Human Surrogate Interaction

EXHIBIT FACT SHEET

Over the past two decades, the Office of Naval Research (ONR) has been at the forefront of developing immersive training capabilities that seek to engender a sense of presence for Warfighters. Immersion refers to an objective level of fidelity in an environment or with a human surrogate. Presence refers to a user's psychological sense of being in an environment, or with a "human surrogate", often measured by the trainee's verbal, physiological, and behavioral characteristics.

Human surrogates are context-specific stand-ins for real humans. These surrogates can be virtual (2D/3D display), physical (animatronic robots), physical-virtual (robots with capabilities to alter appearance), and even real humans (role players). There have been many studies that have explored the effects of surrogate affordances such as appearance, physicality, and gesturing during interactions with real humans. Preliminary findings imply that there is a difference in the way people perceive and interact with the various physical manifestations and affordances of surrogates. This directly impacts the effectiveness of such surrogates and their applications in the real world, including live virtual training.

Physical-virtual human surrogates can be realized by combining dynamic computer graphics with human-shaped (and potentially dynamic) physical forms. A physical-virtual surrogate comprises a combination of realistic shapes and realistic appearance (color and texture). Such a manifestation shares features of both virtual and physical surrogates; they have a realistic physical human shape and size, and they can appear with different races, genders, and personalities. One way to achieve this is via robotic or animatronic surrogates with projected facial imagery (Fig. 1).

Fig. 1: Humanoid robots can change facial appearance and behavior to represent any ethnicity or demographic during live virtual training.

Figure 2: A humanoid robot in its original form showing hybrid electric and pneumatic actuation with passive compliance elements for natural motion.

When controlled or "inhabited" by a real human role player, such surrogates have the ability to be both proactive and reactive, increasing their plausibility for training. A single role-player can inhabit animatronics in distributed locations.

Voice modulation and artificial intelligence routines, combined with low latency network protocols and human-in-the-loop control can potentially provide effective, scalable, and flexible live virtual training systems. We are working on a larger framework called the Avatar Mediated Interactive Training and Individualized Experience System (AMITIES) that supports inhabiting such surrogates.

We are demonstrating one such surrogate at I/ITSEC 2014, controlled using AMITIES, to interact with visitors. The surrogate is a humanoid robot featuring human agency (human-in-the-loop control) allowing for very natural interaction and conversation with attendees. The surrogate is capable of changing facial expressions and body posture during conversations. In addition, the surrogate can instantaneously change both appearance and behavior to take on the characteristics of a completely different entity. Such techniques could be applied to tasks such as cross-cultural training. For the purposes of our demonstration, we have chosen an Afghani context, where the robotic surrogate behaves and appears in keeping with the culture of the Tajiks. Over the course of the event, the surrogate will change in both appearance and behavior when interacting with visitors.

This exhibit is associated with the Human Performance Training and Education (HPT&E) thrust under Code 30 of the Office of Naval Research. We envision this research will help in the public understanding of research related to increased effectiveness, flexibility, scalability, and realism during live-virtual training.

For further information on this exhibit, or business opportunities with ONR, please contact the Training S&T Program Officer, Human & Bioengineered Division, Warfighter Performance Department, Office of Naval Research at 703-696-4501, or by mail at Office of Naval Research, 875 N. Randolph St., Arlington, VA 22203.