Virtual Avatar Co-embodiment and Haptics

Brief: Virtual avatar co-embodiment (top row figures) refers to situations where two or more users embody a single, shared avatar (e.g., in Virtual Reality). This offers a multi-user experience characterized by shared control over the avatar's movement, allowing for the creation of stronger bonds between humans at a distance. Prior experiments have shown that participants who co-embody a virtual avatar report high levels of perceived control, with lower levels of actual control [1], making it a promising method for VR-based rehabilitation and training.

In this project we will build on our prior in which we implemented non-verbal coordination between co-embodied participants using position-aware haptic feedback [2]. Initial results showed that participants reported a lower Sense of Agency (SoA) with haptics than without. However, the type of haptics (bottom left figure), and the type of shared avatar representation (bottom right figure) could have impacted the findings. This raises questions about how best to design haptic feedback and avatar representations for convincing virtual co-embodiment.

In this project you start from an existing VR system [2] and explore one of several directions relating to the design of haptic feedback, avatar embodiment, or a combination of both. The project involves digital design work and conducting user studies to evaluate the impact of the designs on the experience of co-embodiment. During the project we will collaborate with the Nara Institute of Science and Technology (NAIST) in Japan. There is the possibility for a (paid) visit to NAIST during the project.

Skills: Electronics (e.g., Arduino), programming (e.g., Android, C#), user evaluation, quantitative and qualitative analysis, interest in haptic actuators and design, AR/VR

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[1] D. Kodama, T. Mizuho, Y. Hatada, T. Narumi and M. Hirose, "Effects of Collaborative Training Using Virtual Co-embodiment on Motor Skill Learning" in IEEE TVCG, vol. 29, no. 05, pp. 2304-2314, 2023. doi: 10.1109/TVCG.2023.3247112

[2] Karthikeya Puttur Venkatraj, Wo Meijer, Monica Perusquía-Hernández, Gijs Huisman, and Abdallah El Ali (2024). ShareYourReality: Investigating Haptic Feedback and Agency in Virtual Avatar Co-embodiment. In Proc. CHI '24, ACM, NY, USA, 1–14. https://doi.org/10.1145/3613904.3642425