

## **REFLECT: A Head Mounted Projector Display**

2011-present

### **Sharing Space with Virtual Humans**

ICT's Mixed Reality Lab has developed a near axis retroreflective projector system called REFLECT (Retroreflective Environments For Learner-Centered Training) that is conducive to mixed reality training. REFLECT is designed to unobtrusively deliver mixed reality training experiences. REFLECT:

- Places no glass or optics in front of a user's face.
- Needs only a single projector per user.
- Provides each user with a unique and perspective correct image.
- Situates imagery within a physical themed and prop-based environment.
- Can be low power, lightweight, and wireless.
- Works in normal room brightness.

A Texas Instruments micro-projector and active LED tracking markers are mounted on a helmet. The markers are part of a PhaseSpace Impulse tracking system that provides position and orientation to a personal computer running Panda3D for graphics and VRPN for tracker data communication.

Each user only sees the imagery from his or her own projector, since retroreflective screens bounce light straight back towards the light source. This personalized information display allows each user to experience a perspective correct viewpoint, enabling each user to unambiguously perceive whether a virtual character is establishing eye contact, gesturing, or pointing a tool or weapon at them. Furthermore, since no bulky optics cover the users' eyes, trainees can also establish eye contact with each other.

Retroreflective surfaces also open up new user interface capabilities beyond mixed reality training. The spatially targeted nature of the information presentation is well matched to other applications that require user-personalized data. For example, cell phones with embedded projectors could be used as "cheek-based displays": at an airport, a user would hold a cell phone projector to his/her cheek and look at a blank retroreflective surface to see real-time directions, guidance arrows, and flight information, in the user's preferred language.

References: Augmented Reality Applications and User Interfaces Using Head-Coupled Near-Axis Personal Projectors with Novel Retroreflective Props and Surfaces. Mark Bolas and David M. Krum. Pervasive 2010 Ubiprojection Workshop, May 17, 2010, Helsinki, Finland.

Project Leader: Mark Bolas

At the University of Southern California Institute for Creative Technologies leaders in artificial intelligence, graphics, virtual reality and narrative advance low-cost immersive techniques and technologies to solve problems facing service members, students and society.

