NextMed / MMVR21
The 21st Medicine Meets Virtual Reality Conference
February 19 - 22, 2014
Manhattan Beach Marriott Hotel • Manhattan Beach, California

Conference Program

Please note: While we always aim for stability, this program is subject to change in order to accommodate presenters’ needs, educational objectives, and logistical imperatives. Please check back for any updates.

Program at a Glance

Wednesday Afternoon, February 19

[p 3] 2014 TATRC Military Medical Simulation Public Briefing

Wednesday Evening

[p 3] Welcome Reception

Thursday Afternoon

[p 5] Track A: Rehabilitation & Aging; Psychology & Technology; Integrating Intelligent Tutoring Systems in Virtual World Training/Learning

[p 5] Track B: Surgical Simulator Design; Surgical Simulation Metrics; Surgical Simulation Validation; GLSIM: Highly Demanded Full-VR Simulator as an Endoscopic Laser Surgery Curriculum

[p 7] Track C: The Federal Medical Simulation and Training Consortium

[p 8] Track D: Extending Extensible 3D (X3D): from Haptic-Based Medical Training to Clinical Applications

[p 8] Track E: Share Your Ideas with the Government

Thursday Morning, February 20

[p 4, 9-10] Poster Session: Rehabilitation & Aging; Psychology & Technology; Networking & Telemedicine; Surgical Simulator Systems; Surgical Simulator Design; Surgical Simulator Validation

[p 4] Plenary Session

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[p. 8] Networking Social: Innovate NextMed

Friday Morning, February 21

[p. 11, 14-16] Poster Session: Learning & Technology; Simulator Design & Development; Simulator Systems; Information-Guided Therapies; Imaging & Visualization; Robotics; Sensors; Haptics; Modeling

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Friday Afternoon

[p. 11] Track A: Imaging & Visualization; Information-Guided Therapies; Robotics; Interfaces; Haptics

[p. 12] Track B: Simulator Validation; Simulator Systems; Simulator Design; Learning & Technology; Fundamentals of Robotic Surgery: Development and Validation of an Online Curriculum and New Psychomotor Testing Device

[p. 13] Track C: Novel Approaches to the Study of Medical Skill Decay

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Friday Evening

[p. 14] Tour of USC’s Institute for Creative Technologies (Separate registration required)

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[p. 18] Track B: The Wide Area Virtual Environment: Lessons Learned

[p. 19] Track C: 3D Printing for Rapid Prototyping

[p. 19] Closing Mixer
Wednesday, February 19

Wednesday Afternoon

Independently Organized Session

2014 TATRC Military Medical Simulation Public Briefing

1:00 - 5:15 PM

Thomas Talbot, Organizer
Telemedicine & Advanced Technology Research Center

This session is to inform the public of developments within the military medical simulation community, share future planning ideas and engage the research community regarding mechanisms by which they can participate in advancing medical simulation goals within the defense medical community.

This track will conclude with an exciting panel discussion by Principal Investigators from two of the three Combat Casualty Training Consortia projects, all funded by the Defense Department. The goal is to determine the effectiveness of live tissue training as well as human-made simulators and the potential suitability of simulation technologies as a replacement for live tissue training. As this $20 million effort nears conclusion toward the end of CY 2014, the Principal Investigators’ experiences will be shared in a panel forum. Expect to learn how the investigators designed their studies and hear about lessons learned. Because data collection is not yet complete, this forum is not intended to provide study results. Those data will be submitted for publication at the end of their Period of Performance. Any subsequent interpretation and use of the results those will be DoD policy decisions, to be made at the Office of the Secretary of Defense.

Presentations:

Military Medical Simulation

1:00 Thomas Talbot
Telemedicine & Advanced Technology Research Center
Current Research & Development at TATRC

1:20 Rodney Metoyer
Applied Research Associates
BioGears, Update on an Open Source Physiology Engine for Everyone

1:35 Sheryl Flynn
Blue Marble Games
ReSET Neurocognitive Assessment Interface

1:50 Break

2:00 Kevin Kunkler
JPC-1 Medical Training & Health Information Science (MTHIS) Program
Future Medical Simulation Research Plans of the Defense Department

2:50 Break

3:00 Harvey Magee
Telemedicine & Advanced Technology Research Center
DoD Funding Opportunities

3:20 Break

Combat Casualty Training Consortium

3:30 Robert Sweet
University of Minnesota
Combat Hemorrhage and Airway Training Research

3:50 Pamela Andreatta
University of Minnesota
Emergency Medical Skills: Pediatric Intubation & Cholinergic Crisis

4:15 Panel Presentation with:

Robert Sweet & Pamela Andreatta
University of Minnesota

Thomas Talbot
Telemedicine & Advanced Technology Research Center

Combat Casualty Training Consortium Panel Q & A

5:00 Adjourn

Welcome Reception

5:15 – 6:30
Thursday, February 20

**Poster Session**

7:30 - 8:30 AM

During the morning poster session, presenters will stand with their posters and share their research with fellow attendees. Continental breakfast will be served.

Thursday posters stay up until the end of the afternoon parallel sessions.

Thursday posters are listed on pages 9 – 10.

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**Morning Plenary Session**

8:30 James Westwood & Karen Morgan, Organizers
*Aligned Management Associates, Inc.*
*Welcome*

8:45 Panel Presentation with:
Patrick Cregan, Chair
*University of Sydney, Nepean Clinical School*

Li Felländer-Tsai
*Karolinska University Hospital*

Cali Fidopiastis
*University of Alabama at Birmingham*

Carla Pugh
*University of Wisconsin – Madison*

Giuseppe Riva
*Università Cattolica del Sacro Cuore*

Jannick Rolland
*University of Rochester*

Ganesh Sankaranarayanan
*Rensselaer Polytechnic Institute*

Anand Santhanam
*University of California, Los Angeles*

Kirby Vosburgh
*Brigham & Women’s Hospital; Harvard Medical School*

(Un?) Affordable Care

How can engineers and other technology experts collaborate with healthcare providers to deliver better care—at a price that is economically viable? This panel will examine stresses on the healthcare industry and revisit a fundamental objective of the NextMed/MMVR conference: to treat patients and educate caregivers with greater economic efficiency.

10:15 Break (Exhibits open. Coffee in exhibit hall.)

10:45 Anthony Gallagher
*ASSERT for Health Centre, University College Cork*
*Simulation Fidelity: More Than Experience and Mere Repetition?*

11:15 Stephen Scott
*Biomedical and Molecular Sciences, Queen’s University*
*Potential of Robots as Next-Generation Technology for Clinical Assessment of Neurological Disorders*

11:45 Paul Debevec
*Institute for Creative Technologies, University of Southern California*
*Advances in Photoreal Digital Humans in Film and in Real-Time*

12:15 Adjourn

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**Lunch**

12:15 Noon - 1:10 PM

Thursday's lunch will be served in the exhibit hall.
Thursday Afternoon, Track A

1:10   Moderator's Welcome

Rehabilitation & Aging

1:15   Zach McKinney
Center for Advanced Surgical and Interventional Technology & Dept of Bioengineering, University of California, Los Angeles
Initial Biomechanical Evaluation of Portable Tactile Biofeedback System for Gait Rehabilitation in Peripheral Neuropathy

1:30   Gregorij Kurillo
Department of Electrical Engineering and Computer Sciences, University of California at Berkeley
Kinect-Based Tele-Medicine Tool for Remote Motion and Function Assessment

1:45   Josh Pickhinke
Nebraska Biomechanics Core Facility, University of Nebraska at Omaha
Varying the Speed of Perceived Self-Motion Affects Postural Control during Locomotion

2:00   Giuseppe Riva
Applied Technology for Neuro-Psychology Lab, Istituto Auxologico Italiano
Virtual Reality as Egocentric Technology for the Assessment of Cognitive Decline in the Elderly

2:15   Howard Rose
Firsthand Technology Inc.
The Metascope: A Low-Cost, High-Immersion VR Display for Pain Control

Psychology & Technology

2:30   J. Galen Buckwalter
Institute for Creative Technologies, University of Southern California
Stress Resilience in Virtual Environments: Preliminary Findings on Allostatic Load

2:45   Andrea Gaggioli
Applied Technology for Neuro-Psychology Lab, Istituto Auxologico Italiano
A Decision Support System for Real-Time Stress Detection During Virtual Reality Exposure

3:00   Albert "Skip" Rizzo
Institute for Creative Technologies, University of Southern California
Expansion of a VR Exposure Therapy System for Combat-Related PTSD to Medics / Corpsman and Persons Following Military Sexual Trauma

3:15   Break

Thursday Afternoon, Track B

1:10   Moderator's Welcome

 Independently Organized Session

Integrating Intelligent Tutoring Systems (ITS) in Virtual World (VW) Training/Learning

3:30 - 5:00

Parvati Dev, Organizer
Innovation in Learning, Inc.

LeRoy Heinrichs
Innovation in Learning, Inc.

Keith Shubeck
Department of Psychology, University of Memphis

In this tutorial, we will present the use of Intelligent Tutoring Systems (ITS) technology as an alternative to live facilitator training in well-prescribed situations such as triage of victims in a mass casualty disaster. We will begin by reviewing two well-developed technologies, learning environments simulated in virtual worlds, and natural language-based intelligent tutors used in tightly circumscribed learning contexts, and will show how we have constructed an integrated solution where the intelligent tutor becomes available within the virtual world. The presentation will include the results of preliminary evaluation comparing the use of the virtual world alone with that using the intelligent tutor in the virtual world.

Surgical Simulator Design

1:15   Timothy Kelliher
SimQuest Solutions Inc.
Open Surgical Simulation (OSS) - A Community Resource

1:30   Ellie Hawkinson
Center for Education in Medicine, Feinberg School of Medicine, Northwestern University
The Evolution of Design: A Novel Thoracoscopic Diaphragmatic Hernia Repair Simulator

1:45   Zhan Yu
Department of Computer & Information Sciences, University of Delaware
A Real Time Immersive Surgery Training System using RGB-D Sensors

2:00   Bertram Unger
Laboratory for Surgical Modeling, Simulation and Robotics, University of Manitoba
Design and Validation of 3D Printed Complex Bone Models with Internal Anatomic Fidelity for Surgical Training and Rehearsal
Surgical Simulation Metrics

2:15 Timothy Coles
The Australian e-Health Research Centre & Surgical Simulation and Planning Team, CSIRO
Outside Observer, an Enhanced Training Methodology: Bringing Back the Expert’s Eye Whilst Training Alone

2:30 David Rojas
The Learning Institute, The Hospital for Sick Children
The Impact of Secondary-Task Type on the Sensitivity of Reaction-Time Based Measurement of Cognitive Load for Novices Learning Surgical Skills using Simulation

2:45 Ganesh Sankaranarayanan
Center for Modeling, Simulation and Imaging in Medicine, Rensselaer Polytechnic Institute
Kinematic Measures for Evaluating Surgical Skills in Natural Orifice Translumenal Endoscopic Surgery

3:00 Break

Surgical Simulation Validation

3:15 Ngan Nguyen
Department of Electrical and Computer Engineering, Western University
Realism, Criterion Validity, and Training Capability of Simulated Diagnostic Cerebral Angiography

3:30 Sudanthi Wijewickrema
Department of Otolaryngology, University of Melbourne
A Virtual Reality Temporal Bone Surgery Simulator with Automated Real-Time Feedback for Effective Learning of Surgical Technique

3:45 Lee White
Bioengineering Department, University of Washington
Validation of a Crowd-Sourced Assessment of Technical Skills (C-SATS) with Application to Measuring Warm-Up Benefit in Robotic Surgery

Indepedently Organized Session

GreenLight™ Laser Simulator: Highly Demanded Full-VR Simulator as an Endoscopic Laser Surgery Curriculum

4:00 - 5:00

Robert M. Sweet, Organizer
Medical School Simulation Programs, University of Minnesota
Yunhe Shen, Organizer
Center for Research in Education and Simulation Technologies, University of Minnesota

This session describes a process by which a VR procedural trainer has successfully been integrated into a comprehensive training program for practicing surgeons prior to doing their first cases. Over 120 of these simulators have been deployed in North America and worldwide for doctors and medical school students’ practice, and dozens of rotating units are routinely used by faculty of urologic surgery in workshops and conferences. These facts show that, at this point, there should be no doubt that full-VR simulators are being volume-produced and are serving as powerful and reliable tools meeting today’s medical training needs.

Hands-on demonstration of the GLSIM simulator will be provided on site during this session.

4:00 Robert M. Sweet
Medical School Simulation Programs, University of Minnesota
GLSIM—Introduction and Demonstration

4:10 Michael R. Kujak
Prostate Health, American Medical Systems
AMS—A Medical Device Company’s Interest in VR Simulation

4:20 Robert M. Sweet
Medical School Simulation Programs, University of Minnesota
Backward Design—Not Only a Simulator but a Virtual Trainer with Valid Curriculum

4:30 Yunhe Shen
Center for Research in Education and Simulation Technologies, University of Minnesota
Robust Solutions to the Challenges — Needs-Driven R&D

4:40 Michael R. Kujak
Prostate Health, American Medical Systems
GLSIM Curriculum—Worldwide Greenlight™ Simulation Sites for Doctors and Students

4:50 Discussion

5:00 Adjourn
Thursday Afternoon, Track C

Independently Organized Session

The Federal Medical Simulation and Training Consortium

1:10 - 5:10

Alan Liu & Gilbert Muniz, Organizers
National Capital Area Medical Simulation Center, Uniformed Services University of the Health Sciences

The FMSTC is a partnership between nine medical education institutions of the Army, Navy, Air Force, Department of Defense, and the Department of Veteran’s Affairs. The mission of the FMSTC is to enhance the medical education and training mission of its partners. This mission rests on five pillars: Education, Curriculum, Validation, Research & Development, and Strategic Partnerships. The consortium plans to accomplish this through knowledge sharing, collaboration toward common goals, and participation in joint training initiatives. Collectively, the FMSTC provides simulation-based medical instruction to more than 90% of all military medical healthcare personnel.

In this workshop, we provide insight on the formation of the FMSTC. The background and motivation for its formation will be discussed. The mission statement and organization of the FMSTC will be described. Representatives from FMSTC members will provide their perspective on the FMSTC as it relates to their strategic goals for medical simulation. We will discuss specific initiatives within the FMSTC that facilitate its mission objectives. The industry perspective on the FMSTC will be discussed. This session will end with an open forum for follow on discussion with participants.

1:10 Gilbert Muniz
National Capital Area Medical Simulation Center
Welcome & Introduction

1:20 Gilbert Muniz
National Capital Area Medical Simulation Center
The Federal Medical Simulation and Training Consortium

1:45 Meletios Fotinos
Air Force Medical Modeling and Simulation Training Program
Meeting the Challenges of Modern Medical Training: The Air Force Medical Modeling and Simulation Training Program

2:10 William Bewley
National Center for Research on Evaluation, Standards, and Student Testing
The Tri-Service Medical Simulation and Training Initiative

2:35 Richard Wainess
Independent Consultant
The Education Resource Framework—Curriculum Assessment and Training
Thursday Afternoon, Track D

Independently Organized Session

Extending Extensible 3D (X3D): from Haptic-Based Medical Training to Clinical Applications

1:10 - 3:15

Felix G. Hamza-Lup, Organizer
Computer Science and Information Technology, Armstrong Atlantic State University

Nicholas F. Polys, Co-Chair
Advanced Research Computing, Virginia Tech

Medical applications developed using the open and royalty-free X3D standard range from simulation and training tools for concept/procedure teaching and skill assessment to applications that directly support and improve the clinical stage. MedX3D is an extension to the X3D standard (Web3D, ISO) to support advanced medical visualization functionality and medical data exchange. This focus session will explore X3D applications in the medical field as well as provide information on the current updates and features on the MedX3D standard and the H3D haptics API.

Presentations:

Michael Aratow
Medical Informatics, CEP America
A Health IT Perspective on X3D

Timothy Coles
The Australian e-Health Research Centre & Surgical Simulation and Planning Team, CSIRO
X3D in Medical Training & Simulation

Tommy Forsell
SenseGraphics AB
H3D In Real Life - Medical Simulation

Nicholas F. Polys
Advanced Research Computing, Virginia Tech
Volume Rendering and Lossless Metadata with X3D

Felix G. Hamza-Lup
Computer Science and Information Technology, Armstrong Atlantic State University
Radiation Therapy Training with X3D

Thursday Afternoon, Track E

Independently Organized Session

Share Your Ideas with the Government

2:30 - 5:00

Harvey Magee, Organizer
Telemedicine & Advanced Technology Research Center

This popular session continues as a sounding board where military simulation program folks listen to the public to hear about innovative ideas, research and concepts in the fields of medicine, simulation, education and virtual reality. It is also an opportunity to ask questions about current military simulation research. These discussions are intended for informational purposes only and are not negotiations or offers to the Government.

This session consists of individual ten minute appointments. Appointment slots are limited. Sign up begins during the Wednesday afternoon Military Medical Simulation briefing.

Thursday Evening

Networking Social

5:00 - 7:00

Innovate NextMed

Our second annual Innovate NextMed reception will mix rapid-fire presentations with casual conversation. Participants can make new contacts and catch up with friends made at previous conferences. Presentations (optional, of course) will be invited from all attendees in late January.
Thursday Posters

Rehabilitation & Aging

Malcolm Chan  
*Family Practice Health Centre, Women’s College Hospital & Faculty of Medicine, University of Toronto*

*Do Not Forget the Oldest Old: Design Principles for the 80+*

Troy McDaniel  
*Department of Computer Science and Engineering, Arizona State University*

*Augmented Motor Learning and Rehabilitation using Vibrotactile Feedback*

Susan Truong  
*Family Practice Health Centre, Women’s College Hospital & Faculty of Medicine, University of Toronto*

*Assessing the Interest in Using Social Networking from the Perspective of Older Adults Aged 80+*

Alvaro Uribe Quevedo  
*Industrial Engineering, Nueva Granada Military University*

*Anthropomorphic Passive Mechanism for Performing Hand Exercises*

Sergio Valdivia  
*Multimedia Engineering, Nueva Granada Military University*

*Serious Game Strategy for Lower Member Rehabilitation*

Psychology & Technology

Georgina Cárdenas-López  
*School of Psychology, National Autonomous University of Mexico*

*Virtual Reality for Improving Body Image Disorders and Weight Loss after Gastric Band Surgery: A Case Series*

Bruce John  
*Institute for Creative Technologies, University of Southern California*

*Self-Reported Differences in Personality, Emotion Control, and Presence Between Pre-Military and Non-Military Groups in a Pilot Study using the STress Resilience in Virtual Environments (STRIVE) Program*

Andrea Gaggioli  
*Applied Technology for Neuro-Psychology Lab, Istituto Auxologico Italiano*

*A Virtual Reality Procedure For Assessing Deficit in the Mental Frame Syncing: Feasibility Study*

Giuseppe Riva  
*Applied Technology for Neuro-Psychology Lab, Istituto Auxologico Italiano*

*A Virtual Reality Platform for Assessment and Rehabilitation of Neglect using a Kinect*

Laura Serra Oliva  
*Institute for Creative Technologies, University of Southern California*

*Preliminary Psychophysiological Findings During Resilience Training*

Networking & Telemedicine

Ben Boedeker  
*University of Nebraska Medical Center*

*Development of a Tele ENT Program to Support Distant Military Treatment Facilities for the European Regional Medical Command*

Yanbo Guo  
*Temerty Chang International Center for Telesimulation and Innovation in Medical Education, Toronto Western Hospital*

*Software Based Videoconferencing Software for Use in Telementoring Laparoscopic Surgery*

Angelika Peer  
*Institute of Automatic Control Engineering, Technische Universität München*

*Towards a Remote Medical Diagnostian for Medical Examination*

Ali Turabi  
*Anesthesia Prep Unit, Post Anesthesia Care Unit, and Pre Procedure Unit, Landstuhl Regional Medical Center, Germany*

*Development of a Tele-Anesthesia Preoperative Clinic to Support Distant Military Treatment Facilities for the European Regional Medical Command*

Karthik Venkatraman  
*University of Texas at Dallas*

*Tele-Rehabilitation with a 3D Augmented Virtual Reality and Haptic Devices*

Surgical Simulator Systems

Ryan Armstrong  
*Biomedical Engineering Graduate Program, University of Western Ontario*

*Patient-Specific Pipeline to Create Virtual Endoscopic Third Ventriculostomy Scenarios*

Ellie Hawkinson  
*Center for Education in Medicine, Feinberg School of Medicine, Northwestern University*

*A Low-Cost Tissue Replica for Simulation of Thoracoscopic Tracheoesophageal Fistula Repair*
Ellie Hawkinson
Center for Education in Medicine, Feinberg School of Medicine, Northwestern University
Design and Development of a Laparoscopic Gastrostomy Tube Placement Simulator

Ellie Hawkinson
Center for Education in Medicine, Feinberg School of Medicine, Northwestern University
Design and Development of a Duodenal Atresia Simulator

Nikoo Saber
Centre for Image Guided Innovation and Therapeutic Intervention, The Hospital for Sick Children
Development of a Patient-Specific Surgical Simulator for Pediatric Laparoscopic Procedures

Yasushi Yamauchi
Faculty of Science and Engineering, Toyo University
Smart Dry Lab: An Augmented Reality (AR) Based Surgical Training Box

Peter Weyhrauch
Charles River Analytics, Inc.
Tourniquet Master Training for Junctional and Inguinal Hemorrhage Control (TMT)

Surgical Simulator Design

Woojin Ahn
Center for Modeling, Simulation and Imaging in Medicine, Rensselaer Polytechnic Institute
Development of a Virtual Reality Simulator for Natural Orifice Transluminal Endoscopic Surgery (NOTES) Cholecystectomy Procedure

Randy Ellis
School of Computing, Queen’s University
Overall Wrist Biomechanics Are Conserved By Phenol-Based Embalming

Toma Kato
Haptic Vision Lab, Ritsumeikan University
Evaluation of Haptic Teaching Approaches for Laparoscopic Surgery Training

Jason Lee
Center for Modeling, Simulation and Imaging in Medicine, Rensselaer Polytechnic Institute
Developing Extracorporeal Suturing Simulation in Virtual Basic Laparoscopic Skill Trainer (VBLaST)

Krzysztof Rechowicz
Department of Modeling, Simulation, and Visualization Engineering, Old Dominion University
Developing Clinically Relevant Aspects of the Nuss Procedure Surgical Simulator

Ganesh Sankaranarayanan
Center for Modeling, Simulation and Imaging in Medicine, Rensselaer Polytechnic Institute
A Framework for Providing Cognitive Feedback in Surgical Simulators

Ganesh Sankaranarayanan
Center for Modeling, Simulation and Imaging in Medicine, Rensselaer Polytechnic Institute
Toward the Development of a Virtual Electrosurgery Training Simulator

Ravikiran Singapogu
Haptic Interaction Lab, Clemson University
Endovascular Seldinger Needle Placement: A Simulator for Examining Haptic Skills

Pierre-Frédéric Villard
LORIA, Lorraine University
Toward a Realistic Simulation of Organ Dissection

Surgical Simulator Validation

Chun-Kai Huang
Center for Advanced Surgical Technology, University of Nebraska Medical Center
Virtual Laparoscopic Surgical Skills Practice Using a Multi-Degree of Freedom Joystick
Friday, February 21

Poster Session
7:30 - 8:30 AM

During the Friday morning poster session, presenters will stand with their posters and share their research with fellow attendees. Continental breakfast will be served.

Friday posters will stay up until the end of the afternoon parallel sessions.

Friday posters are listed on pages 14 – 16.

Morning Plenary Session

Human-Computer Interface Technology
8:30 – 10:40 AM

8:30 Ramin Shahidi, Moderator
California Institute of Computer Assisted Surgery
Introduction & Overview

8:40 Jose Carmena
Brain-Machine Interface Systems Laboratory, University of California, Berkeley
Closed-Loop Design Strategies for Brain-Machine Interfaces

9:10 Todd Coleman
Department of Bioengineering, University of California, San Diego
Wearable Wireless Sensors and Analytics in the Cloud to Advance Human-Computer Interaction

9:40 Daniel Palanker
Department of Ophthalmology & Hansen Experimental Physics Laboratory, Stanford University
Photovoltaic Restoration of Sight to Patients Blinded by Retinal Degeneration

10:10 Theodore Berger, Discussant
Center for Neural Engineering, University of Southern California
Session Summary with Q & A

11:15 Catherine Mohr
Intuitive Surgical
Robotics as a Catalyst for Disruption

11:45 Presentation of the 19th Satava Award

12:00 Break

Lunch Break
12 Noon - 1:10 PM

Friday lunch is on your own.

Friday Afternoon, Track A
1:10 Moderator's Welcome

Imaging & Visualization

1:15 Nadezhda Radeva
Department of Computer Science, The George Washington University
Visualization of Tissue Removal using Focus + Context Techniques

1:30 Deyu Sun
Biomedical Imaging Resource Lab, Mayo Clinic
Anatomic Surface Reconstruction from Sampled Point Cloud Data and Prior Models

1:45 Anand Santhanam
Department of Radiation Oncology, University of California, Los Angeles
Modeling and Visualizing Cardiovascular Deformations under Normal and Altered Circulatory Conditions

2:00 Yusheng Feng
SiViRT Computation Center, University of Texas at San Antonio
A Haptic-Enabled Novel Approach to Cardiovascular Visualization
2:15  Mohamed Hefny  
School of Computing, Queen’s University  
**A Matrix Lie Group Approach to Statistical Shape Analysis of Bones**

2:30  Igor Peterlík  
Institut Hospitalo-Universitaire, Strasbourg  
**Constraint-Based Simulation for Non-Rigid Real-Time Registration**

Information-Guided Therapies

2:45  Thorsten Brennecke  
Institute for Process Control and Robotics, Karlsruhe Institute of Technology  
**An Ultrasound-Based Navigation System for Minimally Invasive Neck Surgery**

3:00  Break

3:15  Hugo Talbot  
INRIA  
**Interactive Planning of Cryotherapy using Physics-Based Simulation**

3:30  Naoki Suzuki  
Institute for High Dimensional Medical Imaging, The Jikei University School of Medicine  
**A Concept for Overlaid-Type Surgical Navigation System with Organ Modification Functions using Non-Contact Type Surface Measurement**

Robotics

3:45  Deanna Glassman  
University of Washington School of Medicine  
**Raven Surgical Robot Training in Preparation for da Vinci Use: a Randomized Prospective Trial**

4:00  Gyusung Lee  
Department of Surgery, Johns Hopkins University School of Medicine  
**Physical and Cognitive Ergonomic Workload Assessment with Robotic and Laparoscopic Surgeries**

Interfaces

4:15  Stanislas Mauser  
Faculty for Informatics, Reutlingen University  
**Touch-Free Gesture Based Control of Medical Devices and Software Based on the Leap Motion Controller**

Haptics

4:30  Jun Wu  
Computer Graphics & Visualization Group, Technische Universität München  
**Real-Time Haptic Cutting of High-Resolution Soft Tissues**

4:45  Dirk Fortmeier  
Institute of Medical Informatics, University of Lübeck  
**An Image-Based Multiproxy Palpation Algorithm for Patient-Specific VR-Simulation**

5:00  Tobias Plic  
Electrical Engineering and Information Technologies, Innovative Surgical Training Technologies, HTWK Leipzig University of Applied Sciences  
**Pulsed Ultrasound Approach for the Measuring of Tension and Compression at Nerve Fibre Structures in Surgical Training Simulators**

5:15  Adjourn

Friday Afternoon, Track B

1:10  Moderator’s Welcome

Simulator Validation

1:15  John Quarles  
Department of Computer Science, University of Texas at San Antonio  
**Virtual Humans for Inter-Ethnic Variability Training in Sedation and Analgesia**

1:30  Dave Taylor  
Division of Surgery, Imperial College London  
**3D Simulation of a Hospital Environment and Ward Round to Augment a Summer School Program for Pre-Medical Students**

Simulator Systems

1:45  Anna Galea  
Vivonics, Inc.  
**PATIENT: Physical Anatomical Trainer Instrumented for Education and Non-Subjective Testing**

2:00  Li Liu  
Dept of Biomedical Engineering, Worcester Polytechnic Institute  
**Personal Training Simulator for Asynchronous Learning of Obstetric Ultrasound**

2:15  Piotr Slawinski  
Department of Mechanical and Materials Engineering, University of Nebraska - Lincoln  
**Intestinal Biomechanics Simulator**

2:30  Andrew Raij  
Department of Electrical Engineering, University of South Florida  
**Sensing and Visualization Tools for Objective Assessment and Debriefing of High-Risk Neonatal Resuscitation Training Scenarios**

Simulator Design

2:45  Bryan Bergeron  
Archetype Technologies, Inc.  
**Modular Simulator Building Blocks: Physiologic Signaling Requirements**

3:00  Break
3:15  Shlomi Laufer  
Department of General Surgery & Department of Electrical  
Engineering and Computer Science, University of Wisconsin - Madison  
**Multimodality Approach to Classifying Hand Utilization for the Clinical Breast Examination**

*Lecture*  

3:30  David Rojas  
The Learning Institute, The Hospital for Sick Children  
**The Effect of Contextual Sound Cues on Visual Fidelity Perception**

*Lecture*  

3:45  Victoria Roach  
Corps for Research in Instructional and Perceptual Technologies, Western University  
**The Path More Travelled: Defining a Gaze-Based Approach to Analyzing Spatial Reasoning**

*Lecture*  

4:00  Bryan Bergeron  
Archetype Technologies, Inc.  
**Application of Learning Record Stores and Other Forms of Electronic Competency Records in Modeling Competency Degradation**

*Lecture*  

**Independently Organized Session**

**Fundamentals of Robotic Surgery: Development and Validation of an Online Curriculum and New Psychomotor Testing Device**

4:15 - 5:15  
Roger D. Smith, Organizer  
Florida Hospital Nicholson Center  
Richard M. Satava, Organizer  
University of Washington School of Medicine  

The curriculum for the Fundamentals of Robotic Surgery is being developed through a collaboration of representatives of 14 surgical specialties and their representative societies, as well as the Department of Defense and the Veterans Administration. This session will present the progress that has been made in creating an online didactic curriculum and a psychomotor testing device to be used in measuring the competency of aspiring robotic surgeons. These products have been derived from the joint expertise of practicing robotic surgeons, surgical educators, test and evaluation professionals, and manufacturing engineers. Samples of the online curriculum and device prototypes will be available for examination.

**Friday Afternoon, Track C**

**Independently Organized Session**

**Novel Approaches to the Study of Medical Skill Decay**

1:10 - 5:15  
Ray S. Perez, Organizer  
Office of Naval Research  
Anna Skinner, Co-Chair  
AnthroTronix, Inc.

The session will begin with a brief review, summarizing what we currently know from the research literature on skill decay. This will be followed with each panel member presenting a summary of their research. They will cover approach, procedures/methods, results, and a discussion/conclusion for this research. The discussant will then provide a discussion of the presentations and future research needed for medical training and implications for practice.

1:10  Ray S. Perez  
Office of Naval Research  
**Introduction**

1:30  Peter Weyhrauch & James Niehaus  
Charles Rivers Analytics, Inc.  
**Laparoscopic Surgery Skill Models for Refresher Training**

2:15  Carla M. Pugh  
Department of Surgery, University of Wisconsin  
**Psycho-Motor and Error Enabled Simulations: Modeling Vulnerable Skills in the Pre-Mastery Phase**

3:00  Break

3:15  Anna Skinner  
AnthroTronix, Inc.  
**Retention and Retraining of Integrated Cognitive and Psychomotor Skills**

4:00  Harry B. Burke  
National Naval Medical Center  
**Intelligent Systems to Assess and Maintain Cognitive Skills to Improve Safety and Quality of Care**

4:45  Harry O’Neil, Discussant  
Department of Educational Psychology and Technology, Curry School of Education, University of Southern California  
**Session Summary**

5:15  Adjourn
Friday Afternoon, Track D

Independently Organized Session

Simulation Development

1:10 – 3:15

Harvey Magee, Organizer
Telemedicine & Advanced Technology Research Center

This session focuses on challenges for developers and creators of simulations. Talks will include detailed discussions of emerging conversational virtual standardized patient technology which has the potential to provide targeted experiential training along with germane constructive feedback. The session will conclude with a panel for surgical simulator development and challenges regarding high fidelity tissue simulation.

Presentations:

1:10 Thomas Talbot & Albert “Skip” Rizzo
USC Institute for Creative Technologies
Virtual Standardized Patients: An Interactive Demonstration for Authoring Conversational Agents for Interview Training

2:00 Julia Campbell
USC Institute for Creative Technologies
Branching Conversations for Simulated Medical Encounters

2:20 Break

2:30 Panel Presentation with:

Robert Hale
US Army Institute of Surgical Research

Anthony Johnson
US Army Institute of Surgical Research

E.J. Caterson
US Army Institute of Surgical Research

Gianluca De Novi
Harvard Univ & Massachusetts General Hospital

Simulation Challenges in Oculofacial Trauma Surgery

3:15 Adjourn

Friday Evening

Optional Field Trip

5:30 – 9:00

Tour of USC’s Institute for Creative Technologies

ICT is a pioneering innovator in simulation, graphics, virtual reality, and artificial intelligence. Nurturing collaborations among film and gaming industry artists, social scientists, and computer scientists, its projects focus on improving health and well-being, education, and training. Please visit http://ict.usc.edu to learn more about its work.

Our visit to their Playa Vista facility will feature hands-on demonstrations of their current projects, explanatory presentations, and a casual reception.

This tour requires a separate paid registration, which includes transportation and the reception. Space is limited and advance registration is necessary.

Friday Posters

Learning & Technology

Bryan Bergeron
Archetype Technologies, Inc.
The Confluence of Experiential Databases, MOOCs and The Internet of Things: Promise for Medical Simulation Developers

Johan Creutzfeldt
CLINTEC, Center for Advanced Medical Simulation and Training, Karolinska Institutet & Karolinska University Hospital
Using Virtual World Training to Increase Situation Awareness during Cardiopulmonary Resuscitation

Ross Dworkin
Blue Grotto Technologies, Inc.
Methods and Techniques for Use of Medbiquitous Standards and Concepts to Facilitate the Functional Integration of Competency, Learning, MOC, and Training Systems

Lars Enochsson
Department of Surgical Gastroenterology, Karolinska University Hospital
Gender Specific Differences and Value of Simulator Training in Medical Students?

Troy McDaniel
Department of Computer Science and Engineering, Arizona State University
Geo-Social Mobile Health Gaming

Marcus Schlickum
CLINTEC, Karolinska Institute
The Role of Motivation in Surgical Simulator Training
Simulator Design & Development

Wolfgang Fink
Departments of Electrical & Computer Engineering, and Biomedical Engineering, University of Arizona
Visual Perception of Intraocular Inclusions from a First-Person Perspective using the simEye 3D Ray Tracing Environment

Thomas Kaltofen
Research Unit Medical-Informatics, RISC Software GmbH
Computer-Based Simulation of the Prism Cover Test with the Biomechanical Eye Model SEE-KID

Calvin Kwan
Department of Surgery, University of Wisconsin - Madison
Validity of a Newly Developed Tri-Axial Sensor for Clinical Breast Examination Skills Assessment

Calvin Kwan
Department of Surgery, University of Wisconsin - Madison
Application of a New Adaptable Thyroid Model for Ultrasound and Hands-On Skill Assessment

Mark Ottensmeyer
Simulation Group, Dept of Radiology, Massachusetts General Hospital & Harvard Medical School
Conversion of Stereo Surgical Microscope for Augmented Reality Application in an Eye Trauma Simulator

Simulator Systems

Elvis Chen
Robarts Research Institute, Western University
Navigated Simulator for Spinal Needle Interventions

Calvin Kwan
Department of Surgery, University of Wisconsin - Madison
Modification of the Pelvic Examination Simulator for the Developing World

Lisbet Meurling
Division of Anaesthesia and Intensive Care & CLINTEC, Karolinska Institutet
High-Fidelity Paediatric Simulation Team Training Makes a Difference: A Case Control Study

Alicia Unangst
Rocky Vista University
From Trauma in Austere Environments to Combat or Medical School: How Blended Hyper-Realism in the Real and Virtual Worlds Can Better Prepare Surgeons

Information-Guided Therapies

Manal Alassaf
Department of Computer Science, School of Engineering and Applied Science, The George Washington University
Computer-Based Planning System for Mandibular Reconstruction

Matthew Kramers
Biomedical Engineering Graduate Program & Robarts Research Institute, University of Western Ontario
Towards Evaluation of a Mobile Augmented Reality Application for Image Guidance of Neurosurgical Interventions

Sehyung Park
Biomedical Research Institute, Korea Institute of Science and Technology
Automatic Detection of Inferior Alveolar Nerve Canal from Cone-Beam Computed Tomography Images for Dental Surgery Planning

Naoki Suzuki
Institute for High Dimensional Medical Imaging, The Jikei University School of Medicine
Development of AR Surgical Navigation Systems for Multiple Surgical Regions

Imaging & Visualization

Adrian Johnson
Robot Perception and Action Lab, University of South Florida
Unobtrusive Augmentation of Critical Hidden Structures in Laparoscopy

Ashkan Maccabi
Department of Electrical Engineering, University of California, Los Angeles
Ultrasound-Stimulated Vibro-Acoustography for High-Resolution Differentiation of Benign and Malignant Tissue of the Head and Neck

Arun Nemani
Center for Modeling, Simulation and Imaging in Medicine, Rensselaer Polytechnic Institute
Monte Carlo Based Simulation for Evaluating Optode Fiber Placement in Prefrontal Cortex Imaging of Motor Skills during Surgical Training

Robotics

Gordon Hirschman
Vivonics, Inc.
Actively Compliant Parallel End-Effector Mechanism for Medical Interventions

Sensors

Anne-Lise Maag
Department of General Surgery, University of Wisconsin - Madison
Sensor-Based Assessment of Cast Placement and Removal

Rustam Nabiev
Department of Clinical Science Intervention and Technology, Karolinska Institutet
ShifoSound System for the Lung Status Remote Monitoring of People Suffering from COPD
Shannon O’Toole  
Vivonics, Inc.  
**Deployable Automated Analgesia Unit (DAAU)**

Pankaj Sharma  
Clinical Anatomy, Department of Surgery, Stanford University  
**Hand Motion Tracking System Using Inertial Measurement Units**

**Haptics**

Seong Pil Byeon  
Division of Mechanical Engineering, Korea Advanced Institute of Science and Technology  
**Cut Surface Generation and Haptic Feedback for Interactive Cutting Simulation**

Saurabh Dargar  
Center for Modeling, Simulation and Imaging in Medicine, Rensselaer Polytechnic Institute  
**A Decoupled 2 DOF Force Feedback Mechanism for the Virtual Translumenal Endoscopic Surgical Trainer (VTEST)**

Rozaliya Gabidullina  
Laboratory of Mechanoreceptor Diagnosis, Lomonosov Moscow State University  
**Haptic Devices in Endoscopy**

Byron Perez-Gutierrez  
VR Center & Davinci Research Group, Nueva Granada Military University  
**Liver Biomechanical Model for Virtual Palpation**

Stefan Suwelack  
Humanoids and Intelligence Systems Lab, Institute for Anthropomatics, Karlsruhe Institute of Technology  
**Towards Open-Source, Low-Cost Haptics for Surgery Simulation**

David Velandia  
Multimedia Engineering, Nueva Granada Military University  
**Human Eye Haptics-Based Multimedia**

**Modeling**

Mario Cypko  
Innovation Center Computer Assisted Surgery (ICCAS), Universität Leipzig  
**3D++ Visualisation of MEBN Graphs and Real Time Interaction with Screen Representations of Patient Models (PIXIE II)**

Tansel Halic  
Computer Science Department, University of Central Arkansas  
**pWeb - A High Performance Parallel Computing Framework for Web Browser-Based Medical Simulation**

John Moore  
Robarts Imaging, Western University  
**Real-time Simulation of Transesophageal Echocardiography**

Nobuhiko Mukai  
Tokyo City University  
**Particle Based Simulation of the Aortic Valve by Considering Heart’s Pulsation**

Tuan Trung Nguyen  
Division of Mechanical Engineering, Korea Advanced Institute of Science & Technology  
**A Hybrid Contact Model for Cannulation Simulation of ERCP**
Saturday, February 22

**Morning Plenary Session**

8:50  Moderator's Welcome

9:00  Richard Satava  
*Department of Surgery, University of Washington*  
**Directed Energy Surgery: Dawning of the Next Generation of Surgery**

9:30  Elizabeth Hillman  
*Biomedical Engineering and Radiology, Columbia University*  
**Hyperspectral and Dynamic Contrast: What your Eyes Can’t See**

10:00  Kevin Patrick  
*Center for Wireless & Population Health Systems, University of California, San Diego*  
**Modeling the Exposome: A Whole Health Information Approach to Support Personalized Population Health**

10:30  Break

11:00  Justin Sanchez  
*Defense Sciences Office, Defense Advanced Research Projects Agency*  
**Next-Generation Neurotechnology at the Defense Advanced Research Projects Agency**

11:30  Jack Young  
*Qualcomm Life Fund North America, Qualcomm Ventures*  
**Digital Health Investment**

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**Saturday Afternoon, Track A**

1:10  Moderator's Welcome

**Optics**

1:15  Jannick Rolland  
*Center for Visual Science and Biomedical Engineering, University of Rochester*  
**Pushing the Envelope of 3D Optical Imaging For Resolution and Speed**

**Modeling**

1:30  Alexandre Bilger  
*SHACRA Team, INRIA*  
**Computation and Visualization of Risk Assessment in Deep Brain Stimulation Planning**

1:45  John Neylon  
*Department of Radiation Oncology, University of California, Los Angeles*  
**Simulating High-Resolution Bio-Mechanical Head and Neck Model using a Multi-GPU Framework**

2:00  Stefan Suwelack  
*Humanoids and Intelligence Systems Lab, Institute for Anthropomatics, Karlsruhe Institute of Technology*  
**The Medical Simulation Markup Language - Simplifying the Biomechanical Modeling Workflow**

2:15  Igor Peterlík  
*Institut Hospitalo-Universitaire, Strasbourg*  
**Complete Real-Time Liver Model Including Glisson’s Capsule, Vascularization and Parenchyma**

2:30  Myeongjin Kim  
*Division of Mechanical Engineering, Korea Advanced Institute of Science and Technology*  
**Multi-Rate Contact Resolution for an Explicit Meshless Deformable Model**

2:45  Brian Jo  
*Salisbury Biorobotics Lab, Stanford University*  
**Using Total Lagrangian Implicit Dynamics FEM to Model the Airway**

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**Lunch Break**

12 Noon - 1:10 PM

Saturday lunch is on your own.
Cardiovascular Blood Flow Analysis under Normal and Open Injury Conditions

3:15 Adjourn

Saturday Afternoon, Track B

Independently Organized Session

The Wide Area Virtual Environment - Lessons Learned

1:10 - 5:15

Alan Liu, Organizer
National Capital Area Medical Simulation Center, Uniformed Services University of the Health Sciences

The Wide Area Virtual Environment (WAVE) is a 1,000 sq. ft. immersive virtual environment designed for medical team training over an extended period of time. The WAVE blends 3D virtual reality, live patient actors, human patient simulators, and part task trainers to provide an unprecedented realism. The WAVE supports medical teams training continuously over a period of up to four days to simulate the rigors of military field medicine.

Development of the WAVE concept has achieved steady progress during the past 10 years. During this time, we have demonstrated the concept with a 3-screen WAVElet. The WAVElet is designed to augment established training programs with an immersive virtual reality capability. The Medical Readiness Training Center (MRTC) at Camp Bullis is the first facility to employ the WAVElet concept. The MRTC runs more than 500 WAVElet based training encounters a month.

In 2012, construction of the 1,000 sq. ft. WAVE began. Built at a cost of $7 million, the WAVE is the world’s largest immersive virtual reality training theater. The WAVE is the first integrated training facility to integrate all major medical simulation modalities on this scale. It can do this in a controlled physical environment that can be changed as necessary to meet training requirements. The WAVE is capable of providing training to more than 200 participants a day. It is also capable of running continuous (24hr) training scenarios for up to four days. It can support the training for large scale mass casualty events.

In this workshop, we share the history, purpose, design, implementation, and operation of the WAVElet and WAVE. We will describe some of the challenges in generating 3D virtual environments on a massive scale. 3D modeling issues will be described. In particular, the challenges of developing 3D environments, animations, and lighting will be highlighted. Issues related to the integration of physical elements, such as air cannons, sound, smoke and scent generators will be presented. We will also share our experience in using this technology for medical instruction. We will discuss the nature and type of curriculum suited for WAVE training. We will share the feedback received after this training, and factors differentiating such training from conventional training environments. We will also describe our research on the efficacy of using immersive virtual environments for medical training. The implications of our early results will be discussed.

This workshop will conclude with an open forum. We will address questions from workshop participants related to the use of this technology.

1:10 Alan Liu
National Capital Area Medical Simulation Center
Welcome & Introduction

1:20 Alan Liu
National Capital Area Medical Simulation Center
Designing the WAVE

1:35 Raymund Machacon
Air Force Medical Modeling & Simulation Training Program
Using the WAVE at the MRTC

2:00 Grady Wier
Air Force Medical Modeling and Simulation Training Program
Validating Training Effectiveness of the WAVE in Medical Simulation

2:25 Jamie Cope
National Capital Area Medical Simulation Center
Rendering Considerations for a Distributed 3D Virtual Environment

2:50 Valerie Henry
National Capital Area Medical Simulation Center
3D Modeling for the WAVE: Integrating Virtual and Physical Components

3:15 Break

3:30 Eric Acosta
National Capital Area Medical Simulation Center
Integrating Physical Elements with the WAVE: Tracking, Cannons, Smoke, and Smell

3:55 Discussion & Conclusion

5:15 Adjourn
Saturday Afternoon, Track C

Independently Organized Session

3D Printing for Rapid Prototyping

1:10 - 3:15

Bryan Bergeron, Organizer
Archetype Technologies, Inc.

Additive manufacturing, such as 3D printing, is a game-changer when it comes to rapid prototyping, especially when the design and printing are done in-house. The goals of this workshop are to introduce participants to 3D printing, in the context of the required prototype durability, size, resolution, and cost. Participants will learn whether in-house 3D printing or design is appropriate for them or is part of a multi-part prototyping process. This workshop will cover:

- Basics of 3D printing
- Purchase and upkeep costs for affordable models
- Printing material properties, cost, and selection
- Print times, resolution, color, and durability
- Post-printing processing
- Software tools and file standards
- Online libraries and open source files
- 3D image capture tools
- High-end printer features and characteristics

In addition, touching upon biological applications for this technology, Jon Barton of Advanced Diagnostic Technologies LLC will share research in 3D-printed synthetic tissue and embedded tactile sensors.

Saturday Afternoon

3:15 - ?

Closing Mixer

Our final coffee break will give people a one more opportunity to connect with others, share enthusiasms, and say goodbye.