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EDUCATION

Johns Hopkins University – Baltimore, MD

Ph.D. Candidate, Mechanical Engineering (Expect Spring 2008)

Doctoral Thesis : Enabling Technologies for MRI Guided Interventional Procedures
(With Applications to Prostate Cancer Diagnosis and Therapy)

Advisor : Gabor Fichtinger, *Thesis Committee members* : Allison Okamura and Russell Taylor

M.S.E., Mechanical Engineering (May 2005)

Master's Thesis : Electromagnetic Tracker Calibration and Optimal Tool Design
(With Applications to ENT Surgery)

Advisor : Russell Taylor, *Industry Collaborator* : Northern Digital, Inc.

M.S.E., Electrical Engineering (May 2003)

Specialization: Control Systems, Robotics, and Digital Signal Processing

Research at Johns Hopkins: Focus on medical robotics and image-guided surgery in the Computer Integrated Surgical Systems Technology Engineering Research Center (CISST ERC) as part of the Laboratory for Computational Sensing and Robotics (LCSR). Conducted research on: pneumatically controlled robotic interventions under real-time MRI guidance, CT and MRI guided interventions using augmented reality displays (AR), surgical instruments with integrated biosensors, and electromagnetic tracker calibration and optimal tool design.

Rensselaer Polytechnic Institute – Troy, NY

B.S., Mechanical Engineering (May 2002)

B.S., Electrical Engineering (May 2002)

Specialization: Mechatronics and Automatic Control Systems.

AWARDS AND CERTIFICATIONS

- Predoctoral Prostate Cancer Training Fellowship from the Congressionally Directed Medical Research Program (CDMRP) – \$100k funding for 2 years of doctoral research (2007)
- Johns Hopkins Student Employee of the Year Finalist (2007)
- Scientific Exhibition Award, Cum Laude for "Image Overlay for MR-Guided Joint Arthrography" at Sixth Interventional MRI Symposium (2006)
- FE/EIT Certificate - Professional Engineer certification exam (2004)
- Ethicon College Scholarship for Academic Excellence (1998 – 2002)
- New York State Emergency Medical Technician - EMT-B (1999 – present)
- Science and Technology Award, Watchung Hills Regional HS (1998)
- Eagle Scout, Troop 41, Boy Scouts of America (1997)

PROFESSIONAL EXPERIENCE

2002 – present: CISST ERC – Johns Hopkins University – Baltimore, MD

Graduate Student Researcher. Medical robotics and computer assisted interventions with the focus of my doctoral work on MRI-guided percutaneous therapy. Developed systems include servo-pneumatic robotic needle placement robot system for prostate cancer diagnosis and therapy and augmented reality (AR) displays for guiding joint arthrography and spinal pain management needle insertions.

Lab Manager and Researcher for Computer Integrated Surgical Systems Technology Engineer Research Center. Managed lab operations, meetings, equipment management, and assisted in developing computer assisted and robotic surgical devices including: “smart” ischemia and force sensing surgical instruments, augmented reality CT and MR guided interventions, robotic steady hand neurosurgery systems, and navigation and guidance.

1999 – 2002: Bihler of America – North Branch, NJ

Summer Intern (four summers) / mechanical and electrical engineer at a company specializing in fabricating automated manufacturing equipment. Implemented networked data acquisition and statistical process control systems, designed mechanical and electrical systems for industrial automation machinery, and performed troubleshooting and repair of production machinery electrical systems.

2001 – 2002: Rensselaer Polytechnic Institute – Troy, NY

Undergraduate Research. Independent research in automation of biotech assay and eye simulator for eye tracking research. Course design of “smart” sensing surgical drill for spine surgery.

TEACHING AND MENTORING EXPERIENCE

Teaching

- **Teaching Assistant for Advanced Manufacturing Engineering.** *Johns Hopkins University – Fall 2007.* Presented lectures on manufacturing techniques and how they apply to engineering design. Trained students in lab on operating machining equipment and modeling machine interactions.
- **Teaching Assistant for Robot Sensors and Actuators.** *Johns Hopkins University – Fall 2004.* Led laboratory sessions involving modeling and control of robotic components (motors, encoders, optical sensors, embedded control, and microprocessor programming) and graded assignments.
- **Teaching Assistant for Introduction to Computer Integrated Surgery.** *Johns Hopkins University – Summers 2005 and 2006.* Assisted with running the course and labs for two summers.
- **Teaching Assistant for Engineering Graphics and CAD.** *Rensselaer Polytechnic Institute (2001-2002).* Led instructional sessions in ProEngineer and SolidWorks for design, component optimization, and documentation (four semesters).

Mentoring of Graduate and Undergraduate Students

Course Projects

Advanced Computer Integrated Surgery

Safiullah Shareef – Sensing surgical instruments software interface (Spring 2006)

Anand Sharma and Wilfred Wong – Image Overlay validation with fluoroscopy (Spring 2006)

Katherin Peperzak – Electromagnetic (EM) tracker calibration (Fall 2004 – Spring 2005)

Peter Choe and Ajin Tae – Aurora EM tracker sensor design and calibration (Spring 2005)

Sunipa Saha – Ischemia and force sensing surgical retractor, 2 publications (Spring 2005)

Jennifer Horvat and John Yu – Sensing surgical retractor tool development (Spring 2005)

Tope Akinbiyi – Instrumentation of robotic surgical instruments, 2 publications (Spring 2004)

Hana Chang – Tissue oxygenation sensing retractor electronics (Spring 2004)

Mentoring of Undergraduates

Mentoring for NSF Research Experience for Undergrads (REU) Program

Eva Dyer – Image Overlay validation testbed with Aurora EM tracker, 2 publications (Summer 2006)

Tricia Gibo – Sensing surgical instrument signal processing and calibration (Summer 2006)

Dan Schlattman – MRI Image Overlay display hardware design, 1 publication (Summer 2005)

Jennifer Kuo – Biosensor custom hardware design, 1 publication (Summer 2004)

Mentoring for Howard Hughes Program

Kaloyan Kanev – Sensing surgical instrument software interface, 1 publication (Fall 2004 – Spring 2005)

Mentoring of High School Students

Christina Wamsley – Image Overlay fluoroscopic validation, 2 publications (Summer 2005, Winter 2006)

Ashley Veatch – Force sensing surgical instrument design and calibration (Fall 2005 – Fall 2006)

FIRST Robotics Competition at Woodlawn High School (Spring 2006)

Middle School Workshop Leader

Summer Robotics Camp at Woodlawn Middle School (Summer 2005)

Invited presentation at middle school career fair (2006, 2007)

GRANTS

1. NIH/NCI R01: “Image Overlay for MRI-Guided Needle Insertions.” John Carrino(PI) and Gabor Fichtinger. I contributed significantly and organized much of this proposal. (7/2007 – 6/2011)
2. NIH/NCI R01: “Enabling technology for MRI-guided prostate interventions.” Clare Tempany (PI), Gabor Fichtinger and Cliff Burdette. I performed preliminary work and wrote a section of this proposal. (7/2006 – 6/2011)

PROFESSIONAL ACTIVITIES

Memberships

Institute of Electrical and Electronics Engineers (IEEE)

American Society of Mechanical Engineers (ASME)

Washington Computer Aided Surgery Society (WashCAS)

Computer Integrated Surgery Student Research Society (CISSRS)

Medical Image Computing and Computer-Assisted Intervention Society (MICCAI)

Technical Reviews

IEEE/ASME Transaction on Mechatronics

IEEE International Conference on Robotics and Automation (ICRA)

International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)

OTHER ACTIVITIES

2005 – *present*: Highfield House Condominium – Baltimore, MD

Chair of Physical Plant Committee – Responsible for managing \$200k budget,

Member Board of Directors

2000 – 2005: Warren Township Volunteer Rescue Squad – Warren, NJ

1998 – 2002: RPI Ambulance Volunteer Rescue Squad – Troy, NY

1998 – 2002: Delta Tau Delta Fraternity, Upsilon Chapter – Troy, NY.

House Manager, Director of Academic Affairs, and Philanthropy Chair

PUBLICATIONS

Refereed Journal Publications

3. **Fischer GS**, Iordachita I, Csoma C, Tokuda J, DiMaio SP, Tempany CM, Hata N, Fichtinger G, MRI-Compatible Pneumatic Robot for Transperineal Prostate Needle Placement, IEEE / ASME Transactions on Mechatronics – Focused section on MRI Compatible Mechatronic Systems, June 2008 (In press)
4. **Fischer GS**, Deguet A, Csoma C, Taylor RH, Fayad LM, Carrino JA, SJ Zinreich, Fichtinger G, MRI Image Overlay: Application to Arthrography Needle Insertion, Journal of Computer Assisted Surgery - JCAS, Vol 12, No 1, pp 2-14, Taylor & Francis, January 2007
5. Fichtinger G, Deguet A, Masamune K, **Fischer GS**, Balogh E, Mathieu H, Taylor RH, SJ Zinreich, Fayad LM, Image Overlay Guidance for Needle Insertion in CT Scanner, IEEE Transactions on Biomedical Engineering, Vol 52, No 8, pp 1415-1424, IEEE, August 2005
6. Fichtinger G, Deguet A, **Fischer GS**, Balogh E, Masamune K, Taylor RH, Fayad LM, SJ Zinreich, CT Image Overlay for Percutaneous Needle Insertions, Journal of Computer Assisted Surgery - JCAS, Vol 10, No 4, pp 241-255, Taylor & Francis, July 2005

Refereed Conference Proceedings

1. **Fischer GS**, Iordachita I, Csoma C, Tokuda J, Mewes PW, Tempany CM, Hata N, Fichtinger G, Pneumatically Operated MRI-Compatible Needle Placement Robot for Prostate Interventions, International Conference on Robotics and Automation - ICRA 2008, Pasadena, CA, May 2008 (accepted)
2. Mewes PW, Tokuda J, DiMaio SP, **Fischer GS**, Csoma C, Gobbi DG, Tempany CM, Fichtinger G, Hata N, An Integrated MRI and Robot Control Software for an MRI-compatible Robot in Prostate Intervention, International Conference on Robotics and Automation - ICRA 2008, Pasadena, CA, May 2008 (accepted)
3. **Fischer GS**, Iordachita I, DiMaio SP, Fichtinger G, Development of a Robotic Assistant for Needle-Based Transperineal Prostate Interventions in MRI, 10th International Conference on Medical Image Computing and Computer-Assisted Intervention - MICCAI 2007, Brisbane, Australia, Lecture Notes on Computer Science, Vol 4791, pp 425-433, Springer, November 2007
4. DiMaio S, Samsel E, **Fischer GS**, Iordachita I, Fichtinger G, Jolesz F, Tempany C, Dynamic MRI Scan Plane Control for Passive Tracking of Instruments and Devices, 10th International Conference on Medical Image Computing and Computer-Assisted Intervention - MICCAI 2007, Brisbane, Australia, Lecture Notes on Computer Science, Vol 4792, pp 50-58, Springer, November 2007
5. **Fischer GS**, Iordachita I, DiMaio SP, Fichtinger G, Design of a Robot for Transperineal Prostate Needle Placement in an MRI Scanner, IEEE International Conference on Mechatronics - ICM 2006, Budapest, Hungary, July 2006
6. **Fischer GS**, Deguet A, Csoma C, Taylor RH, Fayad L, Zinreich SJ, and Fichtinger G, Musculoskeletal Needle Placement with MRI Image Overlay Guidance, International Society for Computer Assisted Orthopaedic Surgery 6th Annual Conference - CAOS 2006, Montreal, Canada, pp 158-160, June 2006
7. **Fischer GS**, Wamsley C, Zinreich SJ, and Fichtinger G, Laser-Assisted MRI-Guided Needle Insertion and Comparison of Techniques, International Society for Computer Assisted Orthopaedic Surgery 6th Annual Conference - CAOS 2006, Montreal, Canada, pp 161-163, June 2006

8. DiMaio SP, **Fischer GS**, Haker SJ, Hata N, Iordachita I, Tempany CM, Fichtinger G, System for MRI-guided Prostate Interventions, IEEE International Conference on Biomedical Robotics and Biomechatronics - BioRob 2006, Pisa, Italy, February 2006
9. **Fischer GS**, Akinbiyi T, Saha S, Zand J, Talamini M, Marohn M, Taylor RH, Ischemia and Force Sensing Surgical Instruments for Augmenting Available Surgeon Information, IEEE International Conference on Biomedical Robotics and Biomechatronics - BioRob 2006, Pisa, Italy, February 2006
10. **Fischer GS**, Taylor RH, Electromagnetic Tracker Measurement Error Simulation and Tool Design, Eighth International Conference on Medical Image Computing and Computer-Assisted Intervention - MICCAI 2005, Palm Springs, California, Lecture Notes on Computer Science, Vol 3750, pp 73-80, Springer, October 2005
11. **Fischer GS**, Zand JM, Talamini MA, Marohn M, Akinbiyi T, Kanev K, Kuo J, Kazanzides P, Taylor RH, Intra-operative Ischemia Sensing Surgical Instruments, International Conference on Complex Medical Engineering - CME 2005, Takamatsu, Japan, May 2005
12. Fichtinger G, Deguet A, Masamune K, **Fischer GS**, Balogh E, Mathieu H, Taylor RH, Fayad LM, SJ Zinreich, Needle Insertion in CT Scanner with Image Overlay - Cadaver Studies, Seventh International Conference on Medical Image Computing and Computer-Assisted Intervention - MICCAI 2004, St Malo, France, Lecture Notes on Computer Science, Vol 3217, pp 795-783, Springer, 2004
13. Boctor E, **Fischer GS**, Choti M, Fichtinger G, Taylor RH, A Dual-Armed Robotic System for Intraoperative Ultrasound Guided Hepatic Ablative Therapy, International Conference on Robotics and Automation - ICRA 2004, New Orleans, LA, pp 2517-2522, IEEE, April 2004
14. Prasad S, Kitagawa M, **Fischer GS**, Zand JM, Talamini MA, Taylor RH, Okamura A, A Modular 2-DOF Force-Sensing Instrument For Laparoscopic Surgery, Sixth International Conference on Medical Image Computing and Computer-Assisted Intervention - MICCAI 2003, Montreal, Canada, Lecture Notes on Computer Science, Vol 2878, pp 279-286, Springer, 2003

Conference Abstracts and Non Peer-Reviewed Papers

1. **Fischer GS**, Weiss CR, Dyer E, Csoma C, Deguet A, Carrino JA, Fichtinger G, Evaluation of MR Image Overlay for Spinal Interventions, International Society for Magnetic Resonance in Medicine 15th Scientific Meeting - ISMRM 2006, Berlin, Germany, May 2007
2. **Fischer GS**, Dyer E, Csoma C, Deguet A, Fichtinger G, Validation System of MRI Image Overlay and Other Insertion Techniques, Studies in Health Technology and Informatics - Medicine Meets Virtual Reality 15: In vivo, In vitro, In silico: Designing the Next in Medicine, Vol 125, pp 130-135, February 2007
3. **Fischer GS**, DiMaio SP, Iordachita I, Fichtinger G, Robotic Assistant for MR-guided Prostate Biopsy, 6th Interventional MRI Symposium, Leipzig, Germany, September 2006
4. **Fischer GS**, Deguet A, Csoma C, Taylor RH, Fayad LM, Carrino JA, Zinreich SJ, Fichtinger G, Image Overlay for MR-Guided Joint Arthrography, 6th Interventional MRI Symposium, Leipzig, Germany, pp 240-242, September 2006
5. **Fischer GS**, Deguet A, Csoma C, Taylor RH, Fayad L, Zinreich SJ, and Fichtinger G, MRI Image Overlay: Joint Arthrography Porcine Trials, International Society for Magnetic Resonance in Medicine 14th Scientific Meeting - ISMRM 2006, Seattle, Washington, p 1735, May 2006
6. **Fischer GS**, Wamsley C, Zinreich SJ, and Fichtinger G, MRI Guided Needle Insertion - Comparison of Four Techniques, Society for Interventional Radiology 31st Annual Scientific Meeting - SIR 2006, Toronto, Canada, March 2006

7. **Fischer GS**, Deguet A, Schlattman D, Taylor RH, Fayad L, Zinreich SJ, Fichtinger G, MRI Image Overlay: Applications to Arthrography Needle Insertion, Studies in health technology and informatics - Medicine Meets Virtual Reality 14: Accelerating Change in Healthcare: Next Medical Toolkit, Vol 119, pp 150-155, February 2006
8. **Fischer GS**, Saha S, Horwat J, Yu J, Zand J, Marohn M, Talamini MA, Taylor RH, An Intra-Operative System for Relating Ischemic Damage to Retraction Forces, Annual fall meeting of the Biomedical Engineering Society - BMES 2005, Baltimore, MD, September 2005
9. Zand JM, **Fischer GS**, Hanly E, Shih S, Marohn M, Taylor RH, Talamini MA, Ischemia Sensing Surgical Instruments, Annual congress of the Society of American Gastrointestinal Endoscopic Surgeons - SAGES 2005, Ft. Lauderdale, FL, April 2005
10. DeOliviera M, Deguet A, **Fischer GS**, Balogh E, Taylor RH, Fayad LM, Zinreich SJ, Fichtinger G, Image Overlay for CT-Guided Hepatic Needle Insertions - Cadaver Studies, Congress of the Society of American Gastrointestinal Endoscopic Surgeons - SAGES 2005, Ft. Lauderdale, FL, April 2005

INVITED TALKS AND PODIUM PRESENTATIONS

1. Enabling Technologies for MRI Guided Interventional procedures, Brigham and Women's Hospital - Journal Club, Boston, MA, September, 2007
2. Validation System of MRI Image Overlay and Other Insertion Techniques, Medicine Meets Virtual Reality 15 – MMVR 2006, Long Beach, CA, February 2007
3. MRI Guided Needle Insertion - Comparison of Four Techniques, Society for Interventional Radiology 31st Annual Scientific Meeting - SIR 2006, Toronto, Canada, March 2006
4. MRI Guided Percutaneous Interventions, CISST ERC Seminar Series, February 2006
5. System for MRI Guided Prostate Interventions, IEEE International Conference on Biomedical Robotics and Biomechatronics - BioRob 2006, Pisa, Italy, February 2006
6. MRI Image Overlay: Applications to Arthrography Needle Insertion, Medicine Meets Virtual Reality 14, Long Beach, CA, February 2006
7. Ischemia and Force Sensing Surgical Instruments for Augmenting Available Surgeon Information, IEEE International Conference on Biomedical Robotics and Biomechatronics - BioRob 2006, Pisa, Italy, February 2006
8. Intra-operative Ischemia Sensing Surgical Instruments, International Conference on Complex Medical Engineering - CME 2005, Takamatsu, Japan, May 2005
9. A Dual-Armed Robotic System for Intraoperative Ultrasound Guided Hepatic Ablative Therapy, International Conference on Robotics and Automation - ICRA 2004, New Orleans, LA, April 2004

PATENTS AND PATENT APPLICATIONS

1. Zand JM, **Fischer GS**, *Surgical Instruments with Sensors for Detecting Tissue Properties, and Systems Using Such Instruments* - Sensing surgical instruments capable of measuring tissue status including oxygenation levels in real time during surgery (PCT application filed April 2006, National Phase October 2007).
2. **Fischer GS**, Fichtinger G, Iordachita I, DiMaio SP, *MRI Compatible Robotic Manipulator for Image-Guided Transperineal Prostate Brachytherapy* - Design of robotic system for needle placement under MR image guidance (Provisional patent filed June 2006).
3. Carl A, Adams J, Craig K, Lavery D, **Fischer GS**, Anthony S, Hurst J, Modi A, Digiulio, *Methods and Systems for Controlling the Operation of a Tool* - Drill capable of sensing material properties and bit location based on vibration analysis (US Patent application filed April 2004).