

Collaborative Touch: Who is Touching my Object?

Team(s) **Loki** (Inria centre of the University of Lille & CRISTAL) & **Rainbow** (Inria centre of the University of Rennes)

Level Master

Duration 4-6 months

Advisor(s) **Bruno Fruchard**, **Maud Marchal**, **Thomas Pietrzak** [**Contact advisor(s)**]

This internship investigates how haptic signals (mostly vibrotactile feedback) can provide a sense of presence in collaborative Augmented Reality scenarios. We want to compare several scenarios in which multiple users are trying to manipulate similar objects, and study what haptic messages would optimize the throughput to identify who is touching this object.

Context

Extended realities provide shared virtual environments for co-located and remote users to work in collaboration, both in synchronicity or asynchronously. They heavily rely on visual signals to convey information to users, which can quickly become overwhelming. For instance, knowing what collaborators are working on and what they previously did (e.g., which objects they manipulated) can be difficult to visualize without cluttering the visual space [ref needed].

Haptics (e.g., vibrotactile or kinesthetic feedback) stimulate the sense of touch and is usually used to simulate tangibility in such environments. We rather propose to use it to convey information on the collaboration between users in a collaborative space. We want to investigate how to convey information through vibrotactile feedback on object manipulation, i.e., who is currently touching an object or who did in the past.

Objectives

Our goals are to investigate several strategies to convey information on object manipulation in a multi-user environment, both in synchronous and asynchronous contexts. For instance, we plan to study whether temporal (e.g., multiple vibrations spaced in time) or spatial (e.g., multiple actuators on different areas of the body) provide different benefits. We plan to run a Wizard-of-Oz study: we envision a task with a single user interacting with (physical and virtual) objects in Augmented Reality (using a [type of headset]) that receives haptic signals upon touching objects that *simulate* actions of other users.

The candidate will have to: 1. build a vibrotactile or kinesthetic haptic device with multiple actuators that can be easily attached on the body 2. reflect on strategies to map haptic signals to provide a sense of presence of other users in a shared collaborative space 3. design and run a Wizard-of-Oz empirical study to compare the strategies and identify their benefits 4. report on the study results

Candidate

The candidate must be at the MSc (Master 2 in France) level and show interest in Haptics and Extended Reality. Previous experience in programming 3D virtual interactive environments is important.

If you are interested, please send an email to Maud Marchal (maud.marchal@irisa.fr), Thomas Pietrzak (thomas.pietrzak@inria.fr), and Bruno Fruchard (bruno.fruchard@inria.fr) using as a subject [LOKI internship: Collaborative touch: who is touching my object?].