Curriculum Vitae

GREGORY S. FISCHER, PhD

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BACKGROUND

EDUCATION

Johns Hopkins University – Baltimore, MD

Ph.D., Mechanical Engineering (July 2008)
Doctoral Dissertation: 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

MSE, Mechanical Engineering (May 2005)
Master's Thesis: Electromagnetic Tracker Calibration and Optimal Tool Design – With Applications to ENT Surgery
Advisor: Russell Taylor
Thesis Committee: *Kevin Cleary, Industry Collaborator*: Northern Digital, Inc.

MSE, Electrical Engineering (May 2004)
Advisor: Jerry Prince

Rensselaer Polytechnic Institute (RPI) – Troy, NY

BS, Mechanical Engineering (May 2002)

BS, Electrical Engineering (May 2002)

PROFESSIONAL EXPERIENCE

2008 – present: Worcester Polytechnic Institute – Worcester, MA
Assistant Professor Mechanical Engineering, Robotics Engineering and Biomedical Engineering, Director of WPI Automation and Interventional Medicine (AIM) Robotics Laboratory
Research Interests: Medical robotics and computer integrated surgery with a specific interest in developing technologies and systems for MRI guided surgical interventions.

2006 – present: Surgisense Corporation – Washington, DC

Co-President & CTO: Co-founder of start-up medical device company focused on developing "smart" sensing surgical instruments for guiding surgical procedures.

2002 – 2008: ERC CISST – 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. Lab Manager and Researcher for Computer Integrated Surgical Systems Technology Engineer Research Center

2005 – 2008: Highfield House Condominium – Baltimore, MD

Chair of Physical Plant Committee, Member of the Board of Directors.

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

Emergency medical technician (EMT) for volunteer rescue squad.

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

Summer Intern (four summers) / mechanical and electrical engineer working on 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 Assistant for CAD course with instruction in Solidworks and ProEngineer for four semesters.

TEACHING AND ADVISING

TEACHING EXPERIENCE

Undergraduate

RBE 3001 – Unified Robotics III (C-Term 2009, C-Term 2010, A-Term 2010, C-Term 2011)

Junior level, third course in the 4-course Unified Robotics sequence with a focus on embedded systems, analog & digital circuits and robotic manipulator modeling and control.

RBE 3002 – Unified Robotics IV (D-Term 2009, D-Term 2010)

Junior level, final course in the 4-course Unified Robotics sequence with a focus on system architecture, distributed systems, mapping, navigation, and mobile robot kinematics and dynamics.

Graduate

ME 501 / RBE 501 – Robot Dynamics (Spring 2010, Spring 2011)

Graduate course focused on teaching fundamentals of robotics including advanced modeling and control robotic manipulators including representations in space, forward and inverses kinematics, velocity and force control, manipulator dynamics, and robot controller design.

TEACHING INNOVATIONS AT WPI

New Courses Developed

ME 501 / RBE 501 – Robot Dynamics (Spring 2010)

Implemented a new graduate course in advanced robotics. The focus of the course is primarily on kinematics, dynamics and control of robotic manipulators with an introduction into how these techniques also apply to mobile robots. The course is interactive with a combination of lectures, team projects, and student presentations with class discussion of important journal manuscripts.

RBE 3001 – Unified Robotics III (C-Term 2009)

Co-developed and taught a new junior-level course focused on teaching aspects of robotic manipulation including serial manipulator kinematics, dynamics, motor control, sensing, and embedded programming. Created curriculum, instructional materials, and custom laboratory hardware including a low-cost educational robot arm (EduArm) and corresponding drive circuitry. The course was well received, despite the extended hours in the lab, with many students feeling that they learned more in this course than any other they had taken.

RBE 3002 – Unified Robotics IV (D-Term 2009)

Co-developed and taught a new junior-level course focused on teaching aspects of mobile robots including mobile robot kinematics, dynamics, sensor fusion, environment mapping, and path planning. Created curriculum, course materials, and custom lab hardware including a low-cost mobile robot platform (EduBot) that integrates with the RBE 3001 arm hardware.

Significant Course Improvements

RBE Undergraduate Curriculum

Involved in regular meetings with the instructors of RBE1001 through RBE3002 to improve the content and delivery of material in the robotics sequence to better prepare the students. We have made changes to the focus of the lectures, the order in which material is presented and the laboratory hardware used.

RBE 3001 – Unified Robotics III

Adapted the course from the preceding offerings based on our observations and student feedback. The lectures were reorganized with time spent on improving the delivery of material. Labs were modified, and a second generation of the custom lab hardware for the robotic arm was developed. In Fall 2010, I developed all new education electronics hardware for the RBE 3001 course and co-developed a new set of robotic arms for the students. As the course is improved, course evaluations have improved through the course offerings with Spring 2011 being the best to date.

RBE 3002 – Unified Robotics IV

Adapted the course from the first offering based on our observations and student feedback. We have developed a new software framework for the students to use so that they can now better focus on the theoretical understanding of the material including navigation, planning, mapping and control without getting bogged down in the implementation. The labs have

been modified and a second and next generation of the custom lab hardware for the mobile robot and for the control circuitry has been developed.

COURSES TAUGHT AT WPI

- **RBE 3001**, Unified Robotics III (C-term 2009)
  - Two sections, 34 students
  - Overall Course rating: 4.4/5, Instructors: 4.1/5, Amount Learned: 4.6/5

- **RBE 3002**, Unified Robotics IV (D-term 2009)
  - Two sections, 32 students
  - Overall Course rating: 3.6/5, Instructors: 4.1/5, Amount Learned: 4.1/5

- **RBE 3001**, Unified Robotics III (C-term 2010)
  - Two sections, 31 students
  - Overall Course rating: 3.0/5, Instructors: 3.0/5, Amount Learned: 3.9/5

- **RBE 3002**, Unified Robotics IV (D-term 2010)
  - Two sections, 32 students registered
  - Overall Course rating: 2.7/5, Instructors: 2.9/5, Amount Learned: 3.4/5

- **ME 501/RBE 501**, Robot Dynamics (Spring 2010)
  - 13 students
  - Overall Course rating: 4.6/5, Instructors: 4.4/5, Amount Learned: 4.2/5

- **RBE 3001**, Unified Robotics III (A-term 2010)
  - Two sections, 23 students
  - Overall Course rating: 4.0/5, Instructors: 3.7/5, Amount Learned: 4.7/5

- **RBE 3001**, Unified Robotics III (C-term 2011)
  - Two sections, 29 students
  - Overall Course rating: 4.5/5, Instructors: 4.2/5, Amount Learned: 4.5/5

- **ME 501/RBE 501**, Robot Dynamics (Spring 2011)
  - 16 students
  - In progress

UNDERGRADUATE RESEARCH AND PROJECTS

Major Qualifying Projects (MQPs) Advised as Primary Advisor

Medical Robot Teleoperation and Haptic Feedback

(Fall 2009 – Spring 2010)

Students: Hubbard Hoyt (ME) and Andrew Marchese (BME & RBE)

Received Provost's Award for Best RBE MQP 2010

Hybrid Pneumatic-Hydraulic MRI-compatible Actuator Design

(Fall 2009 – Spring 2010)

Students: Michael DiBlasi (ME & RBE), Andrew Nehring (ME & RBE) and Andrew Smith (ECE)

Stand Alone Surgical Haptic Arm for Telesurgery Manipulator (SASHA)

(Fall 2010 – Spring 2011)

Students: Daniel Jones (ECE) and Andrew Lewis (RBE)

Robot for Early Autism Interventions

(Fall 2010 – Spring 2011)

Student: Elizabeth Alexander (ME/RBE)

Hierarchal Swarm Robotics

(Fall 2010 – Spring 2011)

Students: Nicholas Alunni (RBE), Richard Goloski (RBE), Andrew Haggerty (RBE) and Eric Jones (RBE)

Received Best Assigned Project Award at New England Undergraduate Computing Symposium

Stent Design and Delivery Device for Percutaneous Valve Replacement

(Spring 2011)

Students: Hamresh Lutchman (ME)

Sponsored by: Abiomed, Inc.

Robot for MRI Environment: Pneumatic Stepping Motor Design

(Spring 2011 – Fall 2011) *[In Progress]*

Students: Gregory Overton (RBE), Grant McDonald (RBE) and Kellen Pastore (RBE)

Rehabilitative Robotic Glove

(Fall 2011 – Spring 2012) *[In Progress]*

Students: Michael Delph (RBE), Philip Gauthier (ME) and Carlos Martinez Luna (BME), Sarah Fischer (RBE & ECE)

Interactive Qualifying Projects (IQPs) Advised as Primary Advisor

Perceptions of Robots in Surgery (Spring 2009 – Fall 2009)

Students: Andrew Marchese (BME & RBE), Elan Pelletier (RBE), Courney Gilbert (BioChem) and Demetrios Kechris (RBE)

Perceptions of Robots in Surgery: Data Analysis (Part II) (Fall 2010 – Spring 2011)

Students: Joel Sutherland (RBE)

GRADUATE RESEARCH AND ADVISING

Graduate Research Advising

Gregory Cole – RBE PhD Student (Completed ME MS), Primary advisor

Research focus: MRI-compatible robot control systems, piezoelectric motor control, surgical robot mechanism design, robotic system for MR image guided neurosurgery.

Awards: Received first place in WPI Graduate Research Achievement Day (GRAD) 2010, Received first place in Innovation Presentation Competition 2010, Awarded WPI graduate fellowship 2011-2012, NSF Grassroots conference travel award.

Hao Su – ME PhD Student, Primary advisor

Research focus: MRI-image guided prostate cancer interventions, needle and tissue interaction modeling and steering, real-time image-based control, fiber optic force sensing, haptic feedback in MRI.

Awards: NSF conference travel award.

Weijian Shang – ME PhD Student, Primary advisor

Research focus: Robotic system registration and calibration, and pneumatically controlled systems for rehabilitation.

Yi Wang – ME MS Student, Primary advisor (Graduated Fall 2010)

Research focus: MRI-compatible actuators, high precision pneumatic actuator modeling and control.

Kevin Harrington – RBE MS Student, Research advisor

Research focus: Modular robot controller software architecture

Alex Camilo – RBE MS Student (non-matriculating), Research advisor

Research focus: MRI-compatible electronics design, piezoelectric motor control, robot controller electronics.

Xiaoan Yan – ME MS Student, Research advisor

Research focus: Robot mechanism design and optimization, image processing for human robot interaction.

Yuanfang Gui – ECE MS Student, Research advisor

Research focus: FPGA-based hardware robot control, ultra high speed and fidelity haptic systems.

Graduate Qualifying Projects Advised (GQPs)

Market Analysis & Strategy for MRI-Guided Neurosusrgery (Fall 2009 – Spring 2010)

Co-advised a group of advanced MBA students with Mac Banks & Mike Manning in their final project which is focused on commercialization of the MRI-compatible Neurosurgery Robot that we are developing in the AIM Lab.

Students: Tom LaMarche (MGMT), Angelo Chandler (MGMT), Amanda Kosi (MGMT) and Gregory Halloran (MGMT)

SCHOLARSHIP

PUBLICATIONS

Refereed Journal Publications

1. Weiss CR, Marker DR, Fischer GS, Fichtinger G, Machado A, Carrino, JA, *Augmented reality visualization using image-overlay for MR-guided interventions: system description, feasibility, and initial evaluation in a spine phantom*, American Journal of Roentgenology, March 2011. (In press)
2. Padir T, Gennert MA, Fischer GS, Michalson WR, Cobb E, *Implementation of an Undergraduate Robotics Engineering Curriculum*, ASEE Computers in Education Journal - Special issue on Robotics Education, Vol 1, No 3, pp 92-101, ASEE, Sept. 2010. *[Co-authored w/ WPI Other Faculty]*
3. Tokuda J, Fischer GS, DiMaio SP, Gobbi DG, Csoma C, Mewes PW, Fichtinger G, Tempany CM, Hata N, *Integrated Navigation and Control Software System for MRI-guided Robotic Prostate Interventions*, Computerized Medical Imaging and Graphics, Vol 34, No 1, pp 3-8, Jan 2010.
4. Vikal S, U-Thainual P, Carrino JA, Fischer GS, Iordachita I, Fichtinger G, *Perk Station - Percutaneous Surgery Training and Performance Measurement Platform*, Computerized Medical Imaging and Graphics, Vol 34, No 1, pp 19-32, Jan 2010.
5. Tokuda J, Fischer GS, Papademetris X, Yaniv Z, Ibanez L, Cheng P, Liu H, Blevins J, Arata J, Golby A, Kapur T, Pieper S, Burdette E, Fichtinger G, Tempany C, Hata N, *OpenIGTLink: An Open Network Protocol for Image-Guided Therapy Environment*, The International Journal of Medical Robotics and Computer Assisted Surgery, 2009 Vol 5, No 4, pp 423-34, Dec 2009.
6. 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, Vol 13, No 3, pp 295-305, IEEE, June 2008.
7. 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, Jan 2007.

8. 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, Aug 2005.
9. 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.

Book Chapters

1. Su H, Cole GA, Fischer GS, *High-field MRI-Compatible Needle Placement Robots for Prostate Interventions: Pneumatic and Piezoelectric Approaches*, To appear in: Advances in Robotics and Virtual Reality, Published by Springer in the Intelligent Systems Reference Library Series. (In Press) *[Co-authored w/ WPI Students]*
2. Cole G, Harrington K, Su H, Camilo A, Pilitsis J, Fischer GS*, Closed-Loop Actuated Surgical System Utilizing Real-Time In-Situ MRI Guidance*, To appear in: Experimental Robotics, Published by Springer in Tracts in Advanced Robotics. (In Press) *[Co-authored w/ WPI Students]*

Refereed Conference Proceedings

1. Su H, Zervas M, Furlong C, Fischer GS, *A Miniature MRI-Compatible Fiber-optic Force Sensor Utilizing Fabry-Perot Interferometer,* Society for Experimental Mechanics (SEM) Annual Conference & Exposition on Experimental and Applied Mechanics, Uncasville, CT, June 2011. [Co-authored w/ WPI Students & Other Faculty*]*
2. Su H, Zervas M, Cole G, Furlong C, Fischer GS, *Real-time MRI-Guided Needle Placement Robot with Integrated Fiber Optic Force Sensing*, IEEE International Conference on Robotics and Automation - ICRA, Shanghai, China, May 2011. *[Co-authored w/ WPI Students & Other Faculty]*
3. Su H, Camilo A, Cole GA, Tempany CM, Hata N, Fischer GS, *High-Field MRI Compatible Steerable Needle Driver Robot for Percutaneous Prostate Intervention*, Proceedings of MMVR18 (Medicine Meets Virtual Reality), Newport Beach, California, USA, February, 2011. *[Co-authored w/ WPI Students]*
4. Cole G, Harrington K, Su H, Camilo A, Pilitsis J, Fischer GS, *Closed-Loop Actuated Surgical System Utilizing Real-Time In-Situ MRI Guidance*, 12th International Symposium on Experimental Robotics - ISER 2010, New Delhi, India, Dec 2010. *[Co-authored w/ WPI Students]*
5. Wang Y, Su H, Harrington K, Fischer GS, *Sliding mode Control of Piezoelectric Valve Regulated Pneumatic Actuator for MRI-Compatible Robotic Intervention*, ASME Dynamic Systems and Control Conference - DSCC 2010, Cambridge, Massachusetts, Sept 2010. *[Co-authored w/ WPI Students]*
6. Dickstein-Fischer L, Su H, Harrington K, Fu Q, Lu W, Fischer GS, *Cable-Driven Elastic Parallel Humanoid Head with Face Tracking for Autism Spectrum Disorder*

Interventions, Proceedings of the 32nd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Buenos Aires, Argentina, Sept 2010. *[Co-authored w/ WPI Students]*

7. Beach R, Gennert M, Michalson WR, Van de Ven, J, Padir T, Tryggvason G, Fischer GS, *Robotics Innovations Competition and Conference (RICC): Building Community between Academia and Industry through a University-Level Student Competition*, American Society for Engineering Education - ASEE 2010, Louisville, KY, June 2010. *[Co-authored w/ WPI Other Faculty]*
8. Song S, Cho NB, Fischer GS, Hata N, Tempany C, Fichtinger G, Iordachita I, *Development of a Pneumatic Robot for MRI-guided Transperineal Prostate Biopsy and Brachytherapy: New Approaches*, International Conference on Robotics and Automation - ICRA 2010, Anchorage, Alaska, May 2010.
9. Fischer GS, Michalson WR, Padir T, Pollice G, *Development of a Laboratory Kit for Robotics Engineering Education*, Association for the Advancement of Artificial Intelligence (AAAI) Symposium, Mar 2010. *[Co-authored w/ WPI Other Faculty]*
10. Su H, Shang W, Cole GA, Harrington K, Fischer GS, *Haptic System Design for MRI-Guided Needle Based Prostate Brachytherapy*, Haptics Symposium - Haptics 2010, Waltham, Massachusetts, March 2010. *[Co-authored w/ WPI Students]*
11. Su H, Fischer GS, *A 3-Axis Optical Force/Torque Sensor for Prostate Needle Placement in Magnetic Resonance Imaging Environments*, 2nd Annual IEEE International Conference on Technologies for Practical Robot Applications - TePRA 2009, Woburn, Massachusetts, Nov 2009. *[Co-authored w/ WPI Students]*
12. Wang Y, Cole GA, Su H, Pilitis JG, Fischer GS, *MRI Compatibility Evaluation of a Piezoelectric Actuator System for a Neural Interventional Robot*, 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society - EMBC 2009, Minneapolis, Minnesota, Sept 2009. *[Co-authored w/ WPI Students]*
13. Michalson WR, Fischer GS, Padir T, Pollice G, *Balancing Breadth and Depth in Engineering Education: Unified Robotics III and IV*, American Society for Engineering Education - ASEE 2009, Austin, TX, June 2009. *[Co-authored w/ WPI Other Faculty]*
14. Ciraldi M, Cobb EC, Cyganski D, Fischer GS, Gennert M, Demetriou M, Looft F, Michalson WR, Miller B, Padir T, Rong Y, Schachterle LE, Stafford K, Tryggvason G, VandeVen JD, *Robotics Engineering: A New Discipline for a New Century*, American Society for Engineering Education - ASEE 2009, Austin, TX, June 2009. *[Co-authored w/ WPI Other Faculty]*
15. Cole G, Pilitsis J, Fischer GS, *Design of a Robotic System for MRI-Guided Deep Brain Stimulation Electrode Placement*, International Conference on Robotics and Automation - ICRA 2009, Kobe, Japan, pp 4450-4456, May 2009. *[Co-authored w/ WPI Students]*
16. U-Thainual P, Fischer GS, Iordachita I, Vikal S, Fichtinger G, *The Perk Station: Systems design for Percutaneous Intervention Training Suite*, IEEE International Conference on Robotics and Biomimetics - ROBIO 2008, Bangkok, Thailand, pp 1693-1697, Feb 2009. *[Co-authored w/ WPI Students]*

17. U-Thainual P, Fischer GS, Carrino JA, Fichtinger G, Iordachita II, *MR/CT Percutaneous Intervention Training Suite*, 7th International Symposium on Interventional MRI, Baltimore, MD, Section III, pp. 81-85, Sept 2008.
18. Fischer GS, Krieger A, Iordachita I, Csoma C, Whitcomb L, Fichtinger G, *MRI Compatibility of Robot Actuation Techniques – A Comparative Study*, 11th International Conference on Medical Image Computing and Computer-Assisted Intervention - MICCAI 2008, New York, NY, Lecture Notes on Computer Science, Vol 5242, pp 509-517, Springer, Sept 2008.
19. Tokuda J, Fischer GS, Csoma C, DiMaio SP, Gobbi DG, Fichtinger G, Tempany C, Hata N, *Software Strategy for Robotic Transperineal Prostate Therapy in Closed-Bore MRI*, 11th International Conference on Medical Image Computing and Computer-Assisted Intervention - MICCAI 2008, New York, NY, Lecture Notes on Computer Science, Vol 5242, pp 701-709, Springer, Sept 2008.
20. 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, pp 2489-2495, May 2008.
21. 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, pp 2959-2962, May 2008.
22. 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, Nov 2007.
23. DiMaio S, Samset 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, Nov 2007.
24. 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.
25. 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.
26. 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.
27. 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, Feb 2006.

28. 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, Feb 2006.
29. Fischer GS, Taylor RH, E*lectromagnetic 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, Oct 2005.
30. 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.
31. 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.
32. 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.
33. 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. Su H, Fischer GS, *Active Needle Steering System for Percutaneous Prostate Intervention in High-field MRI*, Robotics Science and Systems, Workshop on Enabling Technologies for Image-Guided Interventional Procedures, June 2010. *[Co-authored w/ WPI Students]*
2. Cole GA, Fischer GS, *MRI Compatible Surgical Systems: Analysis of Actuator Compatibility Methodologies and System Effectiveness*, Robotics Science and Systems, Workshop on Enabling Technologies for Image-Guided Interventional Procedures, June 2010. *[Co-authored w/ WPI Students]*
3. Su H, Harrington K, Cole GA, Wang Y, Fischer GS, *Modular Needle Steering Driver for MRI-guided Transperineal Prostate Intervention*, IEEE International Conference on Robotics and Automation, Workshop on Snakes, Worms and Catheters: Continuum and Serpentine Robots for Minimally Invasive Surgery, Anchorage, AK, May 2010. *[Co-authored w/ WPI Students]*
4. Carrino JA, Marker DR, Weiss CR, Fischer GS, Machado A, Fichtinger G, *Augmented reality visualization using image-overlay for MR-guided interventions: system description, feasibility, and initial evaluation in a spine*

phantom, American Society of Spine Radiology, Feb 2010.

5. Song S, Cho NB, Iordachita I, Fischer GS, Hata N, Fichtinger G, Tempany C, *Development of a Pneumatic Robot for MRI-guided Transperineal Prostate Intervention*, 18th Scientific Meeting and Exhibition of the International Society of Magnetic Resonance in Medicine - ISMRM 2010, May 2010.
6. Wang Y, Shazeeb MS, Sotak CH, Fischer GS, *Optimization of Piezoelectric Motors to Enhance MR Compatibility for Interventional Devices*, 17th Scientific Meeting and Exhibition of the International Society of Magnetic Resonance in Medicine - ISMRM 2009, April 2009. *[Co-authored w/ WPI Students & Other Faculty]*
7. Fischer GS, Iordachita I, U-Thainual P, Carrino JA, Fichtinger G, *A Training Suite for Image Overlay and Other Needle Insertion Techniques*, Augmented environments for Medical Imaging including Augmented Reality in Computer-aided Surgery Workshop at MICCAI - AMI-ARCS 2008, September 2008.
8. Tokuda J, DiMaio SP, Fischer GS, Csoma C, Gobbi D, Fichtinger G, Hata N, Tempany CM, *Real-time MR Imaging Controlled by Transperineal Needle Placement Device for MRI-guided Prostate Biopsy*, 16th Scientific Meeting and Exhibition of the International Society of Magnetic Resonance in Medicine - ISMRM 2008, May 2008.
9. 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 2007, Berlin, Germany, May 2007.
10. 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, Feb 2007.
11. Fischer GS, DiMaio SP, Iordachita I, Fichtinger G, *Robotic Assistant for MR-guided Prostate Biopsy*, 6th Interventional MRI Symposium, Leipzig, Germany, Sept 2006.
12. 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, Sept 2006.
13. 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.
14. 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.
15. 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, Feb 2006.
16. 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, Sept 2005.

17. 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.
18. 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.

Dissertations and Theses

1. Doctoral Dissertation, Johns Hopkins University, Enabling Technologies for MRI Guided Interventional Procedures, 2008.
2. Master's Thesis, Johns Hopkins University, Electromagnetic Tracker Characterization and Optimal Tool Design - With Applications to ENT Surgery, 2005.

GRANTS AND FELLOWSHIPS

1. PI/PD: Congressionally Directed Medical Research Program (CDMRP) Prostate Cancer Research Program (PCRP) New Investigator Award, Development of an MRI-Guided Intra-Prostatic Needle Placement System (June 2009 – June 2011)
2. PI: Congressionally Directed Medical Research Program (CDMRP) Prostate Cancer Research Program (PCRP) Graduate Training Fellowship (January 2007 – January 2009)

PROFESSIONAL PRESENTATIONS

1. Invited to present in "Imaged-Guided Robotic Interventions" Workshop at IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), san Francisco, CA, September 2011.
2. Hosting and organizing Invited session on "Robot-Aided Surgery" at IEEE Engineering in Medicine and Biology Conference (EMBC), Boston, MA, August 2011. Also serving as track chair for Robot-Aided Surgery within the Biomechanics and Robotics Theme.
3. Presented research performed under the New Investigator Award and Fellowship at the Congressionally Directed Medical Research Program (CDMRP) Prostate Cancer Research Program (PCRP) Innovative Minds in Prostate Cancer (IMPaCT) meeting, Orlando, FL, March 2011.
4. Hosted and organized Workshop on Enabling Technologies for Image-Guided Interventional Procedures at Robotics Science and Systems Conference (RSS), Zaragoza , Spain, June 2010
5. Presented "Sensor and Actuator Technologies for MR-guided Interventions" at Robotics Science and Systems Conference (RSS), Zaragoza , Spain, June 2010

6. Lectured to the BME 1001 class an introduction to medical robotics and an overview of my lab's research, April 2010
7. Session Chair at Haptics Symposium joint conference with IEEE Virtual Reality, Waltham, MA, March 2010
8. Presented an overview of research in my laboratory to representatives from the Naval War College Strategic Studies Group at WPI. December 2009.
9. Hosted meeting at WPI for representatives from Neurologica, a local medical device company with ties to WPI who has shown interest in sponsored research and possible commercialization of research in our laboratory. November 2009.
10. Presented at the WPI Biomedical Engineering Department Seminar, Medical Robotics and Applications to Interventional MRI, November 2009.
11. Hosted meeting at WPI for representatives from Stryker Navigation, a large medical device company who has shown interest in sponsored research and possible commercialization of research in our laboratory. September 2009.
12. Lectured to the BME 1001 class an introduction to medical robotics and an overview of my lab's research, April 2009.
13. Keynote speaker at regional joint IEEE and ASME Annual Engineer Week dinner, Medical Robotics and Computer Integrated Surgery, Worcester, MA, February 2009
14. Medical Robotics and Computer Integrated Surgery, Worcester Polytechnic Institute – Department of Mechanical Engineering Colloquium, Worcester, MA, October 2008
15. A Training Suite for Image Overlay and Other Needle Insertion Techniques, Augmented environments for Medical Imaging including Augmented Reality in Computer-aided Surgery (AMI-ARCS) Workshop at MICCAI, New York, NY, September 2008
16. Pneumatically Operated MRI-Compatible Needle Placement Robot for Prostate Interventions, International Conference on Robotics and Automation - ICRA 2008, Pasadena, CA, May 2008
17. Enabling Technologies for MRI Guided Interventional Procedures, Stevens Institute of Technology, Hoboken, NJ, March 2008
18. Enabling Technologies for MRI Guided Interventional Procedures, University of Wisconsin, Milwaukee, WI, March 2008
19. Enabling Technologies for MRI Guided Interventional Procedures, Worcester Polytechnic Institute, Worcester, MA, February 2008
20. Enabling Technologies for MRI Guided Interventional Procedures, Brigham and Women's Hospital - Journal Club, Boston, MA, September 2007
21. Validation System of MRI Image Overlay and Other Insertion Techniques, Medicine Meets Virtual Reality 15 – MMVR 2006, Long Beach, CA, February 2007
22. MRI Guided Needle Insertion - Comparison of Four Techniques, Society for Interventional Radiology 31st Annual Scientific Meeting - SIR 2006, Toronto, Canada, March 2006

23. MRI Guided Percutaneous Interventions, CISST ERC Seminar Series, February 2006
24. System for MRI Guided Prostate Interventions, IEEE International Conference on Biomedical Robotics and Biomechatronics - BioRob 2006, Pisa, Italy, February 2006
25. MRI Image Overlay: Applications to Arthrography Needle Insertion, Medicine Meets Virtual Reality 14, Long Beach, CA, February 2006
26. 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
27. Intra-operative Ischemia Sensing Surgical Instruments, International Conference on Complex Medical Engineering - CME 2005, Takamatsu, Japan, May 2005
28. 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

PROFESSIONAL SOCIETY MEMBERSHIPS AND OFFICES

Professional Society Memberships

- Institute of Electrical and Electronics Engineers (IEEE), IEEE Robotics and Automation Society (RAS), and IEEE Engineering in Medicine and Biology (EMBS)
- American Society of Mechanical Engineers (ASME)
- Medical Image Computing and Computer-Assisted Intervention (MICCAI)
- Massachusetts Prostate Cancer Coalition (MPCC)
- Member and attendee for Massachusetts Technology Leadership Council (MassTLC) Robotics Cluster meetings and symposia.
- Sigma Xi scientific Research Society

Session Chair / Co-Chair

- Track Chair of Medical Robotics at IEEE Engineering in Medicine & Biology Conference (EMBC 2011). Host of Invited Session on Robot-Aided Surgery.
- Host of Medical Robotics Workshop at Robotics Science and Systems (RSS 2010)
- Session Chair at Haptics Symposium joint conference with IEEE Virtual Reality (Haptics 2010).
- Co-Chair for session on Medical Robotics at 2008 IEEE International Conference on Robotics and Automation (ICRA 2008)

Professional Offices

- Track Chair and Organizer of Invited Session on Robot-Aided Surgery within the Biomechanics and Robotics Theme at IEEE Engineering in Medicine & Biology Conference (EMBC 2011).
- Organizer of Medical Robotics Workshop at Robotics Science and Systems (RSS 2010)

- Program Committee and Local Arrangements co-chair for the Haptics Symposium (HAPTICS 2010)
- Program Committee for IEEE International Conference on Technologies for Practical Robot Applications (TePRA 2009 & 2011)
- Steering Committee for NSF-sponsored Robotics Innovations Competition and Conference (RICC 2009 & 2011)

EDITORIAL AND REVIEW ACTIVITIES

Technical Reviews / Publications Referee

- NIH Reviewer - ETTN-B50 Robotic Technology Stage 1 Subject Matter Expert
- External reviewer for Vanderbilt internal Development Grants
- IEEE/ASME Transactions on Mechatronics
- IEEE Trans. on Robotics (T-Ro)
- ASME Journal of Dynamic Systems, Measurement and Control
- Int. Jnl of Computer Assisted Radiology and Surgery (JCARS)
- Int. Jnl of Robotics Research (IJRR)
- IEEE/RSJ Int. Conference on Intelligent Robots and Systems (IROS)
- IEEE Int. Conference on Robotics and Automation (ICRA)
- World Haptics, Eurohaptics Conference, and Symposium on Haptic Interfaces
- Int. Conf on Medical Image Computing and Computer-Assisted Intervention (MICCAI)
- Int. Conf on Rehabilitation Robotics (ICORR)

HONORS, RECOGNITION AND AWARDS FOR SCHOLARSHIP

- Featured in and on the cover of the Congressionally Directed Medical Research Program (CDMRP) Prostate Cancer Research Program (PCRP) Program Booklet distributed to 1100+ attendees at CDMRP Innovative Minds in Prostate Cancer (IMPaCT) meeting in March 2011.
- Featured in an article on Robotic Surgery in BioPhotonics Magazine.
- Recognized for doctoral advisee's award-winning graduate research work by wining 2010 GRAD, Innovation Competition and WPI Fellowship
- Recognized for undergraduate project advisee's award-winning MQP research work by winning 2010 Provost's Award.
- Received New Investigator Award from Congressionally Directed Medical Research Program (CDMRP) prostate Cancer Research Program (PCRP) New Investigator Award, Development of an MRI-Guided Intra-Prostatic Needle Placement System, Funding started June 2009.
- Inducted as Member of Sigma Xi Scientific Research Society (2009)
- Featured in the Alumni section of the widely distributed newsletter for the FIRST robotics Competition (FRC), January 2009: "Can't Find a Robotics Degree Program? Then Make Your Own."