Towards Virtual Habitation: Design Research on Human-Centered Mixed Reality (MR) Spaces

Instructor: Yan Chao
Schedule: Wednesday (5–8), Friday(5-8), Weeks 1–8
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No prerequisite skills or knowledge are necessary for enrollment.

Course Overview

With the rapid advancement of intelligent virtual simulation technologies, the concept of human habitation has expanded from the material world to virtual reality (VR), and more recently toward the fusion of virtual and physical realms through mixed reality (MR). Unlike traditional built environments or metaverse scenes rooted purely in VR, MR presents a novel perceptual medium that integrates physical and virtual elements, offering new possibilities for intelligent virtual living environments.

Mixed reality drives the iterative evolution of the relationship between space and the human body, simultaneously disrupting conventional paradigms of spatial design. By constructing dynamically adaptive virtual spatial forms within real-world contexts, MR enables real-time, high-dimensional, and cognitively demanding human-space interactions. These interactions may lead to more efficient, safer, and more pleasant spatial experiences.

This course takes MR-based future habitation scenarios as its core design-research subject. Leveraging a self-developed multi-user MR interaction platform and human-centered analytics toolkit, students will engage in the design and evaluation of intelligent virtual habitation spaces. Through a combination of theoretical instruction, hands-on practice, and experimental validation, the course aims to equip students with the fundamental principles and methods for designing human-centered interactive environments within MR systems, ultimately exploring innovative paths toward future living.
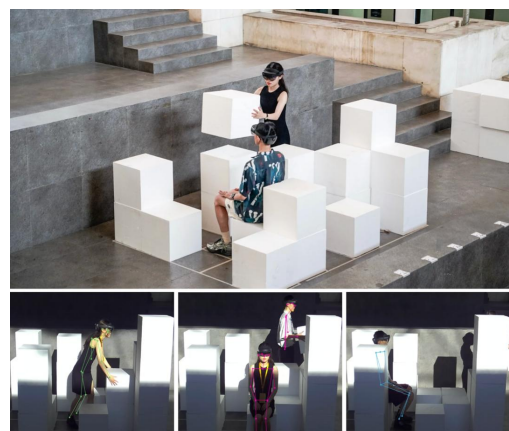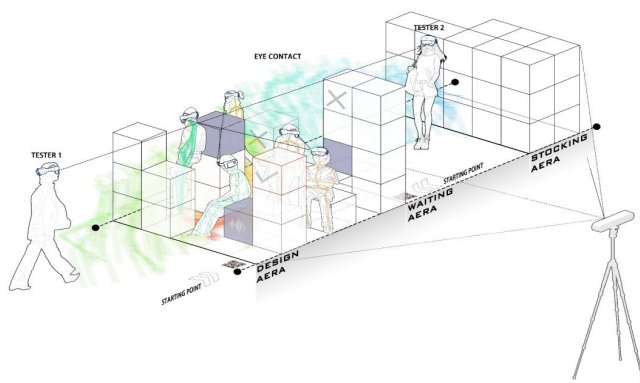
Course Structure

Phase 1: Constructing an MR Interaction Framework (2 Weeks)

Students will learn to use the provided MR interaction platform and AI tools to understand the integration of physical environments with virtual components. They will propose conceptual scenarios and establish preliminary frameworks for human-centered interaction design in MR settings.

Phase 2: Designing Human-Centered MR Spaces (5 Weeks)

Focusing on the dynamic interplay between spatial and human factors, students will develop MR spatial designs in relation to a specific physical site. They will construct full-scale (1:1) immersive environments, establish real-time interaction data flows, and explore hybrid design strategies that merge the virtual with the real.

Phase 3: Interaction Data Collection and Design Validation (2 Weeks)

Students will conduct human-centered experiments within their designed MR environments to assess the multidimensional impact on user experience. They will quantitatively validate their design outcomes based on predefined concepts and goals through experimental data analysis.

Design Research Framework

The design tasks are based on everyday interior environments, with students selecting a specific spatial scenario as their research focus. Within a defined spatial volume (5m × 5m × 5m), students are expected to create a new hybrid space where physical and virtual elements are interwoven. Designs may address issues of **efficiency**, **safety**, or **comfort**, with potential applications including:
– Personalized therapeutic spaces for individuals
– Collaborative environments for two users
– Social interaction spaces for small groups

Through the creation of immersive, interactive, and empirically testable MR environments, students will explore the resolution of real design challenges and the development of novel architectural typologies within a mixed-reality context.