PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 7964

, "Front Matter: Volume 7964," Proc. SPIE 7964, Medical Imaging 2011: Visualization, Image-Guided Procedures, and Modeling, 796401 (18 April 2011); doi: 10.1117/12.894736

SPIE.

Event: SPIE Medical Imaging, 2011, Lake Buena Vista (Orlando), Florida, United States

Medical Imaging 2011

Visualization, Image-Guided Procedures, and Modeling

Kenneth H. Wong
David R. Holmes III
Editors

13–15 February 2011
Lake Buena Vista, Florida, United States

Sponsored by
SPIE

Cosponsored by
Dynasil Corporation/RMD Research (United States) • AAPM—American Association of Physicists in Medicine (United States) • DQE Instruments, Inc. (Canada) • Ocean Thin Films, Inc. (United States) • CREOL—The College of Optics and Photonics, Univ. of Central Florida (United States) VIDA Diagnostics, Inc. (United States)

Cooperating Organizations
APS—American Physiological Society (United States) • CARS—Computer Assisted Radiology and Surgery (Germany) • The Society for Imaging Science and Technology • Medical Image Perception Society (United States) • Radiological Society of North America (United States) Society for Imaging Informatics in Medicine (United States) • SMI—The Society for Molecular Imaging • The DICOM Standards Committee (United States)

Published by
SPIE

Volume 7964

Proceedings of SPIE, 1605-7422, v. 7964

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Medical Imaging 2011: Visualization, Image-Guided Procedures, and Modeling*, edited by Kenneth H. Wong, David R. Holmes III, Proceedings of SPIE Vol. 7964 (SPIE, Bellingham, WA, 2011) Article CID Number.

ISSN 1605-7422

ISBN 9780819485069

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

Copyright © 2011, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 1605-7422/11/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIE
Digital Library

SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.

Contents

Part One

xvii	Conference Committee
xix	Introduction

SESSION 1 IMAGE GUIDED THERAPY I

7964 02	The use of virtual fiducials in image-guided kidney surgery [7964-01] C. Glisson, R. Ong, A. Simpson, P. Clark, S. D. Herrell, R. Galloway, Vanderbilt Univ. (United States)
7964 03	Surgical phantom for off-pump mitral valve replacement [7964-02] A. J. McLeod, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada); J. Moore, Robarts Research Institute (Canada); G. M. Guiraudon, Robarts Research Institute (Canada) and Lawson Health Research Institute (Canada); D. L. Jones, Lawson Health Research Institute (Canada) and The Univ. of Western Ontario (Canada); G. Campbell, Robarts Research Institute (Canada) and National Research Council Canada (Canada); T. M. Peters, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada)
7964 04	Incorporating tissue excision in deformable image registration: a modified demons algorithm for cone-beam CT-guided surgery [7964-03] S. Nithiananthan, D. Mirota, A. Uneri, S. Schafer, Y. Otake, J. W. Stayman, J. H. Siewerdsen, Johns Hopkins Univ. (United States)
7964 05	Evaluation of an ad hoc model of detection physics for navigated beta-probe surface imaging [7964-04] D. I. Shakir, A. Hartl, N. Navab, S. I. Ziegler, Technische Univ. München (Germany)
7964 06	Computer assisted intervention surgery planning and navigation for percutaneous microwave ablation of lung cancer [7964-05] W. Zhai, Tsinghua Univ. (China); L. Sheng, Tsinghua Univ. Yuquan Hospital (China); Y. Song, H. Wang, Y. Zhao, P. Jia, Tsinghua Univ. (China)

SESSION 2 KEYNOTE AND IMAGE GUIDANCE IN UROLOGY

7964 08	2D and 3D visualization methods of endoscopic panoramic bladder images [7964-07] A. Behrens, I. Heisterklaus, Y. Müller, T. Stehle, S. Gross, T. Aach, RWTH Aachen Univ. (Germany)
7964 09	Photoacoustic imaging of prostate brachytherapy seeds in ex vivo prostate [7964-08] N. Kuo, H. J. Kang, T. DeJournett, J. Spicer, E. Boctor, Johns Hopkins Univ. (United States)

- 7964 0A **Optimal drug release schedule for in-situ radiosensitization of image guided permanent prostate implants** [7964-09]
R. A. Cormack, P. L. Nguyen, A. V. D'Amico, Brigham and Women's Hospital (United States); S. Sridhar, Northeastern Univ. (United States); M. Makrigiorgos, Brigham and Women's Hospital (United States)

SESSION 3 VISUALIZATION AND MODELING

- 7964 0B **Fuzzy object modeling** [7964-10]
J. K. Udupa, D. Odhner, The Univ. of Pennsylvania (United States); A. X. Falcao, Univ. of Campinas (Brazil); K. C. Ciesielski, The Univ. of Pennsylvania (United States) and West Virginia Univ. (United States); P. A. V. Miranda, Univ. of Campinas (Brazil); P. Vaideeswaran, S. Mishra, The Univ. of Pennsylvania (United States); G. J. Grevera, The Univ. of Pennsylvania (United States) and Saint Joseph's Univ. (United States); B. Saboury, D. A. Torigian, Hospital of the Univ. of Pennsylvania (United States)
- 7964 0C **The sparse data extrapolation problem: strategies for soft-tissue correction for image-guided liver surgery** [7964-11]
M. I. Miga, Vanderbilt Univ. (United States); P. Dumpuri, Pathfinder Therapeutics Inc. (United States); A. L. Simpson, J. A. Weis, Vanderbilt Univ. (United States); W. R. Jarnagin, Memorial Sloan-Kettering Cancer Ctr. (United States)
- 7964 0D **3D density estimation in digital breast tomosynthesis: application to needle path planning for breast biopsy** [7964-12]
L. Vancanberg, GE Healthcare (France) and ISIR-CNRS, Pierre & Marie Curie Univ. (France); N. Geeraert, R. Iordache, G. Palma, R. Klausz, S. Muller, GE Healthcare (France)
- 7964 0E **Fast interactive exploration of 4D MRI flow data** [7964-13]
A. Hennemuth, O. Friman, C. Schumann, Fraunhofer MEVIS (Germany); J. Bock, Univ. Medical Ctr. Freiburg (Germany); J. Drexler, M. Huellebrand, Fraunhofer MEVIS (Germany); M. Markl, Univ. Medical Ctr. Freiburg (Germany); H.-O. Peitgen, Fraunhofer MEVIS (Germany)
- 7964 0F **Intraoperative 3D stereo visualization for image-guided cardiac ablation** [7964-14]
M. Azizian, R. Patel, The Univ. of Western Ontario (Canada) and Canadian Surgical Technologies and Advanced Robotics (Canada)

SESSION 4 IMAGE SEGMENTATION AND REGISTRATION

- 7964 0G **A novel class of machine-learning-driven real-time 2D/3D tracking methods: texture model registration (TMR)** [7964-15]
P. Steininger, M. Neuner, Paracelsus Medical Univ. (Austria); K. Fritscher, Univ. for Health Sciences, Medical Informatics and Technology (Austria); F. Sedlmayer, H. Deutschmann, Paracelsus Medical Univ. (Austria)
- 7964 0H **Uncertainty propagation and analysis of image-guided surgery** [7964-16]
A. L. Simpson, Vanderbilt Univ. (United States); B. Ma, York Univ. (Canada); R. E. Ellis, A. J. Stewart, Queen's Univ. (Canada); M. I. Miga, Vanderbilt Univ. (United States)

- 7964 0I **Image-based global registration system for bronchoscopy guidance** [7964-17]
R. Khare, W. E. Higgins, The Pennsylvania State Univ. (United States)
- 7964 0J **High-accuracy 3D image-based registration of endoscopic video to C-arm cone-beam CT for image-guided skull base surgery** [7964-18]
D. J. Mirota, A. Uneri, S. Schafer, S. Nithiananthan, Johns Hopkins Univ. (United States);
D. D. Reh, G. L. Gallia, Johns Hopkins Hospital (United States); R. H. Taylor, G. D. Hager,
J. H. Siewerdsen, Johns Hopkins Univ. (United States)
- 7964 0K **A novel hybrid model for deformable image registration in abdominal procedures** [7964-19]
X. Huang, The Hospital for Sick Children (Canada) and Univ. of Toronto (Canada);
P. S. Babyn, Royal Univ. Hospital (Canada); T. Looi, The Hospital for Sick Children (Canada);
P. C. W. Kim, The Hospital for Sick Children (Canada) and Univ. of Toronto (Canada)
- 7964 0L **Learning distance function for regression-based 4D pulmonary trunk model reconstruction estimated from sparse MRI data** [7964-20]
D. Vitanovski, Siemens Corporate Research (United States) and Siemens Corporate
Technology (Germany); A. Tsymbal, Siemens Corporate Technology (Germany); R. Ionasec,
B. Georgescu, S. K. Zhou, Siemens Corporate Research (United States); J. Hornegger,
Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); D. Comaniciu, Siemens Corporate
Research (United States)

SESSION 5 LUNG

- 7964 0M **Real-time method for bronchoscope motion measurement and tracking** [7964-21]
D. C. Cornish, W. E. Higgins, The Pennsylvania State Univ. (United States)
- 7964 0O **Surface modeling and segmentation of the 3D airway wall in MSCT** [7964-23]
M. Ortner, C. Fetita, CNRS, TELECOM/TELECOM SudParis (France); P.-Y. Brillet, Univ. Paris 13
(France); F. Prêteux, MINES ParisTech (France); P. Grenier, Univ. Paris 6 (France)
- 7964 0P **Evaluation of electromagnetically tracked transbronchial needle aspiration in a ventilated porcine lung** [7964-24]
I. Gergel, R. Tetzlaff, H.-P. Meinzer, I. Wegner, German Cancer Research Ctr. (Germany)
- 7964 0Q **On scale invariant features and sequential Monte Carlo sampling for bronchoscope tracking** [7964-25]
X. Luó, Nagoya Univ. (Japan); M. Feuerstein, Technische Univ. München (Germany);
T. Kitasaka, Aichi Institute of Technology (Japan); H. Natori, Keiwakai Nishioka Hospital
(Japan); H. Takabatake, Sapporo-Minami-Sanjo Hospital (Japan); Y. Hasegawa, K. Mori,
Nagoya Univ. (Japan)

SESSION 6 KEYNOTE AND ULTRASOUND GUIDED INTERVENTION

- 7964 0R **Section-thickness profiling for brachytherapy ultrasound guidance** [7964-26]
M. Peikari, T. K. Chen, Queen's Univ. (Canada); E. C. Burdette, Acoustic MedSystems, Inc.
(United States); G. Fichtinger, Queen's Univ. (Canada)

SESSION 7 NEURO

- 7964 OS **Momentum-based morphometric analysis with application to Parkinson's disease** [7964-27]
J. Chen, A. R. Khan, Simon Fraser Univ. (Canada); M. J. McKeown, The Univ. of British Columbia (Canada); M. F. Beg, Simon Fraser Univ. (Canada)
- 7964 OT **Potential predictors for the amount of intra-operative brain shift during deep brain stimulation surgery** [7964-28]
R. Datteri, S. Pallavaram, P. E. Konrad, J. S. Neimat, P.-F. D'Haese, B. M. Dawant, Vanderbilt Univ. (United States)
- 7964 OU **Simulation of brain tumor resection in image-guided neurosurgery** [7964-29]
X. Fan, S. Ji, K. Fontaine, Dartmouth College (United States); A. Hartov, D. Roberts, K. Paulsen, Dartmouth College (United States) and Dartmouth Hitchcock Medical Ctr. (United States)
- 7964 OV **Optimizing nonrigid registration performance between volumetric true 3D ultrasound images in image-guided neurosurgery** [7964-30]
S. Ji, X. Fan, Dartmouth College (United States); D. W. Roberts, Dartmouth Hitchcock Medical Ctr. (United States); A. Hartov, K. D. Paulsen, Dartmouth College (United States) and Dartmouth Hitchcock Medical Ctr. (United States)
- 7964 OW **Improved geometric variables for predicting disturbed flow at the normal carotid bifurcation** [7964-31]
P. B. Bijari, Univ. of Toronto (Canada); L. Antiga, Orobix Srl (Italy); D. A. Steinman, Univ. of Toronto (Canada)
- 7964 OX **Clinical study of model-based blood flow quantification on cerebrovascular data** [7964-32]
A. Groth, I. Wächter-Stehle, Philips Research Labs. (Germany); O. Brina, F. Perren, V. Mendes-Pereira, Univ. Hospital of Geneva (Switzerland); D. Rüfenacht, Swiss Neuro Institute SNI Hirlanden Clinic (Switzerland); T. Bruijns, Philips FXD-Advanced Development (Netherlands); M. Bertram, J. Weese, Philips Research Labs. (Germany)
- 7964 OY **Estimating blood flow velocity in angiographic image data** [7964-33]
C. M. Hentschke, S. Serowy, G. Janiga, G. Rose, K. D. Tönnies, Univ. of Magdeburg (Germany)

SESSION 8 CARDIAC APPLICATIONS

- 7964 OZ **Automatic detection of contrast injection on fluoroscopy and angiography for image guided trans-catheter aortic valve implantations (TAVI)** [7964-34]
R. Liao, W. You, M. Yan, Siemens Corporate Research (United States); M. John, Siemens AG (Germany)

- 7964 10 **A patient-specific visualization tool for comprehensive analysis of coronary CTA and perfusion MRI data** [7964-35]
H. A. Kirşli, Erasmus MC (Netherlands) and Leiden Univ. Medisch Ctr. (Netherlands); V. Gupta, Leiden Univ. Medisch Ctr. (Netherlands) and Delft Univ. of Technology (Netherlands); S. Kirschbaum, L. Neefjes, R. J. van Geuns, N. Mollet, Erasmus MC (Netherlands); B. P. F. Lelieveldt, Leiden Univ. Medisch Ctr. (Netherlands) and Delft Univ. of Technology (Netherlands); J. H. C. Reiber, Leiden Univ. Medisch Ctr. (Netherlands); T. van Walsum, Erasmus MC (Netherlands); W. J. Niessen, Erasmus MC (Netherlands) and Delft Univ. of Technology (Netherlands)
- 7964 11 **Incorporating a Gaussian model at the catheter tip for improved registration of preoperative surface models** [7964-36]
M. E. Rettmann, D. R. Holmes III, D. L. Packer, R. A. Robb, Mayo Clinic (United States)
- 7964 12 **Patient specific optimal catheter selection for right coronary artery** [7964-37]
S. Rahman, S. Wesarg, Technische Univ. Darmstadt (Germany); W. Völker, Universitätsklinikum Würzburg (Germany)
- 7964 13 **Data fusion for catheter tracking using Kalman filtering: applications in robot-assisted catheter insertion** [7964-38]
M. Azizian, R. Patel, The Univ. of Western Ontario (Canada) and Canadian Surgical Technologies and Advanced Robotics (Canada)

SESSION 9 ENDOSCOPY AND LAPAROSCOPY

- 7964 14 **Real-time surface reconstruction from stereo endoscopic images for intraoperative registration** [7964-39]
S. Röhl, S. Bodenstedt, S. Suwelack, Karlsruhe Institute of Technology (Germany); H. Kenngott, B. P. Mueller-Stich, Heidelberg Univ. Hospital (Germany); R. Dillmann, S. Speidel, Karlsruhe Institute of Technology (Germany)
- 7964 15 **3D surface reconstruction for laparoscopic computer-assisted interventions: comparison of state-of-the-art methods** [7964-40]
A. Groch, A. Seitel, German Cancer Research Ctr. (Germany); S. Hempel, Technische Univ. München (Germany) and Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); S. Speidel, Karlsruhe Institute of Technology (Germany); R. Engelbrecht, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); J. Penne, Technische Univ. München (Germany); K. Höller, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany) and Technische Univ. München (Germany); S. Röhl, Karlsruhe Institute of Technology (Germany); K. Yung, German Cancer Research Ctr. (Germany); S. Bodenstedt, Karlsruhe Institute of Technology (Germany); F. Pflaum, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); T. R. dos Santos, S. Mersmann, H.-P. Meinzer, German Cancer Research Ctr. (Germany); J. Hornegger, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); L. Maier-Hein, German Cancer Research Ctr. (Germany)
- 7964 16 **A real-time online video overlay navigation system for minimally invasive laparoscopic tumor resection** [7964-41]
M. Keil, M. Noll, Fraunhofer IGD (Germany)

- 7964 17 **Constructing spherical panoramas of a bladder phantom from endoscopic video using bundle adjustment** [7964-42]
T. D. Soper, J. E. Chandler, M. P. Porter, E. J. Seibel, Univ. of Washington (United States)
- 7964 18 **Comparison of two navigation system designs for flexible endoscopes using abdominal 3D ultrasound** [7964-43]
M. Kaar, R. Hoffmann, H. Bergmann, M. Figl, C. Bloch, A. Kratochwil, W. Birkfellner, Medical Univ. of Vienna (Austria); J. Hummel, Medical Univ. of Vienna (Austria) and Wilhelminenspital (Austria)
- 7964 19 **Evaluation of electronic biopsy for clinical diagnosis in virtual colonoscopy** [7964-44]
J. Marino, W. Du, M. Barish, E. Li, W. Zhu, A. Kaufman, Stony Brook Univ. (United States)

SESSION 10 ORTHOPEDIC AND CRANIAL PROCEDURES

- 7964 1A **Closed-form inverse kinematics for intra-operative mobile C-arm positioning with six degrees of freedom** [7964-45]
L. Wang, R. Zou, Technische Univ. München (Germany); S. Weidert, J. Landes, E. Euler, Ludwig-Maximilians-Univ. München (Germany); D. Burschka, N. Navab, Technische Univ. München (Germany)
- 7964 1B **Spectral-based 2D/3D x-ray to CT image rigid registration** [7964-46]
M. Freiman, O. Pele, A. Hurvitz, M. Werman, L. Joskowicz, The Hebrew Univ. of Jerusalem (Israel)
- 7964 1C **Intra-temporal facial nerve centerline segmentation for navigated temporal bone surgery** [7964-47]
E. H. J. Voormolen, M. van Stralen, P. A. Woerdeman, J. P. W. Pluim, H. J. Noordmans, L. Regli, J. W. Berkelbach van der Sprenkel, M. A. Viergeever, Univ. Medical Ctr. Utrecht (Netherlands)
- 7964 1D **Optimization of multi-image pose recovery of fluoroscope tracking (FTRAC) fiducial in an image-guided femoroplasty system** [7964-78]
W. P. Liu, Johns Hopkins Univ. (United States); M. Armand, Johns Hopkins Univ. (United States) and Johns Hopkins Bayview Medical Ctr. (United States); Y. Otake, R. H. Taylor, Johns Hopkins Univ. (United States)
- 7964 1E **Insertion of electrode array using percutaneous cochlear implantation technique: a cadaveric study** [7964-49]
R. Balachandran, J. E. Mitchell, J. Noble, D. Schurzig, G. Blachon, T. R. McRackan, R. J. Webster, B. M. Dawant, J. M. Fitzpatrick, R. F. Labadie, Vanderbilt Univ. (United States)

SESSION 11 IMAGE GUIDED THERAPY II

- 7964 1F **Single camera closed-form real-time needle trajectory tracking for ultrasound** [7964-50]
M. Najafi, R. Rohling, The Univ. of British Columbia (Canada)

- 7964 1G **Feature-based US to CT registration of the aortic root** [7964-51]
P. Lang, Robarts Research Institute (United States) and The Univ. of Western Ontario (Canada); E. C. S. Chen, Robarts Research Institute (Canada); G. M. Guiraudon, Canadian Surgical Technologies and Advanced Robotics (Canada); D. L. Jones, The Univ. of Western Ontario (Canada); D. Bainbridge, London Health Sciences Ctr. (Canada); M. W. Chu, Canadian Surgical Technologies and Advanced Robotics (Canada) and The Univ. of Western Ontario (Canada); M. Drangova, Robarts Research Institute (Canada); N. Hata, Brigham and Women's Hospital (United States); A. Jain, Philips Research (United States); T. M. Peters, Robarts Research Institute (Canada)
- 7964 1H **Improved validation platform for ultrasound-based monitoring of thermal ablation** [7964-52]
H. Peikari, A. Lasso, G. Fichtinger, Queen's Univ. (Canada)
- 7964 1I **Toward robotic needle steering in lung biopsy: a tendon-actuated approach** [7964-53]
L. B. Kratchman, M. M. Rahman, J. R. Saunders, P. J. Swaney, R. J. Webster III, Vanderbilt Univ. (United States)
- 7964 1K **Implementation of an interactive liver surgery planning system** [7964-55]
L. Wang, J. Liu, R. Yuan, S. Gu, Wuhan National Lab. for Optoelectronics (China) and Huazhong Univ. of Science and Technology (China); L. Yu, Z. Li, Y. Li, Z. Li, Huazhong Univ. of Science and Technology (China); Q. Xie, Wuhan National Lab. for Optoelectronics (China) and Huazhong Univ. of Science and Technology (China); D. Hu, Huazhong Univ. of Science and Technology (China)

Part Two

POSTER SESSION: CALIBRATION

- 7964 1L **System for robust bronchoscopic video distortion correction** [7964-56]
B. Flood, The Pennsylvania State Univ. (United States); L. Rai, Broncus Technologies, Inc. (United States); W. E. Higgins, The Pennsylvania State Univ. (United States)
- 7964 1M **Online temporal synchronization of pose and endoscopic video streams** [7964-57]
Ö. Güler, Innsbruck Medical Univ. (Austria); Z. Yaniv, Georgetown Univ. Medical Ctr. (United States); W. Freysinger, Innsbruck Medical Univ. (Austria)
- 7964 1N **Ultrasound calibration framework for the image-guided surgery toolkit (IGSTK)** [7964-58]
Z. Yaniv, Georgetown Univ. Medical Ctr. (United States); P. Foroughi, H.-J. Kang, E. Boctor, Johns Hopkins Univ. (United States)

POSTER SESSION: CARDIAC PROCEDURES

- 7964 1O **Motion compensation by registration-based catheter tracking** [7964-59]
A. Brost, A. Wimmer, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); R. Liao, Siemens Corporate Research (United States); J. Horneegger, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); N. Strobel, Siemens AG (Germany)
- 7964 1P **First steps towards initial registration for electrophysiology procedures** [7964-60]
A. Brost, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); F. Bourier, Klinik für Herzrhythmusstörungen, Krankenhaus Barmherzige Brüder (Germany); L. Yatziv, Siemens Corporate Research (United States); M. Koch, J. Horneegger, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); N. Strobel, Siemens AG (Germany); K. Kurzydum, Klinik für Herzrhythmusstörungen, Krankenhaus Barmherzige Brüder (Germany)
- 7964 1Q **3D imaging of myocardial perfusion and coronary tree morphology from a single rotational angiogram** [7964-61]
G. Lauritsch, Siemens AG (Germany); C. Rohkohl, Siemens AG (Germany) and Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); J. Horneegger, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany) and Erlangen Graduate School in Advanced Optical Technologies (Germany); A.-M. Sinha, J. Brachmann, Klinikum Coburg (Germany); J. Rieber, Ludwig-Maximilians-Univ. (Germany); H. Rittger, Klinikum Coburg (Germany)
- 7964 1R **Intensity-based hierarchical clustering in CT-scans: application to interactive segmentation in cardiology** [7964-62]
J. Hadida, C. Desrosiers, L. Duong, École de Technologie Supérieure (Canada)
- 7964 1S **4D motion animation of coronary arteries from rotational angiography** [7964-63]
W. Holub, C. Rohkohl, D. Schuldhaus, Siemens AG (Germany) and Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); M. Prümmer, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); G. Lauritsch, Siemens AG (Germany); J. Horneegger, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany) and Erlangen Graduate School in Advanced Optical Technologies (Germany)

POSTER SESSION: ENDOSCOPIC PROCEDURES

- 7964 1T **A novel bronchoscope tracking method for bronchoscopic navigation using a low cost optical mouse sensor** [7964-64]
X. Luó, Nagoya Univ. (Japan); M. Feuerstein, Technische Univ. München (Germany); T. Kitasaka, Aichi Institute of Technology (Japan); H. Natori, Keiwakai Nishioka Hospital (Japan); H. Takabatake, Sapporo-Minami-Sanjo Hospital (Japan); Y. Hasegawa, K. Mori, Nagoya Univ. (Japan)
- 7964 1U **Image-based camera motion estimation using prior probabilities** [7964-65]
D. Sargent, S. Y. Park, STI Medical Systems (United States); I. Spofford, K. Vosburgh, Brigham and Women's Hospital (United States)

- 7964 1V **Detection of inflating balloon in optical coherence tomography images of a porcine artery in a beating heart experiment** [7964-66]
H. Azarnoush, National Research Council Canada (Canada) and McGill Univ. (Canada);
S. Vergnole, M. Hewko, National Research Council Canada (Canada); B. Boulet, McGill Univ. (Canada); M. Sowa, G. Lamouche, National Research Council Canada (Canada)

POSTER SESSION: IMAGE-GUIDED THERAPY

- 7964 1W **Automatic measurement of contrast bolus distribution in carotid arteries using a C-arm angiography system to support interventional perfusion imaging** [7964-68]
A. Fieselmann, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany), Erlangen Graduate School in Advanced Optical Technologies (Germany), and Siemens AG (Germany);
A. Ganguly, Stanford Univ. (United States); D.-Z. Yu, J. Boese, Siemens AG (Germany);
J. Hornegger, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany) and Erlangen Graduate School in Advanced Optical Technologies (Germany); R. Fahrig, Stanford Univ. (United States)
- 7964 1Y **Accuracy assessment of fluoroscopy-transesophageal echocardiography registration** [7964-70]
P. Lang, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada);
P. Seslija, Robarts Research Institute (Canada); D. Bainbridge, London Health Sciences Ctr. (Canada); G. M. Guiraudon, Canadian Surgical Technologies and Advanced Robotics (Canada); D. L. Jones, The Univ. of Western Ontario (Canada); M. W. Chu, Canadian Surgical Technologies and Advanced Robotics (Canada) and The Univ. of Western Ontario (Canada); D. W. Holdsworth, T. M. Peters, Robarts Research Institute (Canada)
- 7964 1Z **A single-imager stereoscopic endoscope** [7964-71]
K. Keller, A. State, InnerOptic Technology, Inc. (United States)
- 7964 20 **Mixed variable optimization for radio frequency ablation planning** [7964-72]
A. Kapoor, M. Li, B. Wood, National Institutes of Health (United States)
- 7964 21 **Automatic fiducial localization in ultrasound images for a thermal ablation validation platform** [7964-73]
L. Bartha, A. Lasso, T. K. Chen, G. Fichtinger, Queen's Univ. (Canada)

POSTER SESSION: INTRAOPERATIVE IMAGING

- 7964 22 **Architecture of a high-performance surgical guidance system based on C-arm cone-beam CT: software platform for technical integration and clinical translation** [7964-74]
A. Uneri, S. Schafer, D. Mirota, S. Nithiananthan, Y. Otake, S. Reaungamornrat, J. Yoo, J. W. Stayman, Johns Hopkins Univ. (United States); D. Reh, G. L. Gallia, A. J. Khanna, Johns Hopkins Medical Institute (United States); G. Hager, R. H. Taylor, Johns Hopkins Univ. (United States); G. Kleinszig, Siemens Healthcare (Germany); J. H. Siewerdsen, Johns Hopkins Univ. (United States)

- 7964 23 **Adaptive bilateral filter for image denoising and its application to in-vitro time-of-flight data** [7964-75]
A. Seitel, T. R. dos Santos, S. Mersmann, German Cancer Research Ctr. (Germany);
J. Penne, PMDTechnologies GmbH (Germany); A. Groch, K. Yung, R. Tetzlaff, H.-P. Meinzer,
L. Maier-Hein, German Cancer Research Ctr. (Germany)
- 7964 24 **Development of a novel laser range scanner** [7964-76]
T. S. Pfeiffer, Vanderbilt Univ. (United States); B. Lennon, Pathfinder Therapeutics, Inc.
(United States); A. L. Simpson, M. I. Miga, Vanderbilt Univ. (United States)
- 7964 26 **Clinical implementation of intraoperative cone-beam CT in head and neck surgery** [7964-79]
M. J. Daly, Ontario Cancer Institute (Canada) and Univ. of Toronto (Canada); H. Chan,
Ontario Cancer Institute (Canada); S. Nithiananthan, Johns Hopkins Univ. (United States);
J. Qiu, Univ. of Toronto (Canada); E. Barker, G. Bachar, B. J. Dixon, J. C. Irish, Ontario Cancer
Institute (Canada) and Princess Margaret Hospital (Canada); J. H. Siewerdsen, Johns
Hopkins Univ. (United States)

POSTER SESSION: LOCALIZATION AND TRACKING TECHNOLOGIES

- 7964 27 **Validation of visual surface measurement using computed tomography** [7964-80]
A. M. VanBerlo, A. R. Campbell, R. E. Ellis, Queen's Univ. (Canada)
- 7964 28 **Alignment and calibration of high frequency ultrasound (HFUS) and optical coherence tomography (OCT) 1D transducers using a dual wedge-tri step phantom** [7964-81]
N. Afsham, K. Chan, L. Pan, S. Tang, R. N. Rohling, The Univ. of British Columbia (Canada)
- 7964 29 **3D-guided CT reconstruction using time-of-flight camera** [7964-82]
M. Ismail, Johns Hopkins Univ. (United States); K. Taguchi, J. Xu, B. M. W. Tsui, Johns Hopkins
Medical Institute (United States); E. M. Boctor, Johns Hopkins Univ. (United States) and Johns
Hopkins Medical Institute (United States)
- 7964 2A **Transorbital therapy delivery: phantom testing** [7964-83]
M.-C. Ingram, N. Atuegwu, L. Mawn, R. L. Galloway, Vanderbilt Univ. (United States)
- 7964 2B **Expansion and dissemination of a standardized accuracy and precision assessment technique** [7964-84]
D. M. Kwartowitz, Clemson Univ. (United States) and Mayo Clinic (United States); R. E. Riti,
Clemson Univ. (United States); D. R. Holmes III, Mayo Clinic (United States)
- 7964 2C **Time-of-flight camera technique for augmented reality in computer-assisted interventions** [7964-85]
S. Mersmann, M. Müller, A. Seitel, German Cancer Research Ctr. (Germany); F. Arnegger,
Univ. of Heidelberg (Germany); R. Tetzlaff, J. Dinkel, M. Baumhauer, German Cancer
Research Ctr. (Germany); B. Schmied, Univ. of Heidelberg (Germany); H.-P. Meinzer,
L. Maier-Hein, German Cancer Research Ctr. (Germany)

POSTER SESSION: MODELING

- 7964 2D **Patient-specific blood flow simulation to improve intracranial aneurysm diagnosis** [7964-86]
W. Fenz, J. Dirnberger, RISC Software GmbH (Austria)
- 7964 2E **Augmented reality needle guidance improves facet joint injection training** [7964-87]
T. Ungi, C. T. Yeo, P. U-Thainual, R. C. McGraw, G. Fichtinger, Queen's Univ. (Canada)
- 7964 2F **Effects of deflated lung's geometry simplifications on the biomechanical model of its tumor motion: a phantom study** [7964-88]
A. Sadeghi Naini, The Univ. of Western Ontario (Canada), Robarts Research Institute (Canada), and Lawson Health Research Institute (Canada); R. V. Patel, The Univ. of Western Ontario (Canada) and Lawson Health Research Institute (Canada); A. Samani, The Univ. of Western Ontario (Canada) and Robarts Research Institute (Canada)
- 7964 2G **Creation of 3D digital anthropomorphic phantoms which model actual patient non-rigid body motion as determined from MRI and position tracking studies of volunteers** [7964-89]
C. M. Connolly, A. Konik, P. K. R. Dasari, Univ. of Massachusetts Medical School (United States); P. Segars, Duke Univ. Medical School (United States); S. Zheng, K. L. Johnson, J. Dey, M. A. King, Univ. of Massachusetts Medical School (United States)
- 7964 2H **3D reconstruction of microvascular flow phantoms with hybrid imaging modalities** [7964-90]
J. Lin, K. Hsiung, R. Ritenour, J. Golzarian, Univ. of Minnesota (United States)
- 7964 2I **A biomechanical liver model for intraoperative soft tissue registration** [7964-91]
S. Suwelack, H. Talbot, S. Röhl, R. Dillmann, S. Speidel, Karlsruhe Institute of Technology (Germany)
- 7964 2J **Approach-specific multi-grid anatomical modeling for neurosurgery simulation with public-domain and open-source software** [7964-92]
M. A. Audette, Kitware, Inc. (United States); D. Rivière, NeuroSpin (France); C. Law, L. Ibanez, S. R. Aylward, J. Finet, Kitware, Inc. (United States); X. Wu, Duke Univ. (United States); M. G. Ewend, The Univ. of North Carolina at Chapel Hill (United States)
- 7964 2K **3D shape decomposition and comparison for gallbladder modeling** [7964-93]
W. Huang, J. Zhou, J. Liu, J. Zhang, T. Yang, Institute for Infocomm Research (Singapore); Y. Su, G. H. Law, Institute of High Performance Computing (Singapore); C. K. Chui, National Univ. of Singapore (Singapore); S. Chang, National Univ. Hospital (Singapore)
- 7964 2L **Virtual simulation of the postsurgical cosmetic outcome in patients with Pectus Excavatum** [7964-94]
J. L. Vilaça, Univ. of Minho (Portugal) and DIGARC, Polytechnic Institute of Cávado and Ave (Portugal); A. H. J. Moreira, P. L-Rodrigues, Univ. of Minho (Portugal); N. Rodrigues, DIGARC, Polytechnic Institute of Cávado and Ave (Portugal) and Univ. do Minho (Portugal); J. C. Fonseca, A. C. M. Pinho, J. Correia-Pinto, Univ. of Minho (Portugal)
- 7964 2M **Intensity non-standardness affects computer recognition of anatomical structures** [7964-95]
U. Bağcı, National Institutes of Health (United Kingdom); J. K. Udupa, The Univ. of Pennsylvania (United States); X. Chen, National Institutes of Health (United States)

- 7964 2N **A comprehensive validation of patient-specific CFD simulations of cerebral aneurysm flow with virtual angiography** [7964-96]
Q. Sun, Philips Research Labs. (Germany) and RWTH Aachen Univ. (Germany); A. Groth, M. Bertram, Philips Research Labs. (Germany); O. Brina, V. M. Pereira, Univ. Hospital of Geneva (Switzerland); T. Aach, RWTH Aachen Univ. (Germany)
- 7964 2O **Alternative statistical methods for bone atlas modelling** [7964-97]
S. Seshamani, G. Chintalapani, R. Taylor, Johns Hopkins Univ. (United States)

POSTER SESSION: REGISTRATION

- 7964 2P **Accuracy assessment of an automatic image-based PET/CT registration for ultrasound-guided biopsies and ablations** [7964-98]
S. Kadoury, Philips Research North America (United States); B. J. Wood, A. M. Venkatesan, National Institutes of Health (United States); S. Dalal, S. Xu, J. Kruecker, Philips Research North America (United States)
- 7964 2Q **2D-3D registration using gradient-based MI for image guided surgery systems** [7964-99]
Y. Yim, X. Chen, M. Wakid, S. Bielałowicz, J. Hahn, The George Washington Univ. (United States)
- 7964 2R **Fast intra-operative non-linear registration of 3D-CT to tracked, selected 2D-ultrasound slices** [7964-100]
J. Olesch, B. Beuthien, S. Heldmann, N. Papenberg, B. Fischer, Univ. of Lübeck (Germany) and Fraunhofer MEVIS (Germany)
- 7964 2S **Automatic C-arm pose estimation via 2D/3D hybrid registration of a radiographic fiducial** [7964-101]
E. Mout, Queen's Univ. (Canada); E. C. Burdette, Acoustic MedSystems, Inc. (United States); D. Y. Song, Johns Hopkins Hospital (United States); P. Abolmaesumi, The Univ. of British Columbia (Canada); G. Fichtinger, P. Fallavollita, Queen's Univ. (Canada)
- 7964 2T **A comparison of thin-plate splines with automatic correspondences and B-splines with uniform grids for multimodal prostate registration** [7964-102]
J. Mitra, Le2i, CNRS, Univ. de Bourgogne (France) and Univ. de Girona (Spain); R. Martí, A. Oliver, X. Lladó, Univ. de Girona (Spain); J. C. Vilanova, Clínica Girona (Spain); F. Meriaudeau, Le2i, CNRS, Univ. de Bourgogne (France)
- 7964 2U **Phantom validation for ultrasound to statistical shape model registration of human pelvis** [7964-103]
S. Ghanavati, P. Mousavi, G. Fichtinger, Queen's Univ. (Canada); P. Abolmaesumi, The Univ. of British Columbia (Canada)
- 7964 2V **3D non-rigid registration using surface and local salient features for transrectal ultrasound image-guided prostate biopsy** [7964-104]
X. Yang, H. Akbari, L. Halig, B. Fei, Emory Univ. (United States)

- 7964 2W **GPU accelerated registration of a statistical shape model of the lumbar spine to 3D ultrasound images** [7964-105]
S. Khallaghi, Queen's Univ. (Canada); P. Abolmaesumi, The Univ. of British Columbia (Canada); R. H. Gong, E. Chen, S. Gill, Queen's Univ. (Canada); J. Boisvert, National Research Council Canada (Canada); D. Pichora, D. Borschneck, Kingston General Hospital (Canada); G. Fichtinger, P. Mousavi, Queen's Univ. (Canada)
- 7964 2X **Anatomically correct deformable colon phantom** [7964-106]
J. A. Norris, M. D. Barton, B. J. Davis, J. Bieszczad, N. L. Meunier, N. W. Brown, D. B. Kynor, Creare Inc. (United States)
- 7964 2Y **Elastic image registration via rigid object motion induced deformation** [7964-107]
X. Zheng, J. K. Udupa, The Univ. of Pennsylvania (United States); B. E. Hirsch, Drexel Univ. College of Medicine (United States)
- 7964 2Z **Correspondenceless 3D-2D registration based on expectation conditional maximization (Cum Laude Poster Award)** [7964-108]
X. Kang, The Univ. of Hong Kong (Hong Kong, China); R. H. Taylor, Johns Hopkins Univ. (United States); M. Armand, Johns Hopkins Univ. (United States) and Johns Hopkins Bayview Medical Ctr. (United States); Y. Otake, Johns Hopkins Univ. (United States); W. P. Yau, P. Y. S. Cheung, Y. Hu, The Univ. of Hong Kong (Hong Kong, China)

POSTER SESSION: SEGMENTATION

- 7964 30 **OpenCL based machine learning labeling of biomedical datasets** [7964-109]
O. Amoros, S. Escalera, A. Puig, Univ. of Barcelona (Spain)
- 7964 31 **Advanced level set segmentation of the right atrium in MR** [7964-110]
S. Chen, Rensselaer Polytechnic Institute (United States); T. Kohlberger, K. J. Kirchberg, Siemens Corporate Research (United States)
- 7964 32 **Automatic 3D segmentation of ultrasound images using atlas registration and statistical texture prior (Cum Laude Poster Award)**[7964-111]
X. Yang, D. Schuster, V. Master, P. Nieh, Emory Univ. (United States); A. Fenster, Robarts Research Institute (Canada); B. Fei, Emory Univ. (United States) and Georgia Institute of Technology (United States)

POSTER SESSION: VISUALIZATION

- 7964 33 **Quantitative wound healing measurement and monitoring system based on an innovative 3D imaging system** [7964-112]
S. Yi, A. Yang, G. Yin, J. Wen, Technest Inc. (United States)
- 7964 35 **Between developable surfaces and circular cone splines: curved slices of 3D volumes** [7964-114]
M. Paluszny, Univ. Nacional de Colombia, Sede Medellín (Colombia)

- 7964 36 **A unified framework for voxel classification and triangulation** [7964-115]
J. S. H. Baxter, Univ. of Waterloo (Canada); T. M. Peters, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada); E. C. S. Chen, Robarts Research Institute (Canada)
- 7964 37 **An interactive ROI tool for DTI fiber tracking** [7964-116]
F. Weiler, H. K. Hahn, Fraunhofer MEVIS, Institute for Medical Image Computing (Germany)
- 7964 38 **SimITK: rapid ITK prototyping using the Simulink visual programming environment** [7964-117]
A. W. L. Dickinson, P. Mousavi, Queen's Univ. (Canada); D. G. Gobbi, Atamai Inc. (Canada); P. Abolmaesumi, Queen's Univ. (Canada) and The Univ. of British Columbia (Canada)
- 7964 39 **Multi-dimensional transfer functions for effective visualization of streaming ultrasound and elasticity images** [7964-118]
D. Mann, J. J. Caban, National Institutes of Health (United States); P. J. Stolka, E. M. Boctor, Johns Hopkins Univ. (United States); T. S. Yoo, National Institutes of Health (United States)
- 7964 3A **Efficient 3D rendering for web-based medical imaging software: a proof of concept** [7964-119]
D. Cantor-Rivera, R. Bartha, T. Peters, Robarts Research Institute (Canada) and The Univ. of Western Ontario (Canada)
- 7964 3B **Efficient ray casting with LF-Minmax map in CUDA** [7964-120]
J. Choi, Catholic Univ. of America (United States)
- 7964 3C **An interactive exploded view generation using block-based re-rendering** [7964-121]
D. S. Kang, B. S. Shin, Inha Univ. (Korea, Republic of)

Author Index

Conference Committee

Symposium Chairs

Maryellen L. Giger, The University of Chicago (United States)
Joseph M. Reinhardt, The University of Iowa (United States)

Conference Chairs

Kenneth H. Wong, Virginia Polytechnic Institute and State University
(United States)
David R. Holmes III, Mayo Clinic (United States)

Program Committee

Purang Abolmaesumi, The University of British Columbia (Canada)
Wolfgang Birkfellner, Medizinische Universität Wien (Austria)
Kevin R. Cleary, Georgetown University Medical Center (United States)
Alexandre X. Falcão, Universidade Estadual de Campinas (Brazil)
Baowei Fei, Emory University (United States)
Gabor Fichtinger, Queen's University (Canada)
Robert L. Galloway, Jr., Vanderbilt University (United States)
George J. Grevera, Saint Joseph's University (United States)
Steven L. Hartmann, Medtronic Navigation (United States)
David R. Haynor, University of Washington (United States)
William E. Higgins, The Pennsylvania State University (United States)
Pierre Jannin, Université de Rennes 1 (France)
Michael I. Miga, Vanderbilt University (United States)
Terry M. Peters, Robarts Research Institute (Canada)
Frank Sauer, Siemens Corporate Research (United States)
Eric J. Seibel, University of Washington (United States)
Guy Shechter, Philips Medical Systems (United States)
Jayaram K. Udupa, The University of Pennsylvania Health System
(United States)
Robert J. Webster III, Vanderbilt University (United States)
Jay B. West, Accuray, Inc. (United States)
Ivo Wolf, Deutsches Krebsforschungszentrum (Germany)
Ziv R. Yaniv, Georgetown University (United States)

Session Chairs

- 1 Image Guided Therapy I
Eric J. Seibel, University of Washington (United States)
Kevin R. Cleary, Georgetown University Medical Center (United States)

- 2 Keynote and Image Guidance in Urology
Kenneth H. Wong, Virginia Polytechnic Institute and State University
(United States)
David R. Holmes III, Mayo Clinic (United States)

- 3 Visualization and Modeling
Baowei Fei, Emory University (United States)
George J. Grevera, Saint Joseph's University (United States)

- 4 Image Segmentation and Registration
Jayaram K. Udupa, The University of Pennsylvania Health System
(United States)
Alexandre X. Falcão, Universidade Estadual de Campinas (Brazil)

- 5 Lung
Jay B. West, Accuray, Inc. (United States)
Steven L. Hartmann, Medtronic Navigation (United States)

- 6 Keynote and Ultrasound Guided Intervention
Marvin Doyley, University of Rochester (United States)
Kenneth H. Wong, Virginia Polytechnic Institute and State University
(United States)

- 7 Neuro
Guy Shechter, Philips Medical Systems (United States)
Terry M. Peters, Robarts Research Institute (Canada)

- 8 Cardiac Applications
Frank Sauer, Siemens Corporate Research (United States)
Robert J. Webster III, Vanderbilt University (United States)

- 9 Endoscopy and Laparoscopy
William E. Higgins, The Pennsylvania State University (United States)
Lena Maier-Hein, Deutsches Krebsforschungszentrum (Germany)

- 10 Orthopedic and Cranial Procedures
Purang Abolmaesumi, The University of British Columbia (Canada)
Michael I. Miga, Vanderbilt University (United States)

- 11 Image Guided Therapy II
Ziv R. Yaniv, Georgetown University (United States)
Michael I. Miga, Vanderbilt University (United States)

Introduction

Welcome to the 2011 edition of the SPIE Visualization, Image-Guided Procedures, and Modeling (VIGPM) conference proceedings. The conference continues to be a premier venue for our field, small enough to be highly collegial yet still showcasing the latest technical advances. The conference is an ideal setting for students to gain an understanding of the research community and interact with both peers and mentors. This year we received approximately 140 abstract submissions and accepted approximately 120. The number and quality of submissions has remained consistent despite many changes in the research and funding environment, which is very encouraging for our field.

Our conference is truly an interdisciplinary one, and our thematic areas are squarely at the interface of the clinical and technical worlds. Thus, we were fortunate this year to welcome Dr. S. Duke Herrell, Associate Professor of Urology and Director of Robotic Surgery at Vanderbilt University Medical Center, as our keynote speaker. Dr. Herrell provided an outstanding overview of the state of the art in minimally invasive interventions. He outlined the elements for successful collaborations between engineers and physicians and provided concrete examples of how such collaborations are changing the way that surgery is practiced. He also challenged our conference to develop new methods that would provide even greater guidance, safety, and clinical efficacy.

This year we continued the tradition of holding a combined session with the Ultrasonic Imaging, Tomography, and Therapy conference. There are numerous scientific areas where our two conferences overlap, and thus the joint session is an excellent opportunity for the two groups to learn from each other and from the keynote speaker. This year's Ultrasonics keynote was provided by Dr. Terry M. Peters, a scientist at the Robarts Research Institute (London, ON) and professor of medical imaging and medical biophysics at the University of Western Ontario. Dr. Peters' research in cardiac ultrasound has made an enormous impact on the field, and numerous students and postdocs have benefited from his guidance and mentorship. His keynote talk continued the theme that advanced guidance has led to dramatic changes in how cardiac procedures can be done, enabling safer and better therapies. New capabilities for intra-operative imaging, in conjunction with precise pre-operative imaging and instrument tracking, will continue to foster these positive changes.

We are truly grateful to all our committee members for their help in reviewing abstracts, evaluating student papers, and judging posters. We can always rely on their speedy and conscientious advice. Their steadfast dedication to the work of the committee makes our job much more pleasant.

It would be impossible to run this conference without the outstanding support of the SPIE staff members, including the office staff, management, and editors. They make our job easier, ensure that deadlines are met, and allow us to focus on the technical content.

Finally, we would like to thank all the attendees who come to give talks, present posters, and actively participate in the meeting. We look forward to seeing you next year in San Diego and for many years to come!

Kenneth H. Wong
David R. Holmes III