

Can you show me what you see? Controlling the visibility of mixed-reality content

Background

Mixed reality (MR) can seamlessly blend virtual elements into the physical world we live in, and it creates new possibilities for designing interactions with digital content. For example, you can have a virtual screen attached to the physical wall of your room and watch a movie, or you can talk to a person shown as an avatar sitting next to you on your sofa. Major tech companies are envisioning a future where people wear an MR device in their daily lives and live in a world in which virtual content is always blended into the physical world.

One challenge in using MR in a multi-user scenario is related to the visibility of the content to others. When someone is wearing an MR device, it is difficult to tell if they are looking at a physical object or an overlaid virtual object. How can we show others when someone is interacting with virtual content and what is the virtual content they are interacting with? If the other person is also wearing an MR device, we could also display the content for that person, but then there is a privacy issue. Should we just put a sign on the headset that says, "I am looking at something you cannot see?" How about when you want to share with another person what you are seeing? How should we design an MR interaction that allows users to control the visibility of what they see to others?

Goals / Methods / Approach

The goal of this master project is to design and implement a novel mechanism to control the visibility of mixed-reality content in a multi-user scenario. It will involve: (1) generating a concept and a scenario for changing the visibility of MR content in a multi-user setting, (2) designing an interaction flow that demonstrates the concept, (3) implementing the interaction using an MR headset (e.g., Microsoft HoloLens or Meta Quest), and (4) conducting a user study to validate the idea. One way to start the project is to analyze how we display and share digital content using conventional mobile devices (e.g., showing what is on your phone screen to a person next to you (proximity) or sending the content to the other person's phone (selected recipient)). Then a new interaction mechanism will be designed and implemented for MR. New ideas may arise by considering how we show and share physical objects since intuitiveness is key to designing MR interactions. With a developed prototype, a user study will be conducted.

Required skills

Experience or interest in learning human-computer interaction design, XR implementation, and programming using a game engine (Unity). The ability to design thinking and creative imagination is a plus.

Notes

The project language is English. This is an initial feasibility study that aims at exploring the idea. It may lead to new research grant proposals and publications.

Tasks for the MSE candidate

The project can be implemented in 2 to 3 stages, e.g., P7 (Concept generation and initial prototype), P8 (interaction flow design and implementation), and p9 (user study and further improvement).

Study type:	<input checked="" type="checkbox"/> Full-time study <input checked="" type="checkbox"/> Part-time study 50%
Project Organization:	Individual or group work
Workplace:	Windisch
Advisor:	Prof. Dr. Kevin Kim

