

Perception of Shared Spaces in Collaborative Augmented Reality

Master level internship at IMT Atlantique (Brest)



Team and location: INUIT team / Lab-STICC, IMT Atlantique, Brest campus, France

Duration: 5-6 months

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Context: Augmented Reality (AR) is becoming a very popular technology to support remote collaboration, as it enables users to share virtual content with distant collaborators. However, sharing the physical spaces surrounding users is still a major challenge. Each user involved in an AR collaborative situation enters the shared environment with a part of its own environment [4, 9]. For example, this space can be shared in several ways for two remote users [3]: (i) in an equitable mode (i.e., half from user 1 and half from user 2) [5], (ii) in a host-guest situation where the host imposes the shape of the augmented environment to the guest [7, 8], or (iii) in a mixed environment specifically designed for the collaborative task [6]. Whatever the configuration, the question of how users perceive and use this shared environment arises [2].

Problematic: Space perception is widely studied in Virtual Reality, but it is still very open question for AR. The necessity of co-localization and integration of the real environment in AR has a significant impact on the space perception. This element is even more important in a remote collaboration situation as the presence of another person and his or her own environment adds to the perceptual biases that can appear.

Internship Goals: The goal of this internship is to explore the augmented space perception in a collaborative situation, to propose rendering and interaction guidelines for maximizing immersion. The objective is to avoid users to consider AR environment as a superposition of environments belonging to each collaborator. Instead, they should consider it as a unique common shared space allowing a fluid interaction between users. This will help users to build a common group [1] and improve their mutual understanding.

The intern will work on the following tasks:

- Do a literature review on the different techniques used to share the physical space of a remote user, including 3D reconstruction and video capture techniques.

- Build a technical system which allow to share and merge the physical spaces of two remote users, based on state-of-the-art techniques.
- Design user experiments to assess space perception in different configurations.

The implementation will probably use a *Microsoft HoloLens 2* headset, but we may also consider other alternative technologies, as projective technology.

Requirements: We are looking for students who are enthusiastic about AR technology and are interested in research in Human-Computer Interaction. The intern is expected to have solid programming skills, and ideally, previous experience with C# and Unity 3D. A background in computer graphics or video processing will be a plus.

The internship could lead to a Ph.D. thesis.

References:

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