“CHI´22 Workshop - VR [we are] training” – Motivation Statement

Steven G. Wheeler
HIT Lab NZ, University of Canterbury
steven.wheeler@pg.canterbury.ac.nz

My name is Steven Wheeler, a first-year PhD student at the University of Canterbury in New Zealand. My research focuses on using virtual reality technology to train New Zealand firefighters for high-risk and high-cost scenarios, specifically wildfire firefighting training. As firefighting rarely, if ever, takes place in isolation, I am highly interested in learning how to incorporate collaboration into my research further. Furthermore, firefighting involves various senses – the smell of smoke, the heat produced by a fire, the recoil of a firehose in hand. Therefore, I see the workshop as an ideal way to expand my thoughts about my research while having the honour of helping create a research agenda for the field.

Before starting my PhD, I was studying for a master’s in computer science, where virtual reality became the focus of my dissertation. My main research interest was exploring multisensory virtual environments, specifically how we can incorporate richer haptic experiences than what is commonly available currently. My dissertation introduced a novel method of introducing passive haptic feedback to virtual environments by using real-world objects as a template for virtual ones. This research aimed to produce a passive haptic solution that could be replicable in many settings and be economically viable to implement. Outside of haptic feedback, the dissertation discusses various themes relevant to the workshop; for example, the virtual environment’s performance and its effect on motion sickness and the concepts of presence and immersion and how to maintain both. Working alongside researchers from a variety of universities, I submitted the dissertation as a paper to the VRST 2021 conference, which was published as a poster [5].

While studying for my master’s, I worked as a research assistant building a training simulation for a security company in London. The project’s development took place over eight months, in which I talked with the clients extensively to understand their needs and collaborated with my team to create viable solutions. While not a collaborative or multisensory virtual environment, I learnt about catering for varying levels of technological acceptance and enthusiasm, incorporating playfulness within a training scenario and the practicality and efficacy of using VR in training. I believe these experiences could provide valuable perspectives when discussing many of the workshop’s proposed themes.

Furthermore, I am the primary author of a systematic review of human factors research in immersive virtual reality firefighter training published in Fron-

tiers in Virtual Reality in October 2021 [4]. This review consisted of six publications involving training simulations for firefighters, focusing on human factors. Four studies consisted of an urban environment and involved search and rescue tasks, and the remaining two looked at aerial firefighting training. Of the papers reviewed, many investigate themes the workshop will address. For example, the work of Cohen-Hatton and Honey [3] looked at using heat panels in a firefighting virtual training environment. Clifford et al. [2] produced a collaborative environment where the pilot used a head-mounted display while the Air Attack Supervisor used a CAVE system with both sitting next to each other in the "cockpit". Backlund et al. [1] provided a hose as the interface for their simulation to provide a more ecologically valid experience. In the review, I discuss the outcomes, potential issues, and future research opportunities of the papers reviewed, which could offer valuable insights in the workshop.

Currently, I am reviewing the literature surrounding real-world firefighting training and the firefighters' attitudes towards it to see where, if possible, we can use virtual reality to help achieve the necessary learning goals. I am attempting to accomplish this by defining the unique features of virtual reality and matching them with the areas identified as crucial to firefighters. From this, I can help uncover scenarios in which virtual reality would be most helpful in aiding wildfire firefighting training and provide novel solutions for them. I hope to explore these very ideas in the workshop and gain additional insight and inspiration for the direction of my research.

In conclusion, although I am relatively new to the world of research, I believe I can add unique insight in developing a research agenda and add value to the discussions within the workshop due to the reasons outlined previously. I would love to join and learn from – and work with – experts in the field, and I thank you in advance for your consideration.

References

[1] Per Backlund, Henrik Engstrom, Cecilia Hammar, Mikael Johannesson, and Mikael Lebram. 2007. Sidh - a Game Based Firefighter Training Simulation. In *2007 11th International Conference Information Visualization (IV '07), Zurich, Switzerland*. IEEE, New York, NY, USA, 899–907. https://doi.org/10.1109/IV.2007.100

[2] Rory MS Clifford, Simon Hoermann, Nicolas Marcadet, Hamish Oliver, Mark Billinghurst, and Robert W Lindeman. 2018. Evaluating the Effects of Realistic Communication Disruptions in VR Training for Aerial Firefighting. In *2018 10th International Conference on Virtual Worlds and Games for Serious Applications (VS-Games). Würzburg, Germany*. IEEE, New York, NY, USA, 1–8. https://doi.org/10.1109/VS-Games.2018.8493423

[3] Sabrina R. Cohen-Hatton and R. C. Honey. 2015. Goal-Oriented Training Affects Decision-Making Processes in Virtual and Simulated Fire and Rescue Environments. *Journal of Experimental Psychology: Applied* 21, 4 (Dec. 2015), 395–406. https://doi.org/10.1037/xap0000061

[4] Steven G Wheeler, Hendrik Engelbrecht, and Simon Hoermann. 2021. Human Factors Research in Immersive Virtual Reality Firefighter Training: A Systematic Review. *Frontiers in Virtual Reality* 2 (Oct. 2021), 671664. https://doi.org/10.3389/frvir.2021.671664

[5] Steven G. Wheeler, Simon Hoermann, Robert W. Lindeman, George Ghinea, and Alexandra Covaci. 2021. Content-Rich and Expansive Virtual Environments Using Passive Props As World Anchors. In *Proceedings of the 27th ACM Symposium on Virtual Reality Software and Technology*. ACM, New York, NY, 1–2. https://doi.org/10.1145/3489849.3489947