Medical and Healthcare

Simulation, Training, and Education

Events

Monday 28 November - Friday 2 December

Tutorials

Monday 28 November 2011

Understanding the Healthcare Simulation Development Lifecycle (1131)

Dr. Haru Okuda, National Medical Director for SimLEARN. **Dr. Lygia Arcaro**, RN, BC, National Director of Nursing Programs for SimLEARN, **Dr. William L Gaught** Curriculum Developer and the creator of the simulation healthcare lifecycle model used at SimLEARN.

Track: 8 Room: W304H Time: 0830-1000

Simulation is gaining wide-spread acceptance in the field of healthcare, and many healthcare accreditation organizations are requiring simulation-based assessments in order for physicians, nurses and other clinicians to earn specialty certifications. In addition, healthcare simulation is being used for continuing professional education so practicing healthcare professionals can acquire new skills or practice current skills in a safe environment. The development of a reliable and valid healthcare simulation that is sustainable requires a lifecycle development methodology that is unique to healthcare. This tutorial presents a health-care simulation lifecycle model developed by the Veterans Health Administration's (VHA) National Simulation Learn- ing Education and Research Network (SimLEARN) Center located in Orlando, Florida. The SimLEARN lifecycle model can be used by DoD or civilian healthcare organizations to develop healthcare simulations that meet the core competencies and accreditation requirements of the healthcare industry.

Creating an Interoperability architecture supporting Healthcare simulation (1109)

Dr Brian F. Goldiez is Deputy Director at the University of Central Florida's (UCF) Institute for Simulation and Training.
Dr. Teresita Sotomayor is a Science and Technology Manager for Medical Simulation Technologies at the U.S. Army Simulation and Training Technology Center.

Track: 8 Room: W304H Time: 1245-1415

There is an active community developing and using virtual simulators in the healthcare field. Department of Defense, Veterans Affairs, and other government entities are also creating and supporting the use of simulators to train individuals and teams. Discussions with various users and developers indicate that it would be beneficial to connect simulators and their components. Illustrations include remote operation (e.g., where the instructor station is separate from the simulator), hand-off between caregivers using different simulators, delivery of consumables (e.g., whole blood), and integration into a larger environment (e.g., warfare or terrorist act).

This tutorial will describe how the addition of healthcare simulators to the interoperability paradigm is accomplished, the structure of information conveyed between simulators, and additional information, such as images and health records, which are being proposed to enrich the learning experience for all of the constituencies noted above.

Paper Sessions

Tuesday 29 November

Markerless Full Body Tracking: Depth-sensing Technology within Virtual Environments (11363)

Dr. Belinda Lange, Dr. Albert 'Skip' Rizzo, Chien-Yen Chang, Dr. Evan Suma, Mark Bolas, University of Southern California Institute for Creative Technologies

Session: EC3 Room: W304A Time: 1600 Date: Tuesday November 29

Over the last decade there has been growing recognition of the potential value of virtual reality and game technology for creating a new generation of tools for advancing rehabilitation, training and exercise activities. However, until recently the only way people could interact with digital games and virtual reality simulations, was by using relatively constrained gamepad, joystick and keyboard interface devices. Thus, rather than promoting physical activity, these modes of interaction encourage a more sedentary approach to playing games, typically while seated on the couch or in front of a desk. More complex and expensive motion tracking systems enable immersive interactions but are only available at restricted locations and are not readily available in the home setting. Recent advances in video game technology have fueled a proliferation of low-cost devices that can sense the user's motion. This paper will present and discuss three potential applications of the new depth-sensing camera technology from PrimeSense and Microsoft Kinect. The paper will outline the technology underlying the sensor, the development of our open source middleware allowing developers to make applications, and provide examples of applications that enhance interaction within virtual environments and game-based training/rehabilitation tools. The PrimeSense or Kinect sensors, along with open source middleware, provide markerless full-body tracking on a conventional PC using a single plug and play USB sensor. This technology provides a fully articulated skeleton that digitizes the user's body pose and directly quantizes their movements in real time without encumbering the user with tracking devices or markers. We have explored the integration of the depth sensing technology and middleware within three applications: 1) virtual environments, 2) gesture controlled PC games, 3) a game developed to target specific movements for rehabilitation. The benefits of implementing this technology in these three areas demonstrate the potential to provide needed applications for modern-day warfighters.

Cost-effective, Simulated, Representative (Human) High- Fidelity Organosilicate Models (11328)

Troy E. Reihsen, Lauren H. Poniatowski, Dr. Robert M. Sweet, University of Minnesota Medical School, Department of Urology

Session: EC3 Room: W304A Time: 1630 Date: Tuesday November 29

Current methods employed for the manufacturing of manikins and analogue simulators are lacking accurate physiology, and do not benchmark against human tissue properties. We have created cost-effective, simulated, and representative (human) high-fidelity bench top models and manikins with realistic mechanical properties built from human biomechanics data. Our program creates analogue tissue models with material properties representative of human tissue that can be designed and benchmarked against our Human tissue-property database. Such models are generated from, and can be registered with, patient-specific VR 3-D models. A simple organosilicate is used as a template for the development of human tissue models. Organosilicate films that are exposed to an ultraviolet light source have at least a 10% or greater improvement in their mechanical properties (i.e., material hardness and elastic modulus) compared to as- deposited film. Additionally, organosilicates are ideal due to their x-ray reflectivity, making them good clinical model substitutes for ultrasound and fluoroscopy applications. Moreover, this soft matter can be layered like human tissue with no space between layers and wrinkles very similar to human skin. The goal of this project has the potential to replace animal models. The tissues can be shot, exposed to blast pressures, cut, burned, etc, and then "surgically repaired." They can be used independently or as hybrid models attached to standardized patients or confederates in training environments. They are relatively cheap, rapid to produce, and greatly exceed current simulator fidelity. The production methodology allows for imbedding of sensors or fiducials to capture data for user's performance relative to collision forces and location.

Tuesday 29 November (cont'd.)

Virtual Preceptoring and Virtual Patient Medical Records: an Effective, Realistic, Low-cost Alternative to Virtual Patients (11199)
Tom McCarthy, David Mosher, Booz Allen Hamilton; Dr. Marianne Cloeren, Managed Care Advisors

Session: EC3 Room: W304A Time: 1700 Date: Tuesday November 29

Use of highly realistic virtual patients provides a low-risk method for medical personnel to practice their clinical decision-making skills, but they are often costly to develop. In this paper, the authors describe a low-cost method to achieve a level of realism similar to that afforded by virtual patients, using virtual preceptoring (mentoring) and virtual patient medical records. The authors developed interactive, web-based courseware to guide military medical providers through the review of Service members' disability cases. While virtual patients allow students to identify pertinent facts through interviews and examination, they are not relevant to disability evaluation, which is conducted primarily by reviewing medical records. The traditional case-study approach, in which pertinent facts about the case are summarized for the student, was also considered. However, case studies do not provide students the opportunity to identify the pertinent facts, a critical disability evaluation skill.

Virtual preceptoring and virtual patient medical records were used to teach providers disability evaluation decisionmaking skills. This method cost significantly less, required less development time, and achieved a greater level of task realism and relevance than would be possible using virtual patient simulations. Preliminary data from focus groups with physicians and medical residents across the Military Services indicate this approach is engaging, realistic and relevant. The authors present lessons learned and evaluation data, along with suggested criteria for when this method is applicable. This paper should interest training professionals who develop training for providers in which medical record review plays a critical role, such as epidemiology, hazardous material exposure assessment, preventive health surveillance, workers' compensation evaluation, and billing and coding chart review. Readers will benefit from lessons learned and criteria to determine when this method is applicable to other clinical topics.

Wednesday 30 November

Using Civilian Simulation Centers for Reserve Component Medical Unit Training (11030)
Dr. John C. Morey, Vinette Langford, DRC

Session: T3 Room: W304E Time: 1030 Date: Wednesday November 30

This paper reports the results of three studies of a five year project that examined the logistics, training events, and outcomes associated with using civilian medical simulation centers as training venues for Reserve Component (RC) medical units. The studies were based on the need for clinical skills, and especially team-based skills, to be sustained through periodic training. In the absence of resources to support unit-level patient simulators and the distances involved for using the Army's Medical Simulation Training Centers, RC units might meet this training need by using civilian simulation centers close to their locations. The studies showed that in terms of logistics, units could readily access a regional center and engage in one-day training events. A variety of training strategies were examined, but the model that emerged was that the focus should be on team-based care of combat casualties presenting to level II/III health care facilities. Outcomes were examined in terms of the clinical task and teamwork performances of the care provider teams, the roles of unit trainers, and factors affecting the quality of the after-action reviews (AARs). The results of the three studies are summarized, and key observations and recommendations for using civilian medical simulation centers for RC medical unit training are provided.

Usability Analysis of Prototype Partial Task Tourniquet Trainers (11249)
Matthew Hackett, Jack Norfleet, Beth Pettitt, U.S. Army Research Laboratory, HRED, STTC

Session: T6 Room: W304E Time: 1600 Date: Wednesday November 30

Recent studies have found that hemorrhage is the cause of 83% to 87% of potentially survivable combat deaths. To address this issue, increased use of tourniquets and hemostatic agents has been emphasized in training. In an effort

to improve the technology used in the training of tourniquet application, a number of prototype partial task trainers have been developed by the Army Research Laboratory's Simulation and Training Technology Center. These trainers simulate the look and feel of a wounded human arm with simulated brachial and radial pulses. Each trainer can simulate arterial and venous bleeding. After proper tourniquet application, the device responds with appropriate feedback, including cessation of both bleeding and pulse. With the variety of capabilities available in these devices, it is important to objectively analyze the devices for usability in training scenarios. The study included approximately 10 participants attempting to apply a tourniquet to each training arm and ultimately stop simulated blood loss. This study analyzed a number of usability metrics gathered during the study including: task completion, time of task, efficiency, and self- reported metrics. Finally, the results of the analysis are reported, along with discussion of the findings in respect to future development of partial task trainers, including a thigh tourniquet trainer.

Haptics-based Combat Medical Training Effectiveness (11172)

Sandra Dickinson, U.S. Army Research Laboratory, HRED, STTC; Dr. Samuel Kolodney, Dr. Kevin Stagl, CHI Systems, Inc.; Glenn Martin, University of Central Florida, Institute for Simulation and Training

Session: T6 Room: W304E Time: 1630 Date: Wednesday November 30

Lessons from the research and development of a Haptics-Based Combat Medical Training System, as well as summative evaluation findings, are discussed with an emphasis on best practices that can be benchmarked by training stakeholders. The multiyear research effort has yielded informative lessons learned that instructional designers would benefit from when developing similar training technologies. Given the mandate to aggressively minimize preventable deaths, and the difficulties inherent to providing care in foreign theaters, it is necessary to continuously scrutinize and evolve the best practices leveraged to train, certify and sustain medical personnel.

Simulation-based Training for Burr Hole Creation (11241)

Dr. Dwight Meglan, Daniel King, Mark Ottensmeyer, Bob Waddington, Howard Champion, SimQuest; Thomas Genarelli, Frank Pintar, Brian Stemper, Medical College of Wisconsin

Session: T6 Room: W304E Time: 1700 Date: Wednesday November 30

Craniotomy is a challenging technique typically performed by a neurosurgeon, but in remote areas, available combat surgical personnel must perform this life saving procedure. To provide a means of achieving competence in the techniques involved, a prototype simulation-based training approach has been developed at the request of the US Army that provides cognitive and proprioceptive experiences in craniotomy burr hole creation. This novel prototype has been assessed and shown to produce measureable benefits for less experienced individuals performing a first craniotomy procedure in as little as 20 minutes' use of the simulator (Scerbo, Turner, & Newlin-Canzone, 2010).

Requirements were defined by military and civilian neurosurgeons, with emphasis on practical predeployment training constraints. Experimental data of the actual movements as well as the forces and torques experienced in placing a burr hole were analyzed to define the physics of drill-to-bone interaction and the requirements of the haptic device providing the user with the force/torque feel of the simulated drilling. Equations were developed based on the experimental data to model the physical interactions between the drill and the skull. Using a voxel representation of the skull's volume, a generalized approach based on energy transfer was implemented to allow the drill to erode away bone voxels.

A custom haptic device, combining two commercially available, off-the-shelf haptic devices, provided the necessary capabilities at significantly less cost than adapting any existing high-end haptic device. The resulting device uniquely enabled the feedback of large forces, bending moments, and axial torques as well as allowing continuous drill rotation with the actual Hudson Brace manual drill handle specified by the Army. Objective metrics were defined and implemented to quantify the learner's performance relative to geometric and bone-removal goals. Time-based, rotation cycle-based, and session summative metrics are also extracted for more detailed assessment.
The Army is now funding a second generation of this simulator for completion in 2011.

Thursday 1 December

SimCoach: An Intelligent Virtual Human System for Providing Healthcare Information and Support (11263) Dr. Albert "Skip" Rizzo, Dr. Kenji Sagae, Eric Forbell, Julia Kim, Dr. Belinda Lange, Dr. J. Galen Buckwalter, Josh Williams, Dr. Thomas D. Parsons, Patrick Kenny, Dr. David Traum, University of Southern California, Institute for Creative Technologies; Dr. JoAnn Difede, Cornell University, Weill Medical College; Dr. Barbara O. Rothbaum, Emory University, School of Medicine

Session: EC13 Room: W304B Time: 0830 Date: Thursday December 1

Over the last 15 years, a virtual revolution has taken place in the use of Virtual Reality simulation technology for clinical purposes. Recent shifts in the social and scientific landscape have now set the stage for the next major movement in Clinical Virtual Reality with the "birth" of intelligent virtual humans. Seminal research and development has appeared in the creation of highly interactive, artificially intelligent and natural language capable virtual human agents that can engage real human users in a credible fashion. No longer at the level of a prop to add context or minimal faux interaction in a virtual world, virtual human representations can be designed to perceive and act in a 3D virtual world, engage in face-to-face spoken dialogues with real users (and other virtual humans), and in some cases they are capable of exhibiting human-like emotional reactions. This paper will present an overview of the SimCoach project that aims to develop virtual human support agents to serve as online guides for promoting access to psychological healthcare information and for assisting military personnel and family members in breaking down barriers to initiating care. While we believe that the use of virtual humans to serve the role of virtual therapists is still fraught with both technical and ethical concerns, the SimCoach project does not aim to become a "doc in box". Rather, the SimCoach experience is being designed to attract and engage military Service Members, Veterans and their significant others who might not otherwise seek help with a live healthcare provider. It is expected that this experience will motivate users to take the first step – to empower themselves to seek advice and information regarding their healthcare (e.g., psychological health, traumatic brain injury, addiction, etc.) and general personal welfare (i.e., other non-medical stressors such as economic or relationship issues) – and encourage them to take the next step towards seeking other, more formal resources if needed.dynamics. Our view is that sustainability and scalability of JLVC exercises are not addressed by the short-term options.

OPERATION LOST PARADISE: A Low-cost Classroom Simulation for Medical Stability Operations in Medical Education (11088)

LTC Justin Woodson, USA, MD, MPH, Uniformed Services University of the Health Sciences

Session: ED7 Room: W304F Time: 0900 Date: Thursday December 1

DODI 3000.05 "Stability Operations" and DODI 6000.16 "Military Health Support for Stability Operations" both state that Stability Operations and Medical Stability Operations (MSO) respectively "shall be given priority comparable to combat operations and be explicitly addressed and integrated across all Military Health System (MHS) activities." In current operations, inexperienced military medical officers are increasingly asked to perform at a high level in stability operations requiring interaction with international government (IGO), non-governmental (NGO), and interagency personnel to achieve the mission. Traditional medical school curricula at The Uniformed Services University and other medical curricula at specific military service schools have only addressed MSO minimally, if at all, while maintaining their traditional focus on medical support of combat operations. Additionally, traditional curricula have relied on lecture based teaching methodologies to address this important content area, which has been shown to have low efficacy and unreliable outcomes for long term retention and application in the field. These effects combined with the inherent difficulty in teaching attitude based learning objectives result in military physicians being ill-prepared for the challenges faced in MSO deployments.

OPERATION LOST PARADISE is a low-technology, low-cost solution to for interactive medical education using a classroom based simulation that addresses IGO-NGO-Interagency-Military coordination in the operational environment. The exercise is modeled after the popular party game, "How to Host a Murder Mystery" and uses a novel application of role-play on a negotiation platform to guide students through critical learning objectives in an adult discovery learning experience. This presentation will describe in detail the methodology, lessons learned, and

initial outcomes assessment of the OPERATION LOST PARADISE exercise for military medical student education at the Uniformed Services University of the Health Sciences. This methodology has applicability across the full spectrum of military, governmental, and civil organizations for training and preparation for Stability Operations in all disciplines and is a feasible approach to effective training in today's cost-constrained training environment.

Raising the Bar on Medical Part-task Trainers (11041)

Emily Burns Anton, Erin Honold, Information Visualization & Innovative Research, Inc.

Session: S7 Room: W304G Time: 1030 Date: Thursday December 1

Current medical operations reveal the need for more effective training in traumatic injuries, including tourniquet placement, intravenous access for fluid resuscitation, and orthopedic immobilization. Medics have described how current simulations fail to prepare them for injuries treated. New technology allows more realistic portrayal of anatomy and physiology for simulation of traumatic injuries. The Army Research Laboratory (ARL) and Information Visualization and Innovative Research, recognizing the need to develop multi-task partial task trainers (PTT) employing these latest technological advances, conducted an eighteen month research project to demonstrate increased fidelity by creating four simulated upper extremity trauma devices. This paper describes that research project. A multi-prototype approach was chosen, based on requirements for Tactical Combat Casualty Care (TC3). For TC3 care under fire outdoor training, PTTs must be very durable. They are subject to dirt, rain, extreme temperatures, rough handling, etc. An advanced mechanical design may not stand up to the environment, an issue previously noted in high fidelity simulators. Therefore, it was determined prudent to separate the prototypes emphasizing durability on one, mechanical ability, realism, and physiology on two, and life-like realism, using advanced materials that mimic human tissue properties on a fourth. Features successfully simulated in one or all of the PTTs included bone, muscle, and fascia, sutureable, discrete tissue layers, arterial/venous hemorrhage, tourniquet control, packable wounds, and appropriate pulse response distal/proximal to the wound. The research also demonstrated treatable orthopedic breaks, multiple intravenous placement points, and integrated physiological models, displayed on a hand-held device. The project was two-phased and culminated with delivery of the PTTs in February 2011. The paper presents results of the iterative user testing of prototypes, incorporated into the final PTT designs via test-model-test approach, details the challenges and successes of the project, and describes potential productization considerations for the PTTs.

Innovation Showcase Sessions

Tuesday, 29 November, 1445-1530 Booth 3210

Avatar-Based Resiliency and PTSD Training Simulations

Kognito Interactive (Booth 721)

Tuesday, 29 November, 1615-1700 Booth 3210

Innovative Visual Applications to Enhance Medical Training

Archie MD, Inc. (Booth 3349)

Thursday, 1 December, 1215-1300 Booth 3210

Multiprofessional Communication Using Virtual Practice Environments

Clinispace (Booth 3353)

SPECIAL EVENT

WEDNESDAY
30 NOVEMBER
1030-1200
ROOM W307CD

Medical Simulation: A Vision for the Future

Moderators:

Beth Pettitt
Branch Chief, Army Research Laboratory, HRED, STTC

Jennifer Arnold
Principal, Booz Allen Hamilton

Panelists:

Colonel Karl E. Friedl, USA, PhD
Director, Telemedicine and Advanced Technology Research Center, U.S. Army Medical Research and Materiel Command

Haru Okuda, MD
National Medical Director for the Department of Veterans Affairs Simulation Learning Education and Research Network & Associate Professor of Emergency Medicine, University of Central Florida College of Medicine

Roger Smith, PhD
Chief Technology Officer for Florida Hospital, Nicholson Center

David Feinstein, MD
Assistant Professor of Anesthesia, Harvard Medical School; Director, IT and Simulation Training, Department of Anesthesia, Critical Care and Pain Medicine, Beth Israel Deaconess Medical Center, Boston, MA

Michael DeVita, MD
Attending Intensivist, St. Vincent's Hospital, Bridgeport, CT

Thomas Dongilli, AT
Director of Operations, Winter Institute for Simulation Education and Research, University of Pittsburgh, Pittsburgh, PA, Administrator University of Pittsburgh Department of Anesthesiology and School of Medicine

Sandra J. Feaster, RN, MS, MBA
Assistant Dean, Immersive and Simulation-based Learning; Director, Goodman Immersive Learning Center in the Li Ka Shing Center for Learning and Knowledge

Medical simulation facilitates training that addresses experiential gaps, demonstrated competencies, and "lessons to learn" for healthcare teams in a risk free environment. Healthcare leaders see this type of training as an answer to improving patient safety and outcomes. However there still remain issues related to the use of medical simulation for training, perceived use of medical simulation throughout healthcare organizations, criteria used to determine the use of medical simulation for training, the required realism, and the required financial investment.

This exciting event will give the audience an opportunity to hear from experts across the medical, academic, government, and industry arenas on the present use and future state of medical simulation. The audience will have a unique opportunity to shape this event by presenting questions as the event begins. All attendees will gain a clear understanding of:

- Strategic vision for medical simulation training, highlighting the need for research and development
- Focus areas for medical simulation within both civilian and military healthcare organizations
- Current usefulness of simulation in healthcare
- Identified high risk patient issues that require medical simulation training in the future
- Overall future requirements of medical simulation

We are pleased to announce an exciting bonus to this premiere event titled, "Perimeter Patrol," displaying groundbreaking and novel solutions developed to meet the broader medical simulation arena needs.

Post Conference Professional Development Workshops*

Friday 2 December

Times: 0700 Breakfast and registration • AM Session 0800 - 1200 • PM Session 1300 - 1700.
Fees: There is no fee to attend.
CEU: Only I/ITSEC Conference Registrants are eligible for CEU credits.
*Registration: Preregister via https://secure2.rhq.com/iitsec2010/public/index.cgi?track=workshoponly
*Registrations also accepted on-site during I/ITSEC registration hours.
Lunch: On own.
Presented by University of Central Florida's Institute for Simulation and Training and Division of Continuing Education. For additional information on these seminars including topical outline and instructor bios, please see: www.ce.ucf.edu/iitsec.

Immersive Experience in Healthcare Simulation: Crisis recognition and Response

Michael A. DeVita, M.D.; Past President, Society for Simulation in Healthcare

Half Day Session Room W309B 0800 – 1200

This interactive event is a "course within a course". At a high level this workshop will teach attendees how to lead a "team building" course with lessons learned, pitfalls, and clear explanations. Additionally, this workshop will include a highly immersive experience entitled "The First Five Minutes" where we will teach first responders how to recognize a critically ill patient, how to trigger a critical care response, and what to do while one is waiting for them to arrive. Everyone in the workshop will have a role and follow- ing the immersive portion a "meet the professors" section will be conducted where faculty will answer questions relating to either the demonstrated course, the process, or issues/ concerns experienced at their own simulation centers.

Robotic Surgery and Surgical Simulation Workshop for Surgical Advancement— Florida Hospital at Celebration Health

Dr. Roger Smith, Chief Technology Officer, Nina Yon, Director, Global Business Development, Florida Hospital, Nicholson Center for Surgical Advancement

Half Day Session **Meet at Room W309B by 1245** Bus will depart at 1300 and return at 1700*

Every day at the Nicholson Center surgeons from around the world are trained in multi- specialty robotic, minimally invasive, open surgical techniques. This workshop combines an introduction to surgical education and research programs, with a tour of a surgical learning facility and hands-on time with a surgical robot and surgical simulators. The objective is to introduce attendees to the similarities and differences between military and medical simulation curricula, learning environments, teaching tools, and the use of simulators. Attendees will receive overviews of the education and research programs at the Nicholson Center, a tour the learning spaces, and will use some of the equipment.

*Local attendees may drive POV to Celebration Health, 404 Celebration Place, Celebration FL 34747 if desired. www.nicholsoncenter.com/

I/ITSEC 2011
Medical and Healthcare Simulation, Training and Education Events

LEGEND

Boldface Booth # indicates significant Medical & Healthcare Simulation Products & Services

Regular Typeface Booth # indicates component solutions useful for Medical & Healthcare Simulation

Red Indicates *Healthcare Pavilion* Exhibitor

Booth #	Medical & Healthcare Exhibitors
143	U. S. Army PEO STRI - PM CATT
143	U.S. Army RDECOM
409	Strategic Operations
521	Mimic Technologies Inc.
613	National Center for Simulation
701	General Dynamics IS&T
721	Kognito Interactive
739	Engineering & Computer Simulations, Inc.
1020	Polhemus
1024	Booz Allen Hamilton
1048	RAYDON Corporation
1066	SAIC
1086	Third Dimension Technologies
1087	RAYDON Corporation
1121	Stottler Henke Associates
1133	Motion Analysis Corporation
1157	EON Reality
1280	Cybernet Systems Corporation
1421	VMASC/ODU
1449	Lockheed Martin
1581	NGRAIN
1588	Qualisys Motion Systems
1589	RealTime Immersive, Inc.
1735	CAE
1788	MS&T Magazine
1820	Vcom3D, Inc.
1927	JVC Professional Products Company
1935	Heartwood Inc.
1969	Sensics
2049	Christie Digital Systems
2065	Organic Motion
2107	Digital Projection
2121	RGB Spectrum
2135	Georgia Tech Research Institute
2165	Sytronics, Inc.
2173	AVT Simulation
2235	MYMIC, LLC
2315	SIMmersion LLC
2363	Unity Technologies
2365	Design Interactive, Inc.
2417	JHT, Inc.
2435	Northrop Grumman
2481	DiSTI
2511	CSC
2563	projectiondesign
2511	CSC
2591	CSC
2691	CAE
2707	Intevac Vision Systems
2719	Alelo, Inc.
2727	Sensory
2791	CAE
2804	Harris Corporation
2881	Da-Lite Screen Company
2912	Skedco, Inc.
2918	Engineering & Manufacturing Services, Inc (EMS)
2919	Forth Dimension Displays
2921	CHI Systems
2929	National Instruments
2963	Electrosonic, Inc.
2980	SMART EYE AB
3011	ICF International
3030	Clear-Com, LLC
3248	Gaumard Scientific Company
3249	Smooth On, Inc.
3250	Telemedicine & Advanced Technology Research Center
3251	Pocket Nurse
3252	SynDaver Labs
3253	B-Line Medical
3257	Laerdal Medical
3340	University of South Florida
3348	Simulab Corporation
3349	ArchieMD, Inc.
3352	Society for Simulation in Healthcare
3353	CliniSpace