

Measuring the Sense of Presence in Virtual Reality Using Physiological Measurements While Inducing Fear

Thesis Scope: BS/MS

Project Description

Presence, a psychological construct referring to the sense of being in a virtual environment, is widely used to indicate the quality of Virtual Reality (VR) exposures. Most researchers employ questionnaires to measure presence. However, this approach is susceptible to response bias - posing queries about presence directly or indirectly may obtain an answer that would not otherwise have reached the participants' conscious level (2). In this project, we want to measure the sense of presence in VR through physiological data like skin conductance by inducing subjective fear. Previous research has identified that fear is highly correlated with presence (4, 3). In addition, the induced and perceived fear can be explained through mixed-effects models as a function of the skin conductance features (1). The goal is to explain the subject presence in VR through skin conductance features while inducing fear. Therefore, we can ensure we measure presence and achieve an objective measure.

What you will do

- Reading literature about fear and the sense of presence in VR
- Developing and designing VR application to present fear stimulus
- Measuring physiological data like skin conductance
- Analyze and examine the relationship between physiological data, fear and presence
- Research writing and presentation

Prerequisites

- Good programming skills (C#) for VR development using Unity
- Some experience in statistical data analysis would be a plus (R or Python)

Contact

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References

- (1) Andrea Baldini, Sergio Frumento, Danilo Menicucci, Angelo Gemignani, Enzo Pasquale Scilingo, and Alberto Greco. Subjective Fear in Virtual Reality: A Linear Mixed-Effects Analysis of Skin Conductance. *IEEE Transactions on Affective Computing*, 13(4):2047–2057, October 2022. doi: <https://doi.org/10.1109/TAFFC.2022.3197842>.
- (2) Simone Grassini and Karin Laumann. Questionnaire Measures and Physiological Correlates of Presence: A Systematic Review. *Frontiers in Psychology*, 11:349, March 2020. doi: <https://doi.org/10.3389/fpsyg.2020.00349>.
- (3) Daniel Gromer, Max Reinke, Isabel Christner, and Paul Pauli. Causal Interactive Links Between Presence and Fear in Virtual Reality Height Exposure. *Frontiers in Psychology*, 10:141, January 2019. doi: <https://doi.org/10.3389/fpsyg.2019.00141>.
- (4) Holger T. Regenbrecht, Thomas W. Schubert, and Frank Friedmann. Measuring the Sense of Presence and its Relations to Fear of Heights in Virtual Environments. *International Journal of Human-Computer Interaction*, 10(3):233–249, September 1998. doi: https://doi.org/10.1207/s15327590ijhc1003_2.