COURSE SYLLABUS

The 11th Annual Medicine Meets Virtual Reality Conference

NextMed: Health Horizon

JANUARY 22–25, 2003

NEWPORT BEACH MARRIOTT HOTEL & TENNIS CLUB
NEWPORT BEACH, CALIFORNIA
Organizing Committee

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TATRC/USAMRMC; DARPA

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U.S. Food and Drug Administration

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CIMIT/Massachusetts General Hospital/Harvard Medical School

Dave Warner MD PhD
MindTel; Syracuse University;
Institute for Interventional Informatics

Suzanne J. Weghorst MA MS
Human Interface Technology Lab
University of Washington

Mark D. Wiederhold MD PhD FACP
The Virtual Reality Medical Center

* Abstract Review Committee Member
Conference Information

Welcome

Welcome to the eleventh annual Medicine Meets Virtual Reality conference. We are very pleased MMVR remains useful and vital as it proceeds into its second decade. We offer our sincere thanks to the many researchers who share their work with us and make this conference possible. We congratulate them for their vision, creativity, and diligence.

This year’s theme, "NextMed: Health Horizon," implies many ideas, some of which are presented in our introduction to the Proceedings. Let us restate here that the successful utilization of electronic technologies in clinical care and medical education is critical to improving healthcare around the world.

Medicine Meets Virtual Reality has three fundamental goals:

- To share clinical research and experience on interactive, data-focused tools for medical diagnosis, therapy, and education so that healthcare providers who use these tools can make informed decisions about their clinical application
- To educate healthcare providers on the goals, methods, successes, and limitations of commercially available products
- To nurture a partnership with industry to promote continually improved and economically viable products for healthcare and education
- To define visionary goals that will guide medicine into a future of (a) improved minimally invasive diagnosis and treatment, (b) significantly enhanced educational methods, (c) expanded communication and research networks for providers and patients, and (d) more efficient delivery of optimal patient care

Course Objectives

The program consists of three morning general sessions, four afternoon parallel sessions, one workshop activity, and one adjunct symposium. All are designed to encourage open dialogue between participants, speakers, and moderators.

Target Audience

MMVR11 is designed to educate:

- Physicians, surgeons, and other healthcare professionals
- Medical educators and students
- Medical informatics researchers
- IT and medical device developers
- Military medicine specialists
- Biomedical engineers and investors

Evaluation

Please complete and give us your conference evaluation before you leave the conference. This form is required specifically from persons who want CME credit for attendance.

We welcome input from ALL conference participants, however. Your criticism and suggestions are useful to us and we carefully read what you write.

Course Description

MMVR11 provides a forum for exchanging, developing, and disseminating innovative ideas for interactive computer-based tools in healthcare. These ideas are considered in a context supporting minimally invasive clinical care that is both medically and economically advantageous. For firms that create and market these tools, this conference provides the opportunity to demonstrate their products to an informed audience.

The conference sponsors and organizers are solely responsible for the design and production of this conference, including final selection of topics and speakers. Because the meeting's goal is to promote education, all speakers are asked to present information, answer questions, and interact with participants in a manner that is both educational and free of commercial bias.

The conference sponsors and organizers encourage feedback from medical professionals, educators, industry, and conference participants. The course evaluations, including suggestions and criticism, will be welcomed and carefully analyzed to determine content and organization of future meetings.

Disclaimer

The information provided at this conference is intended for general medical education purposes only. All physicians should
fully investigate any new product or device before implementing it in their practice. In no event will the University of California, Irvine College of Medicine or Aligned Management Associates, Inc. assume responsibility for any decision made or action taken as a result of the information provided through this activity.

Accreditation

This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education through the joint sponsorship of the University of California, Irvine College of Medicine and Aligned Management Associates, Inc. The University of California, Irvine College of Medicine is accredited by the ACCME to provide continuing medical education for physicians.

The University of California, Irvine College of Medicine designates this educational activity for a maximum of 19.75 category 1 credits toward the AMA Physician's Recognition Award. Each physician should claim only those credits that he/she actually spent in the activity.

Acknowledgement

The conference organizers wish to thank BARCO Simulation Products for its educational grant via the loan of its stereoscopy projection equipment.

Additional Thanks

The conference organizers also wish to thank:

- TATRC/USAMRMC for its extensive participation in the conference
- The Abstract Review Committee for its time, energy, and critical judgment
- The Organizing Committee for its ongoing support and shared experience
- The Proceedings editors for their shared time and expertise
- Andrew Joel and Steven Senger for their help organizing the stereoscopy session

Disclosure Information

The following presenters have disclosed they have no affiliation, financial agreement or arrangement which could be perceived as a potential conflict of interest in their presentation:

- Michael J. Ackerman PhD
- Ritesh Agrawal MS
- Ron Alterovitz PhD(Cand)
- Sascha Becker
- Rajesh Boian MS
- Fred Bookstein PhD
- Jeffrey D. Brown BSE
- Rainer Burgkart MD
- Conrad Clyburn
- C. Donald Combs PhD
- Peter H. Cosman PhD(Cand)
- Stephane Corin PhD
- Nathan J. Delpson PhD
- Venkar Devanjan PhD
- Johannes Dinnetto, Dipl.-Inform.
- Deena Elhabib
- Ann E. Elsner PhD
- Reyes Enciso PhD
- Dr. Karl-Hans Englemeier
- Maryam Davodi Far MHA DPA
- Ron Fedkiw PhD
- David A. Fineberg MD
- Thomas Fraenholz MD
- Alex Gandas MD
- Vincent Gibson MS
- Eliet Grigg BA
- Amanda J. Gruber MD
- Raghul Halvovravrd PhD
- Felix G. Hamza-Lup
- Marabeth Harder MD
- Dustin Harris
- Asaki Hattori MS
- Mitsuhiro Hayashi MS
- Wm. LeRoy Heinrichs MD PhD
- Pheng Ann Heng PhD
- Cecilia M. Horvitz MBA
- Kay Howell
- Robert C. Hubal MS PhD
- Laura Johnson B.Sc. M.Res.
- John Johnston PhD
- Walar Khaled, Dipl.-Ing.
- Jung Kim
- Paul Krasnecvich MS PE
- Naoshi Koizumi BS
- Tai-Hong Kuo
- Christophe R. Laurent MD
- Jeannie MacDonald MD MA
- Liliane S. Machado MSc
- James Mal DDS DMSc
- Soojie Matsumoto MSc
- Frederic D. McKenzie PhD
- Kevin Montgomery PhD
- Louise Moody PhD
- Krishna Moorthy MBBS FRCS(Ed)
- Gerald R. Moses PhD
- Manivannan Muniasamy PhD
- Dmitry Oleynikov MD
- Peter Oppenheimer MS
- Gabrielle Opale MD
- Yoshito Otake MS
- Mark P. Ortensmeyer PhD
- Terry M. Peters PhD FCCPM
- Roger Phillips PhD
- Lamberto Pirson MD
- Edmond C. Prakash PhD
- Carla M. Pugh MD PhD
- Sitinivasan Rajagopalan
- Robert V. Rege MD
- Jason T. Richards MS
Conference Information

Dr.-Ing. Robert Riener  
Jason Ríquez  
Rogelio C. Rodriguez  
Jacob Rosen PhD  
Prof. Alberto Rosetta  
Martin Rydmark MD PhD  
Ajit K. Sachdeva MD FACS  
Stanley Saiki MD  
Tobias Salb, Dipl.-Inform.  
Richard M. Satava MD FACS  
Michael Schneider, Dipl.-Inform.  
Rainer M.M. Seibel MD  
Ronald Sekulski MA  
Steven Senger PhD  
Yuko Shigeta DDS DDSc  
Jonathan C. Silverstein MD  
Andrei Sitar  
Naoki Suzuki PhD MD  
Shigeyuki Suzuki MS  
Robert M. Sweet MD  
Ioannis Tarnanas MSc  
Frank Tendick PhD  
Dr rer nat. Thomas Tobdorff  
Feres M. Tofaili BE  
Miyuki Uegamatsu BS  
Jalal T. Valvoda, Dipl.-Inform.  
Andries Van Dam PhD  
Satoshi Waka BS  
Richard C. Ward PhD  
Robert J. Waters JD  
Ned Way  
Stefan Weber, Dipl.-Ing.  
Roger W. Webster PhD  
Simon Wildermuth MD  
Celeste Williams PhD  
Wen Wu PhD(Cand)  
Jörg Wulf MD  
Gianluigi Zanetti PhD  
Liping Zhao PhD(Cand)  
James Zimmer BS  
Aleksandar Zivanovic PhD

The following presenters have disclosed that their presentation(s) will include discussion of commercial products or services, and the presenters have a significant financial interest or other relationship with the manufacturer of products or provider of services they intend to discuss. Their relationships are also described:

Anul K. Madan MD  
J. Harvey Magee  
Allison A. Murphy MD  
Abhilash Pandya PhD(Cand)  
M. Beth H Pettit BS ME MBA  
Peter Ratus MD  
Rachel Rosenthal MD  
Nicholas Sachs PhD(Cand)  
Tobias Salb, Dipl.-Inform.  
Warren D. Smith PhD  
Thomas Sangild Sørensen MSc  
Don Stredney  
Patricia Youngblood PhD

Ran Cohen - Simbionix Ltd – employer  
Li Felländer-Tai MD PhD - Mentice AB - R & D grant;  
Mentice will have first access to results.  
Anthony G. Gallagh PhD - Mentice AB - Purchaser of  
Mentice MIST-VR device  
Moji Tzandoussou PhD - Computer Motion - employee  
Walter J. Greenleaf PhD - Greenleaf Medical - owner  
Harrith M. Hassan MD - Am developer and co-inventor of  
device [to be discussed], but no commercial manufacture  
at this time  
David L. Jaffe MS - Vividgroup - provided programming  
support on a government-supported research project  
Ali Khamene PhD - Siemens Corp - funds research activi-  
ties that will be presented  
Tim Kowalewski BS - ACMi gift to UW Urology is spon- 
soring this research. Co-author Jeff Berkley is employee of  
Mimic Inc.  
Michael K. Madison MSEE - NobleScience - CEO  
Michael J. Mastrangelo, Jr MD - Template Graphics Soft- 
ware, Barco International, SG1 - Provided  
software/equipment/technical support  
John C. Messenger MD - Consultant to Medical Simula- 
tion Corp (MSC). Grantee with MSC from Agency for  
Healthcare Research & Quality and National Board of  
Medical Examiners  
Louis Oberndorf - Medical Education Technologies, Inc. -  
employee  
Jonas Oblinsson - Mentice - employee  
David F. Ormerod MS MBA - Employee of Microvision,  
Inc.  
Karl D. Reining PhD - Touch of Life Technologies -  
Founder  
Jan Sigurd Ræstergard - SimSurgery AS - employee (CEO) and  
minority shareholder  
Ramin Shahidi PhD - Cbyon, Inc. - Chief Technology  
Officer  
Dag von Lubitz PhD MD(SC) - Med-Smart, Inc. - chief  
scientist  
Kirby G. Vosburgh PhD - GE /Medical Media Systems -  
shareholder
Yulun Wang PhD - InTouch Health - employee
George T.A. Webb BSc - MMT Ltd - employer
Brenda K. Wiederhold PhD MBA - Virtual Reality Medical
Center - owner
Torsten Wredmark MD PhD - Mentice AB - research grant
- Mentice will have access to results

At the time of this printing, the following presenters had not provided information regarding discussion of commercial products or services, or a significant financial interest or other relationship with a manufacturer of products or provider of services that may be discussed. Additionally, they have not disclosed their intention to discuss the use of any unlabeled/unapproved drugs or devices. However, they have been instructed to provide any such information prior to their presentation:

M. Cenk Cavusoglu PhD
Henry Fuchs PhD
Eric Herbranson DDS
Gerry Higgins PhD
Christopher Johnson PhD
Manny Ko
Andrew McCulloch PhD
Viju K. Peter FRCS(Ed)
Shankar Sarthy PhD
Vircov Spitzer PhD
Richard Ward PhD

The following presenters have disclosed that their presentation(s) will include an unlabeled use of a commercial product, or an investigational use not yet approved for any purpose:

Ann Elener has disclosed that she will be discussing the use of a GDX GDx (LDT, San Diego) which is designed for use in the human retina

David L. Jaffe MS - Vividgroup - software application that implements a research training protocol investigating walking improvements in individuals following stroke

Michael K. Madison MSEE - NobleSurgeon will be part of a CME education initiative in the future

Michael J. Mastrangelo, Jr MD - Amira software - Use rendering DICOM datasets not FDA/IDE approved for clinical use

Contact Information

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Presentation Schedule

**WEDNESDAY 1/22/03**

TATRC Principal Investigator Review*
8:00 AM – 3:00 PM

TATRC Networking Reception*
5:00 – 6:00 PM

* Not a CME activity. For a detailed schedule, please see the separate TATRC publication.

**THURSDAY MORNING 1/23/03**

**GENERAL SESSION**

Moderator: Richard A. Robb PhD

8:00 James D. Westwood and Karen S. Morgan
Aligned Management Associates, Inc.
Welcome

8:10 **PANEL DISCUSSION: FUTURE HEALTH TODAY**

Panelists:

8:10 Yulun Wang PhD
InTouch Health; Computer Motion

8:18 Walter J. Greenleaf PhD
Greenleaf Medical Systems

8:26 Rainer M.M. Seibel MD
University of Witten/Herdecke

8:34 Cecelia M. Horwitz MBA
Ctr for Future Health, Univ of Rochester

8:42 Conrad Clyburn
TATRC/USAMRMC

8:50 Discussion

9:10 Kirby G. Vosburgh PhD
CIMIT/Massachusetts General Hosp/Harvard Med Sch
New Sensor Developments and Clinical Practice

9:40 Richard M. Stavas MD FACS
Univ of Washington; DARPA; TATRC/USAMRMC
Ethical Issues of Technology Driving the Post-Human Future

10:10 Break in Exhibits Hall

**GENERAL SESSION (CONT.)**

Moderator: Suzanne J. Weghorst MA MS

10:45 C. Donald Combs PhD
Family and Community Medicine, Eastern Virginia Med Sch
Analyzing the MMVR Research Space: Past Emphases, Future Directions

11:00 **PANEL DISCUSSION: MEDICAL AND VIRTUAL REALITY COLLABORATION**

Panelists:

11:00 Suzanne J. Weghorst MA MS (moderator)
HIT Lab, Univ of Washington
Introduction/Overview

11:05 Peter Oppenheimer MS
HIT Lab, Univ of Washington

Robert M. Sweet MD
Dept Urology, Univ of Washington

11:20 Wm. LeRoy Heinrichs MD PhD
SUMMIT/Gynecology & Obstetrics, Stanford Univ School of Medicine

Kevin N. Montgomery PhD
National Biocomputation Ctr, Stanford University

11:35 Venkat Devarajan PhD
Electrical Eng, Univ of Texas at Arlington

Robert V. Roeg MD
Dept Surgery, Univ of Texas Southwestern Medical Ctr

11:50 Discussion

12:00 Break

**THURSDAY AFTERNOON SESSION A**

**SESSION A: SURGICAL SIMULATION – HAPTICS**

Moderator: RogerPhillips PhD MBCS

1:15 Moderator's Welcome

1:20 Peter H. Cosman PhD(Cand)
Surgery, Univ of Sydney
Haptic and Graphical Interfaces: A Comparative Study in Simulator Fidelity
THURSDAY AFTERNOON SESSION A (CONT.)

1:35 Aleksandar Zivanovic PhD
Mechanical Eng, Imperial College of Science, Technology and Medicine
Engineering Requirements for a Haptic Simulator for Knee Arthroscopy Training

1:50 Frank Tendick PhD
Surgery, Univ of California, San Francisco
Using Haptic Guidance to Teach the Use of an Angled Laparoscope in Simulation

2:05 Walaa Khaled, Dipl.-Ing.
Electrical Eng, High Frequency Eng Institute, Ruhr-Universität Bochum
A Haptic Sensor-Actor-System Based on Ultrasound Elastography and Electrorheological Fluids for Virtual Reality Applications in Medicine

2:20 Gianluigi Zanetti PhD
Visualization and Virtual Reality Group, CRS4
A Haptic Model of a Bone-Cutting Burr

2:35 Mark P. Ottensmeyer PhD
Simulation Group, CIMIT
Independent Testing of Soft Tissue Visco-Elasticity Using Indentation and Rotary Shear Deformations

2:50 Jeffrey D. Brown BSE
Bioengineering, Univ of Washington
In Vivo and In Situ Compressive Properties of Porcine Abdominal Soft Tissues

3:05 Discussion

3:15 Break

TISSUE MODELING

Moderator: Henry Fuchs PhD

3:30 Jung Kim MS
Mechanical Eng, Massachusetts Inst of Technology
A Physically Based Hybrid Approach in Real Time Surgical Simulation with Force Feedback

3:45 Ron Alterovitz PhD(Cand)
Ind. Eng and Operations Rach, Univ of California, Berkeley
Simulating Needle Insertion and Radioactive Seed Implantation for Prostate Brachytherapy

4:00 Dr. rer. nat. Thomas Toledorff
Med Informatics, Benjamin Franklin Med Center
3D Reconstruction of Organ Surfaces Using Model-Based Snakes

4:15 Johannes Dirmberger, Dipl.-Inform.
Software Eng for Medicine, Univ of Applied Sciences of Upper Austria
Virtual Modelling of Human Burn Injuries

VISUALIZATION - MODELING

Moderator: Henry Fuchs PhD

4:30 Srinivasan Rajagopalan
Biomedical Imaging Resource, Mayo Clinic/Foundation
Interrogative Visualization: Embedding Deformation and Constructive Solid Geometry into Interactive Volume Visualization

4:45 Matthias Harders PhD
Computer Vision Lab, ETH Zurich
Comparing a Simplified FEM Approach with the Mass-Spring Model for Surgery Simulation

5:00 Don Stedney
Interface Lab, OSC
Facilitating Real-Time Volume Rendering

5:15 Discussion

5:30 Adjourn

THURSDAY AFTERNOON SESSION B

SESSION B:
VISIBLE HUMAN PROJECT

Moderator: David C. Balch MA

1:15 Moderator's Welcome

1:20 Michael J. Ackerman PhD
Nat'l Library of Medicine, Nat'l Institutes of Health
The Visible Human Project: What's Next?

1:35 Karl D. Reinig PhD
Engineering, Touch of Life Technologies
Increasing the Resolution of Virtual Anatomic Environments

1:50 Peter Ratiu MD
Radiology, Brigham and Women's Hospital, Harvard Med Sch
Visible Human 2.0 - The Next Generation
**THURSDAY AFTERNOON SESSION B (CONT.)**

**NETWORKING – TELEMEDICINE**

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<th>Time</th>
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| 2:05  | Steven Senger PhD  
Computer Science, Univ of Wisconsin - La Crosse  
*Nomadic Access to Volumetric Data Using a Wireless Handheld Computer* |
| 2:20  | Amanda J. Gruber MD  
Biological Psychiatry Lab, Harvard Med Sch  
*Battlefield Medical Robots* |

**MEDICAL EDUCATION**

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| 2:35  | Stanley Saiki MD  
Medicine, Univ of Hawaii  
*Advanced Collaborative Environments in Medical Education* |
| 2:50  | Dag von Lubitz PhD MD(Sc)  
MedSMART, Inc.  
*EMERGENCY! Transatlantic Simulation-Based Training in Emergency and Trauma Medicine* |
| 3:05  | Discussion |
| 3:15  | Break |

**MEDICAL EDUCATION (CONT.)**

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| 3:30  | Allison A. Murphy MD  
Neonatal and Developmental Medicine, Pediatrics, Stanford Univ Sch of Medicine  
*Evaluation of a Novel Electronic Fetal Monitor Simulator* |
| 3:45  | Robert C. Hubal MS PhD  
Technology Assisted Learning, RTI International  
*Lessons Learned in Modeling Virtual Pediatric Patients* |
| 4:00  | David A. Fineberg MD  
Surgery, State Univ of New York at Buffalo  
*Development of an Interactive Teaching System Based on Motion Synchrony Between Physical and Virtual Models* |

**SIMULATION – REHABILITATION**

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| 4:15  | Nicholas Sachs PhD(Cand)  
Biomedical Eng, Univ of Southern California  
*Virtual Visit: Improving Communications for Those Who Need It Most* |
| 4:30  | Jason T. Richards MS  
Space Physiology and Countermeasures, Wyle Laboratories, Inc.  
*Adaptive Modification of Locomotor Performance Following Exposure to a Passive-Immersive Virtual Environment During Treadmill Walking* |
| 4:45  | Richard Eastgate PhD  
Sch of Med, Univ of Nottingham  
*A Virtual Reality Based System for Amblyopia Therapy* |
| 5:00  | David L. Jaffe MS  
Rehab Resch and Dev Ctr, VA Palo Alto Health Care Sys  
*Using Augmented Reality to Improve Walking in People following Stroke* |
| 5:15  | Discussion |
| 5:30  | Adjourn |

**THURSDAY EVENING 1/23/03**

**POSTER PRESENTATION: 5:30 – 6:30 PM**

At the Presentation, authors will discuss their research person-to-person with conference participants. Posters will be judged and the best posters awarded prizes and the opportunity to give "bullet" presentations in the Friday morning general session. Poster presentations are:

- **Ritesh Agarwal MS**  
  Electrical Eng, Univ of Texas at Arlington  
  *Special Visual Effects for Surgical Simulation: Cauterization, Irrigation and Suction*

- **Rares Boian**  
  CAIP Center, Rutgers Univ  
  *Real-Time Web-Based Tele-Rehabilitation Monitoring*

- **Iman Brouwer**  
  Mechanical Eng, Univ of British Columbia  
  *Price-Quality Trade-Offs in Haptic Interfaces for Simulation of Laparoscopic Surgery*
THURSDAY EVENING POSTERS (CONT.)

Drew S. Cheng MD
Anesthesiology, Harbor-UCLA Med Ctr
Anesthesiology Point of Care: A Technology Model for a Clinical Disaster Management System

Ran Cohen
Simbionix USA Corporation
Practicing Full Laparoscopic Procedures on an Advanced Virtual Reality Simulator

Venkat Devarajan PhD
Electrical Eng, Univ of Texas at Arlington
Simulation of a Preperitoneal Mesh in Laparoscopic Herniorrhaphy

Deena Elsharief
Univ Dept of Surgery, Manchester Royal Infirmary
Comparison of Large and Small Screen Images for Laparoscopic Surgery - A Simulator and Operating Theater Based Study

Ann E. Elsner PhD
Schepens Eye Research Inst and Harvard Med Sch
Novel Algorithms for Polarization Imaging Resulting in Improved Quantification of Retinal Blood Vessels

Maryam Davodi Far MHA DPA
San Diego American Indian Health Ctr
The Impact of the Internet on the Patient - Physician Relationship

Li Felländer-Tsai MD PhD
Ctr for Advanced Med Simulation, Ctr for Surgical Sciences, Karolinska Inst
Visuospatial Skills and Performance in Endoscopic Simulators

Paul Fu Jr. MD MPH
Pediatrics, Harbor-UCLA Med Ctr
Clinical Disaster Management: A New Approach for Management of Natural and Man-Made Disasters

Alex Gandes MD
Surgery, Univ of Kentucky
The University of Kentucky Webcast Project: Interactivity During Live Streaming Events

Eliot Grigg BA
Thayer Sch of Eng
Cyberscare: The Integration of Virtual Reality into Disaster Response

Ragnhild Halvorsrud PhD
Telenor Research and Development
Trauma Team Training in a Distributed Virtual Emergency Room

Harith M. Hasson MD
Ob/Syn, Weis Hospital
Combining Physical and Digital Simulation for Laparoscopic Training Using an Interactive Sensing Module (ISM 50)

Pheng Ann Heng PhD
Comp Science and Eng, Chinese Univ of Hong Kong
A Haptic Needle Manipulation Simulator for Chinese Acupuncture

Richard Holbrey MSc
Sch of Computing, Univ of Leeds
Metrics and Motion Analysis for Suture Simulation

Catherine Kinnaird BSc (Eng)
Mechanical Eng, Univ of British Columbia
Quantitative Measures of Transfer of Training and Validation of Laparoscopic Surgical Simulators

Paul Kizakevich MS PE
Technology Assisted Learning, RTI International
Virtual Simulated Patients for Bioterrorism Preparedness Training

Naoshi Koizumi BS
Integrative Bioscience and Biomedical Eng, Graduate Sch of Science & Eng, Waseda Univ
Development of New Three-Dimensional Endoscopic Ultrasound System Through Endoscope Shape Monitoring

Tai-Hong Kuo MSc
Mechanical Eng, National Cheng Kung Univ
Virtual Tracking System Applied to Maxillofacial Surgery: From Surgical Planning to Calibration

Hans Lamecker, Dipl.-Phys.
Scientific Visualization, Konrad Zuse Zentrum für Informationstechnik
Automatic Segmentation of the Liver for the Pre-operative Planning of Resections

Christophe Laurent MD
CASIMIR

Benjamin Law B.Math
Sch of Computing Science, Simon Fraser Univ
Eye Trackers in a Virtual Laparoscopic Training Environment
THURSDAY EVENING POSTERS (CONT.)

Jeannie MacDonald MD MA
Plastic Surgery, Univ of Western Ontario
Virtual Reality Training Tools - More Than Just Bells and Whistles?

Liliane S. Machado MSc
Electrical Eng, Univ of Sao Paulo
Development and Evaluation of a Simulator of Invasive Procedures in Pediatric Bone Marrow Transplant + Online Training Evaluation in Virtual Reality Simulators Using Gaussian Mixture Models

Atul K. Madan MD
Surgery, Univ of Tennessee - Memphis
Laparoscopic Skill Assessment by MIST-VR

Michael K. Madison MSEE
Electrical Eng, Stanford Univ
Project Noble Surgeon: Proliferation of Surgical Simulation

J. Harvey Magee
Clinical Application Div, Telemedicine and Advanced Technology Research Ctr, US Army
Validation of Medical Simulation for Trauma Training

James Mah
Sch of Dentistry, Univ of Southern California
3D Tooth Shape from Radiographs Using Thin-Plate Splines

Soju Matsumoto MSc
3D Incorporated
Realistic Virtual Endoscopy of the Ventricle System and Haptic-Based Surgical Simulator of Hydrocephalus Treatment

Frederic D. McKenzie PhD
Electrical and Computer Eng, Old Dominion Univ
Quantifying Prostate Surgery Success through 3D Reconstruction and Measurement

John C. Messenger MD
Medicine, Univ of Colorado Health Sciences Ctr
Clinical Skills Assessment Using Medical Simulation of Invasive Hemodynamic Procedures

Louise Moody PhD
Statistics, Univ of Warwick (UK)
A Part-Task Approach to Haptic Knee Arthroscopy Training

Krishna Moorthy MBBS FRCSI(Ed)
Surgical Oncology and Technology, Imperial College of Science, Technology and Medicine
Evaluation of an Upper Gastrointestinal Endoscopy Simulator and Cross Validation with a Video-Endoscopic Assessment Technique

Gabriele Optale MD
Assoc of Med Psychotherapists, Venice
Male Sexual Disorders and Virtual Reality Therapy (Follow-Up)

Abhilash Pandya PhD(Cand)
Electrical and Computer Eng, Wayne State Univ
Medical Robot Vision Augmentation? A Prototype

Vija K. Peter FRCS(Ed)
Computer Science, Univ of Hull (UK)
In Vivo Force Torque Measurements During a Routine Knee Arthroscopy

M. Beth H. Pettitt BS ME MBA
Med Simulation and Training, STRICOM, US Army
Engaging the Medic in Warfighter Simulation

Lamberto Piron MD
Neurology and Psychiatry, Univ of Padova, Ospedale San Camillo
The Augmented Feedback Rehabilitation Technique Facilitates the Arm Motor Recovery in Patients After a Recent Stroke

Edmond C. Prakash PhD
Sch of Computer Eng, Nanyang Technological Univ
Anatomically Accurate Individual Face Modeling

Dr.-Ing. Robert Rienier
Automatic Control Eng [LSR], Technical Univ Munich (TUM)
Force-Torque Input Enhances Medical VR Applications + Force-Input-Device for a Multi-Modal Desktop Knee Joint Simulator

Jason Rives
Computer Science & Information Systems, Kennesaw State Univ
Virtual Reality Therapy in Aid of Senior Citizens’ Psychological Disorders

Rachel Rosenthal MD
Anesthesia and Surgery, Univ Hospital of Basel
 Validity of Perceptual Motor Skills Assessment with the LS 500 Virtual Reality Simulator for Laparoscopic Surgery
THURSDAY EVENING POSTERS (CONT.)

Jan Sigurd Retnes MD PhD
SimSurgery AS
Validation of a Virtual Reality Anastomosis Trainer for Robotic Surgery

Prof. Alberto Rovetta
Mecanics, Politecnico di Milano
Daphne, The New Device for Diagnosis of Neuromotor Diseases: New Design with MEMS and Multivariate Analysis of Results

Martin Rydmark MD PhD
Mednet, Sahlgrenska Academy, Göteborg Univ
Virtual Reality and Haptics in Stroke Rehabilitation

Tobias Salb, Dipl.-Inform.
Computer Science, Univ Karlsruhe
Evaluation of INPRES - Intraoperative Presentation of Surgical Planning and Simulation Results + Simulation Environment for Surgical Planning + A VR-System Supporting Symmetry Related Cranio-Maxillofacial Surgery

Michael Schnaider, Dipl.-Inform.
Visual Computing, ZGDV e.V., Ctr for Computer Graphics
Medarpa - A Medical Augmented Reality System for Minimal-Invasive Interventions

Ronald Sekulski MA
Dow Ctr for Art, Design & Technology, Ferris State Univ/Kendall College of Art & Design
Collaborative Virtual Modeling of Digital Images for the Visible Human Project

Yuko Shigeta DDS DDSc
Inst for High Dimensional Med Imaging, Jikei Univ Sch of Medicine
Four-Dimensional Analysis of Mandibular Movements with Optical Position Measuring and Real-time Imaging

Thomas Sangild Sørensen MSc
Cardiothoracic Surgery and MRI Centre, Aarhus Univ Hospital
MRI Based Preoperative Reconstruction and Surgical Planning in Congenital Heart Disease

Naoki Suzuki PhD MD
Inst for High Dimensional Med Imaging, Jikei Univ Sch of Medicine
Development of Dynamic Spatial Video Camera (DSVC) for 4D Observation, Analysis and Modeling of Human Body Locomotion

Shigeyuki Suzuki MS
Inst for High Dimensional Med Imaging, Jikei Univ Sch of Medicine
Dynamic Deformation of Elastic Organ Model and the VR Cockpit for Virtual Surgery and Tele-Surgery

Ioannis Ternanas MSc
Psychology, Aristotle Univ of Thessalonica
Wearable Schizophrenia Treatment with Real-Time Affective Context Awareness

Feras M. Toufali BE
Mechanical Eng, Univ of Washington - HIT Lab
Simulation of Visual Loss

Miyuki Uematsu BS
Integrative Bioscience and Biomedical Eng, Waseda Univ Graduate Sch of Science and Eng
Development of a Data Fusion System using Color Information for Real-time Intraoperative Liver Surface Measurement

Jakob T. Valvoda, Dipl.-Inform.
Ctr for Computing and Communication, Aachen Univ
NeuroVRAC - A Comprehensive Approach to Virtual Reality-Based Neurological Assessment and Treatment Systems

Satoshi Wakai BS
Integrative Bioscience and Biomedical Eng, Graduate Sch of Science and Eng, Waseda Univ
Real-Time Volumetric Deformation for Surgical Simulation Using Force Feedback Device

Richard C. Ward PhD
Computational Sciences and Eng Div, Oak Ridge National Laboratory
Web-Access to a Lung Deposition Model for Radiation Protection and Physiological Modeling

George T.A. Webb BSc
MMT Medical/Cybernetics, Reading Univ
Virtual Reality and Interactive 3D as Effective Tools for Medical Training

Roger W. Webster PhD
Dept of Computer Science, Millersville University
A Virtual Reality Trainer for Operative Set-up and Exposure for Laparoscopic Cholecystectomy

Torsten Wiredmark MD PhD
Orthopedic Surgery and Ctr for Advanced Med Simulation, Ctr for Surgical Sciences, Huddinge Univ Hospital
Validation of Simulators in Endoscopic Surgical Training
<table>
<thead>
<tr>
<th>Time</th>
<th>Presentation Title</th>
<th>Speaker(s)</th>
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<tr>
<td>8:20</td>
<td>Jonas Ohlsson</td>
<td>Mentice AB</td>
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<td>8:25</td>
<td>Brenda K. Wiederhold PhD MBA</td>
<td>The Virtual Reality Medical Center</td>
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<td>8:30</td>
<td>Rogelio Rodriguez</td>
<td>Med Product Development Certificate Program, Univ of California, Irvine</td>
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<td>8:35</td>
<td>Robert J. Waters JD</td>
<td>Counsel, Ctr for Telemedicine Law; Partner, Arent Fox</td>
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<td>8:50</td>
<td>Discussion</td>
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<td>9:05</td>
<td>Poster Winners’ “Bullet” Presentations</td>
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<td>Director, Division of Education; American College of Surgeons</td>
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<td>9:55</td>
<td>Break</td>
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<tr>
<td>10:15</td>
<td>Anthony G. Gallagher PhD</td>
<td>Endoscopic Research Laboratory, Queen’s Univ</td>
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<td>PANEL DISCUSSION: OR OF THE FUTURE</td>
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<td>Panelists:</td>
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<td>10:45</td>
<td>Gerald R. Moses PhD</td>
<td>TATRC/USAMRMC</td>
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<td>10:55</td>
<td>Rainer M. M. Seibel MD</td>
<td>University of Witten/Herdecke</td>
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<td>11:05</td>
<td>Modjtba Ghodoussi PhD</td>
<td>Tele-Robotics Programs, Computer Motion Inc.</td>
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<td>11:15</td>
<td>Richard M. Satava MD</td>
<td>Univ of Washington; DARPA; TATRC/USAMRMC</td>
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<td>11:30</td>
<td>Discussion</td>
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<td>11:45</td>
<td>PRESENTATION OF THE 9TH ANNUAL SATAVA AWARD *</td>
<td>[* Not a CME activity]</td>
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<td>12:00</td>
<td>Break</td>
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**GENERAL SESSION 1/24/03**

**Moderator:** Steve Charles MD

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<td>Moderator’s Welcome</td>
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<td>PANEL DISCUSSION: NAPKIN TO MARKET PLACE; MMVR BUSINESS STUDIES</td>
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<td>Panelists:</td>
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<td>8:05</td>
<td>Carla M. Pugh MD PhD</td>
<td>SUMMIT/Stanford Univ</td>
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<td>8:10</td>
<td>Yulun Wang PhD</td>
<td>InTouch Health; Computer Motion</td>
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<td>8:15</td>
<td>Louis Oberndorf</td>
<td>Medical Education Technologies, Inc.</td>
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FRIDAY AFTERNOON SESSION A

SESSION A:
SURGICAL SIMULATION – SYSTEMS, ASSESSMENT, AND VALIDATION

Moderator: Julie A. Swain MD

1:15 Moderator’s Welcome

1:20 Kevin Montgomery PhD
National Bioimagination Ctr, Stanford Univ
Virtual Instruments: A Generalized Implementation

1:35 Stephane Cotin PhD
Simulation Group & Radiology, CIMIT/Massachusetts General Hospital/Harvard Med Sch
Laparoscopic Skills Training: A Novel Standardized Scoring System for Performance Assessment

1:50 Jacob Rosen PhD
Electrical Eng, Univ of Washington
Minimally Invasive Surgery Task Decomposition - Etymology of Endoscopic Suturing

2:05 Dmitry Oleynikov MD
Surgery, Univ of Nebraska Med Center
Measurements of the Level of Surgical Expertise Using Flight Path Analysis from da Vinci Robotic System

2:20 Celeste Williams PhD
Computer Science, Univ of Houston
Breast Reconstructive Surgery: A Simulation Study

2:35 Nathan J. Delson PhD
Mechanical and Aerospace Eng, Univ of California, San Diego
Quantifying Expert vs. Novice Skill In Vivo for Development of a Laryngoscopy Simulator

2:50 Henry Fuchs PhD
Computer Science, Univ of North Carolina
Augmented Visualization in the Training for Surgery of Trauma

3:05 Discussion

3:15 Break

SESSION A (CONT.)

Moderator: Christoph Kaufmann MD MPH FACS

3:30 Patricie Youngblood PhD
SUMMIT, Stanford Univ Sch of Medicine
Training in Laparoscopic Surgery: A Comparison of Virtual Reality and Traditional Simulation Methods

3:45 Krishna Moorthy MBBS FRCS(Ed)
Surgical Oncology and Technology, Imperial College of Science, Technology and Medicine
Validation of a Web-Based Training Tool for Lumbar Puncture

4:00 Matthew B. Bloom MD MSEE
Surgery, Stanford Univ Sch of Medicine
Validation of a Virtual Reality Simulator for the Upper Endoscopy Procedure

4:15 Tim Kowalewski BS
HIT Lab, Univ of Washington
Validation of the UW Virtual Reality TURP Simulator

4:30 Dr.-Ing. Uwe Kühnepfel
Inst für Angewandte Informatik, Forschungszentrum Karlsruhe
The Virtual Endoscopic Surgery Training (VEST) System VSOne

4:45 Felix Hamza-Lup PhD(Cand)
Sch of Optics/CREOL, Univ of Central Florida
The Ultimate Intubation Head: HMD, 380, Degree Tracking Probe, 3D Models and System Deployability

5:00 Kevin Montgomery PhD
National Bioimagination Ctr, Stanford Univ
A Surgical Simulator for Cleft Lip Planning and Repair

5:15 Manivannan Muniyandi PhD
Lab of Human and Machine Haptics, RIch Lab of Electronics, Massachusetts Inst of Technology
Real-Time PC-Based Simulation of Fluoroscopic Images for Interventional Radiology Training

5:30 Discussion

5:45 Adjourn
## FRIDAY AFTERNOON SESSION B

### SESSION B: INFORMATION-GUIDED THERAPY - VISUALIZATION

**Moderator:** Kirby G. Vosburgh PhD

1:15  Moderator's Welcome

1:20  Dr. Karl-Hans Englmeier  
GSF, Inst of Med Informatics  
*Dynamic MR-Mammography in Virtual Reality*

1:35  Yoshito Otake MS  
Inst for High Dimensional Med Imaging, Jikei Univ Sch of Medicine  
*4-Dimensional Computer-Based Motion Simulation after Total Hip Arthroplasty*

1:50  Mitsuhito Hayashibe MS  
Inst for High Dimensional Med Imaging, Jikei Univ Sch of Medicine  
*Real-Time 3D Deformation Imaging of Abdominal Organs in Laparoscopy*

2:05  Thomas Frauenfelder MD  
Inst of Diagnostic Radiology, Univ Hospital of Zurich  
*Pre- and Postoperative Computational Fluid Dynamic Simulation of Haemodynamic Conditions for Abdominal Aortic Aneurysm Stent Repair*

2:20  Reyes Enciso PhD  
Craniofacial Therapeutics, Sch of Dentistry, Univ of Southern California  
*The Virtual Craniofacial Patient: 3D Jaw Modeling and Animation*

2:35  Ramin Shahidi PhD  
Image Guidance Laboratories, Stanford Univ Sch of Medicine  
*Integration and Validation of a Volumetric Surgical Navigation System*

2:50  Vincent Gibson MS  
Biomedical Interactive Tech Ctr, Georgia Inst of Technology  
*3D Visualization Methods to Guide Surgery for Parkinson's Disease*

3:05  Discussion

3:15  Break

### SURGICAL ROBOTICS

**Moderator:** Don Stredney

3:30  Naoki Suzuki PhD MD  
Inst for High Dimensional Med Imaging, Jikei Univ Sch of Medicine  
*Development of an Endoscopic Robot System with Two Hands for Various Gastric Tube Surgeries*

3:45  Asaki Hattori MS  
Inst for High Dimensional Med Imaging, Jikei Univ Sch of Medicine  
*A Robotic Surgery System (da Vinci) with Image Guided Function*

4:00  Warren D. Smith PhD  
Biomedical Eng, California State Univ, Sacramento  
*Wireless Virtual Instrument Measurement of Surgeons' Physical and Mental Workloads for Robotic Versus Manual Minimally Invasive Surgery*

4:15  Simon Wildermuth MD  
Inst. of Diagnostic Radiology, Univ Hospital Zürich  
*Virtual Endoscopy for the Small Bowel Based on MR Imaging and Interactive 3D Volume Segmentation*

### AUGMENTED REALITY - DISPLAYS

**Moderator:** Don Stredney

4:30  Stefan Weber, Dipl.-Ing.  
Berlin Ctr for Mechatronic Med Devices, Fraunhofer Gesellschaft IPK  
*A Mobile and Navigated Image Viewer for Surgery - Evaluation of Precision*

4:45  Ali Khamene PhD  
Imaging and Visualization Department, Siemens Corporate Research  
*An Augmented Reality System for MR-Guided Needle Biopsies; Performance Evaluation of Phantom Trial*

5:00  David F. Ormerod MS MBA  
Microvision, Inc.  
*Use of an Augmented Reality Display of Patient Monitoring Data to Enhance Anesthesiologists’ Response to Abnormal Clinical Events*

5:15  Discussion

5:30  Adjourn
FRIDAY AFTERNOON SESSION C

SESSION C WORKSHOP:
DIGITAL HUMAN: NEXT GENERATION TECHNOLOGIES FOR THE GEOMETRICAL MODELING AND DYNAMIC SIMULATION OF BIOLOGICAL SYSTEMS

1:15  Presentations
3:00  Break
3:15  Discussion
6:00  Adjourn

For the detailed workshop program, please see the separate workshop description.

SATURDAY MORNING 1/25/03

GENERAL SESSION: STEREOSCOPIC (3D) PROJECTION "THE 4TH ANNUAL BARCO STEREOSCOPIC SESSION"

Moderator: Parvati Dev PhD

8:00  INTRODUCTION TO STEREOSCOPIC (3D) PROJECTION TECHNOLOGY

Steven Senger PhD (Stereoscopy Session Chair)
Computer Science, Univ of Wisconsin - La Crosse

Andrew Joel
Market Development Manager, Virtual and Augmented Reality, BARCO Simulation Products

Almos Elekes PhD
Medical Director, SGI

Steffen Prohaska
Zuse Institute Berlin / Indeed - Visual Concepts GmbH

8:10  Roger Phillips PhD
Computer Science, Univ of Hull (UK)
Stereo Visualization of 3D Trabecular Bone Structures Produced by Bone Remodelling Simulation

8:25  Rainer Burgkart MD
Orthopaedic Clinic, Technical University Munich
New Method for an Intuitive Surgical Planning System for 3D Correction-Osteotomies of Bony Deformations

8:40  Andrei State
Univ of North Carolina at Chapel Hill
Stereo Imagery from the UNC Augmented Reality System for Breast Biopsy Guidance

8:55  Laura Johnson BSc MRes
Computational Imaging Sciences, Guy's Hospital
When Image location and Perceived Location Differ: The Implications for Augmented Reality in Surgery

9:10  Terry M. Peters PhD FCCPM
Imaging Research Labs, Roberts Research Inst, Univ of Western Ontario,
Stereoscopic Visualization in Image-Guided Surgery

9:25  Kevin Montgomery PhD
National Bio-computing Ctr, Stanford Univ
Surgical Planning and Simulation - In Stereo

9:40  Hans Lamecker, Dipl.-Phys.
Scientific Visualization, Konrad Zuse Zentrum für Informationstechnik
From Image Data to Three-Dimensional Models - Case Studies on the Impact of 3D Patient Models

9:55  Steven Senger PhD
Computer Science, Univ of Wisconsin - La Crosse
Collaborative Segmentation of Volumetric Data over a Next Generation Internet

10:10 Discussion
10:20 Break

STEREOSCOPY (CONT.)

Moderator: Steven Senger PhD

10:40 Jonathan C. Silverstein MD
Surgery, Univ of Chicago
Collaborative Exploration of Medical Data in VR

10:55 Victor Spitzer PhD
Univ of Colorado Ctr for Human Simulation
Stereoscopy and the Visible Human: A Review of Our Experience with Multiple Educational Levels

11:10 Dustin Harris
Neurosurgery, Univ of Florida
Interactive Stereoscopic Virtual Reality: New Approaches to Medical Education
Presentation Schedule

SATURDAY MORNING (CONT.)

11:25  Martin Rydmark MD PhD
       Mednet, Sahlgrenska Academy, Göteborg Univ
       Stereoscopic Visualization in Neuromorphologic
       Research and Education

11:40  Eric Herbranaon DDS
       Sch of Dentistry, Univ of the Pacific
       Update of the Interactive 3D Tooth Atlas

11:55  Michael J. Mastrangelo, Jr MD
       Surgery, Univ of Kentucky College of Medicine
       Inclusion of 3-D Computed Tomography Rendering and Immersive VR in a Third Year Medical
       Student Surgery Curriculum

12:10  Discussion

12:30  Adjourn