Interactive Simulation Training: Computer Simulated Standardized Patients for Medical Diagnosis

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SIMmersion LLC, a spin-off of The Johns Hopkins University Applied Physics Laboratory, is a software development company in Columbia, MD that creates human interactive training simulations. The company, in partnership with the National Capital Area Medical Simulation Center and the Henry M. Jackson foundation, was contracted by the Department of Defense (DoD) to create a medical simulation training module. The contract resulted from the solicitation of the U.S. Army Medical Research and Materiel Command for Training for First Response to Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) Events. The grant resulted from the DoD's Small Business Innovative Research (SBIR) Program.

The prototype simulation was developed to validate the application of SIMmersion's simulation technology to the medical training industry. When developed into a full-featured, multimedia system, the product will train medical practitioners to accurately diagnose illnesses that could pose a threat to public safety and indicate the presence of bioterrorism agents. Specifically, the simulation will train practitioners to perform efficient and effective exams for the diagnosis of smallpox, chicken pox, and Rocky Mountain spotted fever.

Future development on a companion system to the current prototype concept may address the differential diagnosis of other bio-terrorism agents. Biological agents under consideration include anthrax, plague, and tularemia, all of which could initially be mistaken for influenza.

SIMmersion creates PC-based simulations of people with whom trainees are able to hold detailed conversations. Instead of using computer-generated characters, known as avatars, these simulations employ human actors in challenging, life-like situations. Trainees communicate with the simulated characters in a face-to-face conversation, using voice recognition technology or a computer mouse to interact. Questions and responses are scripted to emulate what real people would say at any given stage of a conversation. Trainees can select from the scripted questions and the character will respond based on established motives, emotional state, and character state. The result is a nearly free-form conversation that is different with each play of the simulation. Since each session of simulation training is unique and can be played at any time, practice is essentially unlimited because trainees are willing to play the simulation over and over again.

Feedback is available in a variety of ways: an on-screen Intelligent Tutor who provides non-verbal cues, Help buttons that facilitate queries regarding user statements and character responses, numeric scoring, and instant-replay features that enable users to review and analyze portions of their conversation or even the entire dialogue. Since the training simulations are developed based on specific teaching points, it is possible to test the trainee's ability to meet certain lesson objectives; scoring is also built into the system to assess a trainee's proficiency level.

SIMmersion hypothesizes that the computer simulated patients developed in human interactive training simulations will be a superior alternative to the current practice of using standardized simulated patients. The most significant drawbacks to standardized patient training are time and money; specifically, the amount of time required for clinicians to train and the associated expenses. Computer simulated standardized patients also afford consistency over time and allow trainees to practice the simulation an unlimited number of times. A comparison of the effectiveness of each of the methods may further validate an investment of medical simulation training.

Success in this effort is likely to open the door to many new research projects with the potential to radically change the ways that medical education is delivered. Topics that would match well with SIMmersion's simulation capabilities include diagnosis of depression, alcoholism, or drug use, grievance counseling, marriage counseling, and suicide intervention. SIMmersion's technology can be integrated with technology available elsewhere to create a speech-interactive mannequin-based patient simulation system for healthcare training and assessment. Trainees will not only be able to practice hands-on assessment skills with the patient and treatment interventions, but also practice their skills in patient interviews through SIMmersion's interactive simulation technology. The mannequin system would emulate human behavior using an interactive computer simulated person in a realistic scenario with a realistic, interactive patient.

Demonstrations of the simulation technology best illustrate the realism and accuracy of simulated conversations and subject matter, accordingly. Visit http://www.simmersion.com for more information.