order to understand how they appear, unfold over time, and if and how they differ. This implies triggering different sorts of BIPs in VR, collecting the associated lived experiences, and examining the specific unfolding and content of each one, before proposing more general descriptions.

State of the art

Given that BIPs depend on presence, a preliminary definition of this concept is needed. Presence is considered a psychological state, representing an inherently subjective internal experience (Lee, 2004). However, there is still a lack of agreement on the different dimensions that constitute it [16]. According to Biocca (1997), the sense of presence is an umbrella term that encompasses three components: spatial, self, and social presence. While spatial presence corresponds to the subjective feeling of being physically immersed in a virtual environment (the "being there"), the sense of embodiment (or self-presence) refers to an ensemble of sensations that arise in conjunction with being inside, having, and controlling a body in a virtual world (Kilteni et al., 2012).

Embodiment and spatial presence are two key aspects of presence that can lead to BIPs. However, other types of presence have also been studied. For example, Slater introduced the concept of Plausibility Illusion (PsI), which he defined as the illusion that "what is apparently happening is really happening" (Slater, 2009). Similarly, Waterworth et al. (2001) proposed a model centered on user attention, which considers factors such as whether attention is directed toward the virtual or real world, the individual's presence or absence in the world, and their degree of consciousness.

Objective

In this project, we will investigate BIPs that arise from disruptions in different dimensions of presence (e.g., spatial illusion, plausibility illusion, attention, embodiment, etc.) and capture the lived experiences of these breaks by users. The objective of the thesis is to better understand how breaks in presence are experienced and how they can serve as creative opportunities for designing innovative VR interactions. The PhD candidate will have three specific aims: 1) design and implement a VR environment that can foster presence (place illusion, plausibility illusion, and embodiment), 2) understand the different experiential patterns that underlie BIPs in VR; and 3) propose ways to reduce the impact of these breaks in VR, either by minimizing their frequency or by facilitating a smooth return in presence.

Research agenda

The thesis will begin with a comprehensive state-of-the-art review on presence, embodiment, and BIPs. During the first year, the PhD candidate will design and implement a VR environment that can foster the different aspects of presence (ie. spatial presence, embodiment, plausibility illusion, etc). Then, the PhD candidate will propose and conduct several experimental studies to investigate BIPs. Each study will aim to collect data on various types of BIPs, such as spatial, embodiment-related, or attentional breaks. The methodologies will include micro-phenomenology (Petitmengin, 2006) or other "second-person" interview techniques (Høffding et al., 2023), along with a heterogeneous approach to data collection and analysis, including interviews, video recordings, logs, and more. In the second year, the focus will shift to designing and implementing VR strategies aimed at detecting and mitigating BIPs or facilitating a return to presence after a break. These strategies will be tested in the third year through additional experimental studies, in experimental or real-world contexts.

Desired Qualification and Skills

- Master's degree or equivalent in Human-Computer Interaction, computer science, or a related discipline (cognitive psychology, etc.), with a strong interest or proven experience in VR technologies
- Programming experience, particularly in Unity
- Experience in user-centered design, design study method, and evaluation methods
- Strong research interests, analytical skills, and the ability to conduct rigorous academic work
- Eager to conduct interdisciplinary research, using qualitative methods
- Ability and willingness to work effectively with students, faculty, and staff from all backgrounds
- Good written and spoken English

Applications must include:

- A cover letter, including motivation for the position and emphasizing strengths regarding the project and requirements (max 2 pages).
- A detailed CV (max 2 pages).

- Scans of relevant diplomas or certificates

References

Botvinick, M., & Cohen, J. (1998). Rubber hands 'feel' touch that eyes see. *Nature, 391*(6669), 756-756.

Felton, W.M., & Jackson, R.E. (2022). Presence: A review. *International Journal of Human–Computer Interaction, 38*(1), 1–18.

Høffding, S., Heimann, K., & Martiny, K. (2023). Working with others' experience. *Phenomenology and the Cognitive Sciences, 22*(1), 1-24.

Kilteni, K., Groten, R., & Slater, M. (2012). The sense of embodiment in virtual reality. *Presence: Teleoperators and Virtual Environments, 21*(4), 373-387.

Lee, K.M. (2004). Presence, explicated. *Communication Theory, 14*(1), 27–50.

Petitmengin, C. (2006). Describing one's subjective experience in the second person: An interview method for the science of consciousness. *Phenomenology and the Cognitive Sciences, 5*(3), 229-269.

Pouke, M., Ylipulli, J., Uotila, E., Sitomaniemi, A. K., Pouke, S., & Ojala, T. (2022). A qualitative case study on deconstructing presence for young adults and older adults. *PRESENCE: Virtual and Augmented Reality, 31*, 257-281.

Rivière, J. P., Vinet, L., & Prié, Y. (2024). Towards the use of virtual reality prototypes in architecture to collect user experiences: An assessment of the comparability of patient experiences in a virtual and a real ambulatory pathway. *International Journal of Human-Computer Studies, 192*, 103342.

Slater, M. (2009). Place illusion and plausibility can lead to realistic behaviour in immersive virtual environments. *Philosophical Transactions of the Royal Society B: Biological Sciences, 364*(1535), 3549–3557.

Slater, M., & Steed, A. (2000). A virtual presence counter. *Presence, 9*(5), 413-434.

Tao, Y., & Lopes, P. (2022, October). Integrating real-world distractions into virtual reality. In *Proceedings of the 35th Annual ACM Symposium on User Interface Software and Technology* (pp. 1-16).

Waterworth, E.L., & Waterworth, J.A. (2001). Focus, locus, and sensus: The three dimensions of virtual experience. *CyberPsychology & Behavior, 4*(2), 203–213.

Witmer, B. G., & Singer, M. J. (1998). Measuring presence in virtual environments: A presence questionnaire. *Presence, 7*(3), 225–240.