The Mission Rehearsal Exercise, a Virtual Reality *Tour de Force*

Simulation technology may help train U.S. peacekeeping forces like the real thing.

by Bob Calverley

PHOTO BY IRENE FERTIK - COMPOSITE BY GLENN LEE

From left to right, Jeff Rickel, research assistant professor, computer science; Lewis Johnson, research associate professor, ISI; Bill Swartout, research associate professor and ICT's director of technology; Jackie Morie, ICT's manager of creative technology; and Jonathan Gratch, assistant professor, ICT. In the background is a 150-degree wraparound screen with a simulated projection of a Mission Rehearsal scenario used to teach young officers to make decisions. The screen at left shows a close-up of an anguished mother with her injured child.

Immersed in 3,500 thundering watts of 10.2-channel sound, enveloped by a 150-degree wraparound screen, a young Army officer's dilemma unfolds as he questions a platoon sergeant.

Eagle 1-6, a nearby outpost, is calling for help. A Humvee with reinforcements has just struck and seriously injured a young civilian boy. The boy's mother anxiously hangs over her son. A medic says the boy will be all right – if he gets to a hospital soon. Onlookers gather. A television news cameraman begins videotaping. Is the area secure? The officer calls for a medevac helicopter. Shortly afterwards, Eagle 1-6 calls. They're taking fire. Weapons fire can be heard over the radio. When the lieutenant orders the platoon sergeant to dispatch soldiers to secure the route to Eagle 1-6, the mother explodes. Why are the soldiers abandoning her son?

What should the officer do? Does he forget about Eagle 1-6? Maybe he can split his forces and send some troops to reinforce the outpost? Or, should he just abandon the injured boy?

"This is the kind of scenario that the post-Cold War military increasingly faces in peacekeeping missions, and these are the kinds of decisions that young Army lieutenants must learn to make quickly," said Bill Swartout, technical director and research associate professor at the USC Institute for Creative Technologies (ICT).

Visually, the characters are computer-generated avatars derived from motion-capture images of real actors. The actors wear sensors on their bodies, and a set of cameras captures the movement of their limbs and joints.

Swartout is the project leader of the Mission Rehearsal Exercise, a virtual reality *tour de force* created by a team of seasoned research engineers and Hollywood storytellers who are pushing simulation technology into new realms.

THE PROJECT IS at the heart of an ambitious and unique research program that has rapidly taken form at the ICT. The U.S. Army created the ICT in August 1999 with a $45 million grant.

The two main characters in Mission Rehearsal are highly complex artificial intelligence agents capable of varying degrees of reason and emotion. They have a limited ability to hear what is said to them, analyze it and respond with speech, gestures or other movements.

The sergeant is programmed to be levelheaded and logical. He acts like a coach. If the officer orders some soldiers to go on ahead to Eagle 1-6, the sergeant will warn him that splitting his force is not a good idea. The other main character, the mother, is programmed to react emotionally.

"The mother's goal is to help her child and treat her child," explained Jon Gratch, ICT project leader and research assistant professor who helped do the emotional modeling. "When troops begin leaving, this triggers her anger."

Visually, the characters are computer-generated avatars derived from motion-capture images of real actors. The actors wear sensors on their bodies, and a set of cameras captures the movement of their limbs and joints. Then a computer uses the data to produce movement that is more natural than movement generated solely by a computer. However, there are some limitations.

"If you haven't captured the right motions, the character won't have that in his repertoire. We're working on a way to get a computer to more completely generate motion based on how the human body works," said Swartout.

Jeff Rickel, project leader and research assistant professor at the USC Information Sciences Institute, noted that the characters – fully integrated in a virtual world – not only have personalities and emotions, they also have facial expressions and can recognize and synthesize speech.

"No one else has ever put together a team with expertise in all of these areas," he said.

The project has required close cooperation between technicians and writers. Both groups have been learning from each other.

"The technical people really have to understand what makes a good story. You need emotions, conflict, drama, and the story has to involve you," said Swartout. "Writers, who usually do linear stories, have to create stories where there are lots of possible outcomes. Also, how do you write a story for characters who have some serious technical limitations?"

FOR EXAMPLE, the characters don't touch each other. One woman who saw Mission Rehearsal said it must have been created entirely by men because the mother never touches her child. In fact, women are on the team, and the creators very much wanted the mother to touch her child.

"But the 'collision detection mechanism' isn't good enough. The character might put her hand right through her son," said Swartout. "We couldn't show soldiers getting into the Humvee either. We have them get into the vehicle on the other side, where you can't see them."

Mission Rehearsal currently assaults only the eyes and ears. Jacquelyn Morie, manager of creative development at ICT, said that the next target is the nose.

"Smell is one of the most evocative senses," she said. "We want a multi-sensory environment."

The current scenario lasts about five minutes and has two possible outcomes, depending upon the decision made by the trainee.

"We are working to expand the possible outcomes," said Swartout. The large team of researchers, Hollywood creative talent and companies such as Haptek Corp., Boston Dynamics and Paramount are constantly improving all of the elements in the interactive scenario. "As time goes by the experience will become better and more lifelike." ■

Images of USC: Past, Present and, Perhaps, the Future

IRENE FERTIK

Above, retired teacher Sterling Wallace ('51), a "Half-Century" Trojan, with his wife, Georgina, also a USC grad. Their Laguna Beach home's family room is filled with USC memorabilia. Their son, Lance, doesn't mind – he's a 1996 grad.

INGA KIDERRA

Left, hailing from Honolulu, Hawaii, Samuel David hugs his mother, Sylvia, before taking his B.A. in Spanish to Miami for further studies.

ROB CALVERLEY

Right, dressed in their red and blue uniforms, about two dozen eighth graders from St. Agnes Elementary School stood on a small hill adjacent to Hahn Plaza and watched the ceremony taking place in Alumni Park. "I've been doing this for 15 years," said their teacher, Galen Chappelle, a 1983 USC graduate. "Since I started doing this, about 30 [of my students] have graduated from USC." Six of his former students did so May 11.