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

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Wednesday Evening

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[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

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Wednesday, February 19

**Wednesday Afternoon**

Independently Organized Session

2014 TATRC Military Medical Simulation Public Briefing

1:00 - 5:15 PM

Thomas Talbot, Organizer
Teledmedicine & 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 report and panel from leaders of the three Combat Casualty Training Consortia, which were funded by the Defense Department to determine the value of live animal trauma training and the potential suitability of simulation technology as a replacement. As this $20 million effort concludes, these leaders will share the results of their long anticipated research.

Presentations:

**Military Medical Simulation**

1:00 Thomas Talbot
*Telemedicine & Advanced Technology Research Center*

Current Research & Development at TATRC

1:20 Beth Smith
*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

**Live Animal & Simulator Comparative Research**

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*

4:10 Stephen Barnes
*University of Missouri*

*Combat Hemorrhage, Airway & Emergency Medical Skills Research*

4:30 Panel Presentation with:

Robert Sweet & Pamela Andreatta
*University of Minnesota*

Stephen Barnes
*University of Missouri*

Combat Casualty Training Consortium Panel Q & A

5:15 Adjourn

**Welcome Reception**

5:15 – 6:30

Enjoy refreshments before venturing out for the evening.
Thursday, February 20

Morning Poster Session & Breakfast
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.

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

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-Immerssion 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

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.

Thursday Afternoon, Track B

1:10   Moderator's Welcome

Surgical Simulator Design

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

1:30   Lauren Davis
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

Independently 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, Organizer  
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
Haptic Rendering with H3D

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

Jurgen Broeren  
Department of Physiotherapy and Occupational Therapy, Sahlgrenska University Hospital  
Coordinated Healthcare Across the Post-stroke Continuum to Support Community Integration

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

Lauren Davis  
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

Morning Poster Session & Breakfast

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 – 10:30 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

10:40  Break (Exhibits open; coffee in exhibit hall)

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 Plicic  
*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

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**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  Shujath Syed  
*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

Learning & Technology

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

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

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

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.

Presentations:

Ray S. Perez
Office of Naval Research
Introduction

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

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

Anna Skinner
AnthroTronix, Inc.
Retention and Retraining of Integrated Cognitive and Psychomotor Skills

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

Steven Schwartzberg
Cambridge Health Alliance
Validated Skills are Very Important, but Experience Minimizes Bile Duct Injury

Harry O’Neil
Department of Educational Psychology and Technology, Curry School of Education, University of Southern California
Summary by Discussant
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

Mark Ottensmeyer
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 del Rey 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

Kevin Kunkler
Joint Program Committee 1, U.S. Army Medical Research & Materiel Command & University of Maryland School of Medicine
Military Medical Simulation and Training: A Strategic Plan to Expedite Future Success

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 System

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 Pediatric Simulation Team Training Makes a Difference: A Case Control Study

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

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

Imaging & Visualization

Hossein Arabalibeik
Research Center for Science and Technology in Medicine, Tehran University of Medical Sciences
A Method for Semi-Automatic Nuchal Translucency Thickness Measurement

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
Vivotec, Inc.
Actively Compliant Parallel End-Effector Mechanism for Medical Interventions
Conference Program • January 30, 2014

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
Vivonis, 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

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

Heinz Lemke
University of Southern California & International Foundation of CARS
3D++ Visualisation of MEBN Graphs and Real Time Interaction with Screen Representations of Patient Models (PIXIE II)

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
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

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

Lunch Break

12 Noon - 1:10 PM

Saturday lunch is on your own.
3:00 Anand Santhanam  
*Department of Radiation Oncology, University of California, Los Angeles*

**Cardiovascular Blood Flow Analysis under Normal and Open Injury Conditions**

3:15 Adjourn

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**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.

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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.