University of Central Florida
3280 Progress Drive, Orlando, FL 32826
(407) 882-1300 / www.ist.ucf.edu

Distributed Virtual Environments for Team Training

The Fully Immersive Team Trainer (FITT) supports experiments using virtual environment (VE) technology for team training. The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) developed the functional requirements to meet its research goals and has conducted research using the system. IST designed and implemented all software, hardware and modeling components under contract to ARI.

ARI's primary research objective is to develop and evaluate different ways to use VE technology to train leaders, teams and units. Ancillary goals include investigating the psychological effects of VEs, possible effects of VE-based distributed team training and rehearsal on performance, and the ergonomic aspects of proposed training systems and soldier equipment.

VE Technology. FITT supports the simultaneous immersion of two participants in a VE and allows performance of a wide range of complex individual and collective tasks. It can also support both local and remote participants.

The Defence and Civil Institute for Environmental Medicine in Toronto, Canada, and Old Dominion University have implemented the system. Most recently, FITT has been used to investigate distributed team performance.

The system uses MotionStar™ sensors to track body position, visual display, gesturing, aiming and firing weapons, operating equipment and, by walking-in-place, movement through the VE. The Flight Research V8 helmet-mounted display (HMD) provides graphics display. Headphones support simulated radio nets, allowing participants to communicate with each other and other personnel.

System data capture allows playback of each mission, synchronized with digitized recordings of all communications, and supports both time-based streamed data and processed summary information. Playback can be presented in real time or manipulated for fast, slow, or stop-action motion.

The system depicts participant avatars wearing chemical protective gear and masks, adapting participants' expectations to match the current capabilities and limitations of VE systems in representing locomotion, vision, audition and haptic factors. This enhances, rather than detracts from the sense of presence in the synthetic environment.

Research. The first experiment conducted with the FITT system addressed how and when to give guidance during training in VEs. Members of the VE team studied mission procedures (dealing with hazardous materials, hostage

rescue, terrorist activity, building search) and then, as a team, practiced the mission in the VE.

For each mission, trainees were given guidance either before (demonstration), during (coaching), after (after-action critique) or not at all (control group). Teams given guidance performed better on a final test mission than did the control group teams. All groups performed better on the test mission than on an initial baseline test (see Figure 1).

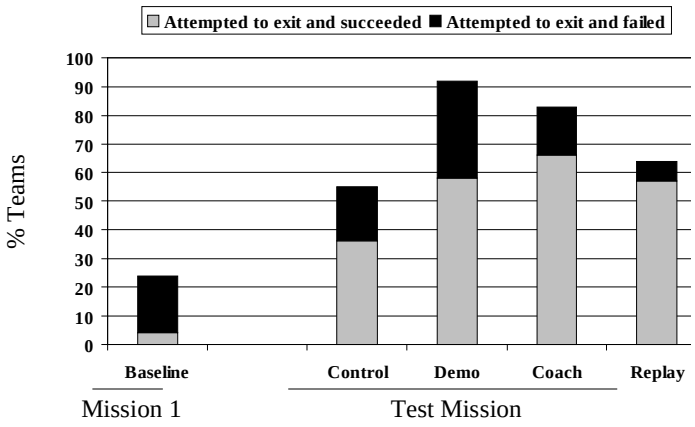

Figure 1. Percentage of teams per group that exited within the time limit or at least attempted to exit. Baseline represents the first mission for the control group and replay group combined.

In general, the findings indicated that the FITT adequately creates immersive environments such that participants can function as teams in learning and performing search, communication, and security procedures for training research purposes. In particular, the FITT interface for walking through the simulated environments was learned quickly by the participants. Each of the instructional strategies could be implemented with the FITT, and each had relative advantages and disadvantages.

The second experiment has taken advantage of the fully developed multi-player capabilities, and supported implementation at remote sites in order to address the potential effects of distributed team members on overall team performance. The key question addressed is whether teams composed of members that can physically interact outside of the VE rehearsal system perform better in any way than teams that never physically interact. If there is any difference between physically local and distributed teams, the ramifications for training, retention, and mission rehearsal may be crucial. Training programs using distributed VE systems would have to be designed to address any discovered differences.

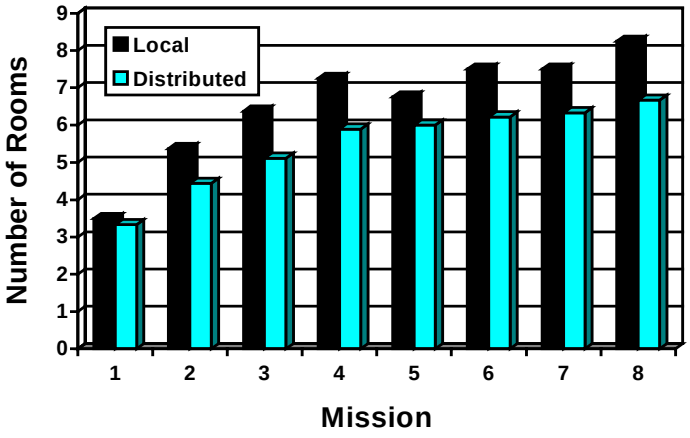

Figure 2. Number of rooms cleared by distributed and local teams over a series of eight mission.

Preliminary data show improvement in overall team performance in the number of rooms searched, time to perform collective tasks, and hazardous materials disarmed. Teams using distributed simulation during missions, having more limited opportunities to interact away from the mission and team AAR, do not develop the same levels of performance achieved by those teams using the distributed simulation while in the same location (see Figure 2).

Contact:
Glenn Martin
Research Scientist
407-882-1349
E-mail: martin@ist.ucf.edu

Dr. Bruce Knerr
U.S. Army Research Institute
for the Behavioral Sciences
407-384-3987
E-mail: Bruce_Knerr@stricom.army.mil