

Robert J. Webster III, Ph.D.

Medical & Electromechanical Design Laboratory
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Curriculum vitae last updated: April 15, 2011

EDUCATION

- Ph.D. 2007** Mechanical Engineering, Johns Hopkins University, Baltimore, MD, USA
Dissertation: Design and Mechanics of Continuum Robots for Surgery
Advisors: Allison M. Okamura and Noah J. Cowan
- M.S. 2004** Mechanical Engineering, Johns Hopkins University, Baltimore, MD, USA
Specialization: Medical Robotics; Design, Modeling, and Kinematics
- B.S. 2002** Electrical Engineering, Clemson University, Clemson, SC, USA
Summa Cum Laude, Departmental Honors

POSITIONS HELD

- 2008-present Assistant Professor, Dept. of Mechanical Engineering, Vanderbilt University
- 2002-2007 Graduate Research Assistant, Dept. of Mechanical Engineering, Johns Hopkins University
- 2006 Visiting Researcher, Scuola Superiore Sant'Anna, Italy
- 2001 Visiting Researcher, University of Newcastle, Australia
- 2001 Research Engineer, Savannah River Technology Center
- 1998-2001 Co-op Engineer, Adtran, Inc.
- 1997 Intern, Georgia Power, Vogtle Nuclear Power Plant

RESEARCH INTERESTS

Electromechanical design, modeling, and control, particularly as applied to medical systems. Image-guided surgery and medical robotics. Cochlear implant surgery. Continuum (continuously flexible) robots. Flexible dexterous needle-sized manipulators, and steerable needles. Pill-sized swallowable robots and other meso-scale devices. Human-Machine Interfaces for surgical training and/or teleoperation.

AWARDS AND HONORS

- 2011 National Science Foundation CAREER Award
- 2009 Best Poster, ASME Design of Medical Devices Conference (Three in Five Competition)
- 2007 Semifinalist, Damon Runyon-Rachleff Innovation Award
- 2006 Finalist, Best Paper Award, IEEE/RSJ Int'l Conference on Intelligent Robots and Systems
- 2003-2007 National Science Foundation Fellowship
- 2006 Best Presentation, Engineering Research Center for Computer Integrated Surgical Systems and Technology Student Competition
- 2002-2005 National Defense Science and Engineering Graduate Fellowship
- 2003 Best Project, Advanced Computer Integrated Surgery
- 2002 Tau Beta Pi Fellowship
- 2002 Rhodes Most Outstanding Undergraduate Engineer, Clemson University
- 1999-2002 Most Outstanding Electrical Engineer in class, Clemson University (3 times)
- 2002 Best Paper, IEEE Piedmont Student Paper Competition
- 1997-2002 Dixon Fellow
- 2000 Tau Beta Pi Scholarship
- 2000 Member, Tau Beta Pi
- 2000 Member, Eta Kappa Nu

PUBLICATIONS

Journal Articles

- [J1] D. C. Rucker and R. J. Webster III. Statics and dynamics of continuum robots with general tendon routing and external loading. *IEEE Transactions on Robotics*. (Accepted).
- [J2] A. Danilchenko, R. Balachandran, J. L. Toennies, S. Baron, B. Munske, J. M. Fitzpatrick, T. J. Withrow, R. J. Webster III, and R. F. Labadie. Robotic mastoidectomy. *Otology & Neurotology*, 32(1):11–16, 2011.
- [J3] D. C. Rucker, B. A. Jones, and R. J. Webster III. A geometrically exact model for externally loaded concentric tube continuum robots. *IEEE Transactions on Robotics*, 26(5):769–780, 2010.
- [J4] D. Schurzig, R. J. Webster III, M. S. Dietrich, and R. F. Labadie. Force of cochlear implant electrode insertion performed by a robotic insertion tool: comparison of traditional versus advance-off stylet techniques. *Otology & Neurotology*, 31:1207–1210, 2010.
- [J5] D. Schurzig, R. F. Labadie, A. Hussong, T. S. Rau, and R. J. Webster III. Design of a tool integrating force sensing with automated insertion in cochlear implantation. *IEEE/ASME Transactions on Mechatronics*. (In Press).
- [J6] R. J. Webster III and B. A. Jones. Design and kinematic modeling of constant curvature continuum robots: A review. *International Journal of Robotics Research*, 29(13):1661–1683, 2010.
- [J7] D. C. Rucker, R. J. Webster III, G. S. Chirikjian, and N. J. Cowan. Equilibrium conformations of concentric-tube continuum robots. *International Journal of Robotics Research*, 29(10):1263–1280, 2010.
- [J8] J. L. Toennies, G. Tortora, M. Simi, P. Valdastrri, and R. J. Webster III. Swallowable medical devices for diagnosis and surgery: The state of the art. *Journal of Mechanical Engineering Science*, 224(7):1397–1414, 2010.
- [J9] R. A. Lathrop, D. Hackworth, and R. J. Webster III. Minimally invasive holographic surface scanning for soft tissue image registration. *IEEE Transactions on Biomedical Engineering*, 57(6):1497–1506, 2010.
- [J10] S. Baron, H. Eilers, B. Munske, J. L. Toennies, R. Balachandran, R. F. Labadie, T. Ortmaier, and R. J. Webster III. Percutaneous inner-ear access via an image-guided industrial robot system. *Journal of Engineering in Medicine*, 224(5):633–649, 2010.
- [J11] C. Quaglia, E. Buselli, R. J. Webster III, P. Valdastrri, A. Menciassi, and P. Dario. An endoscopic capsule robot: A meso-scale engineering case study. *Journal of Micromechanics and Microengineering*, 19:105007, 2009.
- [J12] D. C. Rucker and R. J. Webster III. Parsimonious evaluation of concentric-tube continuum robot equilibrium conformation. *IEEE Transactions on Biomedical Engineering*, 56(9):2308–2311, 2009.
- [J13] P. Valdastrri, R. J. Webster III, C. Quaglia, M. Quirini, A. Menciassi, and P. Dario. A new mechanism for meso-scale legged locomotion in compliant tubular environments. *IEEE Transactions on Robotics*, 25(5):1047–1057, 2009.
- [J14] R. J. Webster III, J. M. Romano, and N. J. Cowan. Mechanics of precurved-tube continuum robots. *IEEE Transactions on Robotics*, 25(1):67–78, 2009.
- [J15] E. M. Boctor, M. A. Choti, E. C. Burdette, and R. J. Webster III. 3DUS-guided robotic needle placement: An experimental evaluation. *International Journal of Medical Robotics and Computer Aided Surgery*, 4(2):180–191, 2008.
- [J16] R. J. Webster III, J. S. Kim, N. J. Cowan, G. S. Chirikjian, and A. M. Okamura. Nonholonomic modeling of needle steering. *International Journal of Robotics Research*, 25(5/6):509–526, 2006.

- [J17] R. J. Webster III. Object capture with a camera-mobile robot system: An introductory robotics project. *IEEE Robotics & Automation Magazine*, 13(1):85–88, 2006.
- [J18] R. J. Webster III, T. E. Murphy, L. N. Verner, and A. M. Okamura. A novel two-dimensional tactile slip display: Design, kinematics, and perceptual experiments. *ACM Transactions on Applied Perception*, 2(2):150–165, 2005.
- [J19] E. M. Boctor, R. J. Webster III, H. Mathieu, A. M. Okamura, and G. Fichtinger. Virtual remote center of motion control for needle-placement robots. *Journal of Computer Aided Surgery*, 9(5):175–183, 2004.

Journal Abstracts

- [JA1] D. Schurzig, Z. W. Smith, D. C. Rucker, R. F. Labadie, and R. J. Webster III. A manual insertion mechanism for percutaneous cochlear implantation. *ASME Journal of Medical Devices*, 4:027533, 2010.
- [JA2] J. Das, D. C. Rucker, and R. J. Webster III. A testbed for multilumen steerable needle experiments. *ASME Journal of Medical Devices*, 4:027535, 2010.
- [JA3] S. Athavale, T. Dutton, and R. J. Webster III. Cuffed inner cannula and flexible outer cannula tracheotomy device: Ensuring a stable airway. *ASME Journal of Medical Devices*, 4:027502, 2010.
- [JA4] D. C. Rucker, J. M. Croom, and R. J. Webster III. Aiming surgical lasers with an active cannula. *ASME Journal of Medical Devices*, 3(2):027506, 2009.
- [JA5] J. L. Toennies and R. J. Webster III. A wireless insufflation system for capsular endoscopes. *ASME Journal of Medical Devices*, 3(2):027514, 2009.
- [JA6] R. A. Lathrop, T. T. Cheng, and R. J. Webster III. Laparoscopic image guidance via conoscopic holography. *ASME Journal of Medical Devices*, 3(2):027546, 2009.

Book Chapters/Collections

- [B1] D. C. Rucker and R. J. Webster III. Mechanics of continuum robots with general tendon routing paths under external loading. *12th International Symposium on Experimental Robotics, Springer Tracts in Advanced Robotics*, 2010. (In Press).
- [B2] R. J. Webster III, J. P. Swensen, J. M. Romano, and N. J. Cowan. Closed-form differential kinematics for concentric-tube continuum robots with application to visual servoing. *11th International Symposium on Experimental Robotics 2008, Springer Tracts in Advanced Robotics 2009*, 54:485–494, 2008.
- [B3] D. Stoianovici, R. J. Webster III, and L. Kavoussi. Surgical robotic applications in minimally invasive uro-oncology surgery. In R. Moore and J. Bishoff, editors, *Minimally Invasive Uro-Oncologic Surgery*, pages 353–363. Taylor and Francis, London and New York, 2005. ISBN 1-84184-566-3.
- [B4] R. J. Webster III, N. J. Cowan, G. S. Chirikjian, and A. M. Okamura. Nonholonomic modeling of needle steering. *9th International Symposium on Experimental Robotics 2004, Springer Tracts in Advanced Robotics 2006*, 21:35–44, 2004.

Refereed Conference Articles

- [C1] J. L. Toennies, J. Burgner, T. J. Withrow, and R. J. Webster III. Toward haptic/aural touchscreen display of graphical mathematics for the education of blind students. *World Haptics*, 2011. (accepted).
- [C2] T. L. Bruns, J. M. Tucker, D. C. Rucker, E. M. Boctor, E. C. Burdette, J. Burgner, and R. J. Webster III. Design of an autoclavable active cannula deployment device. *ASME Design of Medical Devices Conference*, 2011. (Accepted).

- [C3] D. C. Rucker and R. J. Webster III. Computing Jacobians and compliance matrices for externally loaded continuum robots. *IEEE International Conference on Robotics and Automation*, 2011. (Accepted).
- [C4] L. B. Kratchman, M. M. Rahman, J. R. Saunders, P. J. Swaney, and R. J. Webster III. Toward robotic needle steering in lung biopsy: A tendon-actuated approach. *SPIE Medical Imaging*, 2011.
- [C5] J. L. Toennies, G. Ciuti, B. F. Smith, A. Menciassi, P. Valdastri, and R. J. Webster III. Toward tetherless insufflation of the GI tract. *International Conference of the IEEE Engineering in Medicine and Biology Society*, pages 1946–1949, 2010.
- [C6] D. C. Rucker, B. A. Jones, and R. J. Webster III. A model for concentric tube continuum robots under applied wrenches. *IEEE International Conference on Robotics and Automation*, pages 1047–1052, 2010.
- [C7] D. Schurzig, R. F. Labadie, and R. J. Webster III. A force sensing robot for cochlear electrode implantation. *IEEE International Conference on Robotics and Automation*, pages 3674–3679, 2010.
- [C8] L. A. Lyons, R. J. Webster III, and R. Alterovitz. Planning active cannula configurations through tubular anatomy. *IEEE International Conference on Robotics and Automation*, pages 2082–208, 2010.
- [C9] R. A. Lathrop, D. C. Rucker, and R. J. Webster III. Guidance of a steerable cannula robot in soft tissue using preoperative imaging and conoscopic surface contour sensing. *IEEE International Conference on Robotics and Automation*, pages 5601–5606, 2010.
- [C10] J. M. Croom, D. C. Rucker, J. M. Romano, and Robert J. Webster III. Visual sensing of continuum robot shape using self-organizing maps. *IEEE International Conference on Robotics and Automation*, pages 4591–4596, 2010.
- [C11] E. C. Burdette, D. C. Rucker, J. M. Croom, C. Clarke, P. Stolka, C. J. Diederich, E. M. Bector, and R. J. Webster III. The acusitt ultrasonic ablator: The first steerable needle with an integrated interventional tool. *Proceedings of SPIE Medical Imaging*, 2010.
- [C12] E. M. Bector, P. Stolka, C. Clarke, D. C. Rucker, J. M. Croom, E. C. Burdette, and R. J. Webster III. Precisely shaped acoustic ablation of tumors utilizing steerable needle and 3D ultrasound image guidance. *Proceedings of SPIE Medical Imaging*, 2010.
- [C13] D. Schurzig, Z. W. Smith, D. C. Rucker, R. F. Labadie, and R. J. Webster III. A manual insertion mechanism for percutaneous cochlear implantation. *ASME Design of Medical Devices Conference*, 2010.
- [C14] J. Das, D. C. Rucker, and R. J. Webster III. A testbed for multi-lumen steerable needle experiments. *ASME Design of Medical Devices Conference*, 2010.
- [C15] L. A. Lyons, R. J. Webster III, and R. Alterovitz. Motion planning for active cannulas. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, page 801806, 2009.
- [C16] D. C. Rucker and R. J. Webster III. Mechanics of bending, torsion, and variable precurvature in multi-tube active cannulas. *IEEE International Conference on Robotics and Automation*, pages 2533–2537, 2009.
- [C17] R. A. Lathrop, T. T. Cheng, and R. J. Webster III. Conoscopic holography for image registration: A feasibility study. *Proceedings of the SPIE*, 7261:72611M–72611M–11, 2009.
- [C18] M. Matinfar, R. J. Webster III, L. Ford, I. Iordichata, C. C. Edwards II, and R. H. Taylor. Nerve tensiometer for spondyloptosis surgery. *Northeast Bioengineering Conference*, pages 1–2, 2009.
- [C19] D. C. Rucker and R. J. Webster III. Mechanics-based modeling of bending and torsion in active cannulas. *IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechanics*, pages 704–709, 2008.

- [C20] R. J. Webster III, A. M. Okamura, and N. J. Cowan. Kinematics and calibration of active cannulas. *IEEE International Conference on Robotics and Automation*, pages 3888–3895, 2008.
- [C21] M. Quirini, R. J. Webster III, A. Menciassi, and P. Dario. Design of a pill-sized 12-legged endoscopic capsule robot. *IEEE International Conference on Robotics and Automation*, pages 1856–1862, 2007.
- [C22] N. Ng Pak, R. J. Webster III, A. Menciassi, and P. Dario. Electrolytic silicone bourdon tube microactuator for reconfigurable surgical robots. *IEEE International Conference on Robotics and Automation*, pages 3371–3376, 2007.
- [C23] J. M. Romano, R. J. Webster III, and A. M. Okamura. Teleoperation of steerable needles. *IEEE International Conference on Robotics and Automation*, pages 934–939, 2007.
- [C24] R. J. Webster III, A. M. Okamura, and N. J. Cowan. Toward active cannulas: Miniature snake-like surgical robots. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, pages 2857–2863, 2006. **Best Paper Award Finalist.**
- [C25] R. J. Webster III, J. Memisevic, and A. M. Okamura. Design considerations for robotic needle steering. *IEEE International Conference on Robotics and Automation*, pages 3599–3605, 2005.
- [C26] E. M. Boctor, R. J. Webster III, M. A. Choti, R. H. Taylor, and G. Fichtinger. Robotically assisted ablative treatment guided by freehand 3D ultrasound. *Computer Assisted Radiology and Surgery*, pages 503–508, 2004.
- [C27] T. E. Murphy, R. J. Webster III, and A. M. Okamura. Design and performance of a two-dimensional tactile slip display. *Eurohaptics*, pages 130–137, 2004.
- [C28] E. M. Boctor, R. J. Webster III, H. Mathieu, A. M. Okamura, and G. Fichtinger. Virtual remote center of motion control for needle placement robots. In *Medical Image Computing and Computer-Assisted Interventions*, volume 2878 of *Lecture Notes in Computer Science*, pages 157–164. Springer-Verlag, 2003.
- [C29] A. M. Okamura, R. J. Webster III, J. T. Nolan, K. W. Johnson, and H. Jafry. The haptic scissors: Cutting in virtual environments. *IEEE International Conference on Robotics and Automation*, pages 828–833, 2003.
- [C30] R. J. Webster III and A. S. Brannon. The electronic ball boy: A reactive visually guided mobile robot for the tennis court. *IEEE International Conference on Robotics and Automation*, pages 2054–2059, 2002.

Patents

- [P1] R. J. Webster III, A. M. Okamura, N. J. Cowan, and R. H. Taylor. An active cannula for bio-sensing and surgical intervention. U.S. patent application number 60/736,789, International patent pending.
- [P2] R. J. Webster III, A. M. Okamura, N. J. Cowan, G. S. Chirikjian, K. Y. Goldberg, and R. Alterovitz. Distal bevel-tip needle control device and algorithm. U.S. patent application number 11/436,995.
- [P3] M. Quirini, R. J. Webster III, A. Menciassi, and P. Dario. Teleoperated endoscopic capsule. International Patent application PCT/IT2007/000259.

Poster/Invited/Non-refereed/Abstract Publications

- [Oth1] L. B. Kratchman, G. S. Blachon, T. J. Withrow, R. Balachandran, R. F. Labadie, and R. J. Webster III. Toward automation of image-guided microstereotactic frames: A bone-attached parallel robot for percutaneous cochlear implantation. *Robotics, Science and Systems - Workshop on Enabling Technologies for Image-Guided Robotic Interventional Procedures*, 2010. (Paper and Poster).

- [Oth2] J. L. Toennies, G. Ciuti, B. Smith, P. Valdastri, A. Menciassi, and R. J. Webster III. Initial feasibility studies on wireless insufflation of the GI tract. *IEEE International Conference on Robotics and Automation - Workshop on Meso-Scale Robotics for Medical Interventions*, 2010. (Poster).
- [Oth3] D. Schurzig, Z. W. Smith, D. C. Rucker, R. F. Labadie, and R. J. Webster III. A manual insertion mechanism for percutaneous cochlear implantation. *ASME Design of Medical Devices Conference*, 2010. (Poster).
- [Oth4] J. Das, D. C. Rucker, and R. J. Webster III. A testbed for multi-lumen steerable needle experiments. *ASME Design of Medical Devices Conference*, 2010. (Poster).
- [Oth5] A. Danilchenko, J. L. Toennies, R. Balachandran, S. Baron, B. Munske, R. J. Webster III, and R. F. Labadie. Robotic mastoidectomy. *American Otological Society Spring Meeting*, 22, 2010. (Abstract + Oral Presentation).
- [Oth6] J. L. Toennies and R. J. Webster III. A wireless insufflation system for capsular endoscopes. *ASME Design of Medical Devices Conference*, 2009. (Poster) **Best Poster Award** - 3 in 5 competition winner.
- [Oth7] D. C. Rucker, J. M. Croom, and R. J. Webster III. Aiming surgical lasers with an active cannula. *ASME Design of Medical Devices Conference*, 2009. (Poster).
- [Oth8] R. A. Lathrop, T. T. Cheng, and R. J. Webster III. Laparoscopic image guidance via conoscopic holography. *ASME Design of Medical Devices Conference*, 2009. (Poster).
- [Oth9] R. A. Lathrop, R. L. Smith, and R. J. Webster III. Needle-membrane puncture mechanics. *Medical Image Computing and Computer-Assisted Intervention*, 2008. (Poster).
- [Oth10] D. C. Rucker, N. J. Cowan, G. S. Chirikjian, and R. J. Webster III. Toward a general active cannula model. *Medical Image Computing and Computer-Assisted Intervention*, 2008. (Poster).
- [Oth11] X. Xie and R. J. Webster III. A 3d trajectory-following controller for bevel-steered needles. *Medical Image Computing and Computer-Assisted Intervention*, 2008. (Poster).
- [Oth12] J. P. Swensen, R. J. Webster III, and N. J. Cowan. Active cannula: Applications to steerable needles. *Medical Image Computing and Computer-Assisted Intervention*, 2008. (Poster).

GRANTS AND CONTRACTS

Pending

1. NIH R01 “New Technologies for Open and Minimally Invasive Kidney Surgeries” R. L. Galloway (PI), S. D. Herrell (PI), M. I. Miga, and R. J. Webster III. For \$1,583,239 over three years (4/01/11–3/31/14). Impact/Priority Score: 23. Percentile: 15.
2. NIH R01 “Clinical Translation of Deformation Compensation for Image-Guided Liver Surgery” M. I. Miga (PI), R. L. Galloway, and R. J. Webster III. For \$3,787,981 over 5 years (7/1/11-6/31/16). Impact/Priority Score: 18. Percentile: 5.
3. NIH R01 “A Robotic Mastoidectomy” R. F. Labadie (PI), T. J. Withrow (PI) M. I. Miga (PI), R. L. Galloway, and R. J. Webster III. For \$3,800,000 over 5 years (7/1/11-6/31/16).

Current

1. NSF CAREER Award “Lifesaving Robotic Tentacles” R. J. Webster III (PI). For \$400,000 over five years (7/1/11–6/30/16).
2. Intuitive Surgical “Dexterous Needle-sized Teleoperated Patient Side Manipulators” R. J. Webster III (PI). For \$16,200 over one year (1/1/11–12/31/12).

3. NIH R21 #EB011628: “Reaching Inaccessible Anatomy Percutaneously Via Multi-Lumen Steerable Needles” R. J. Webster III (PI) and R. Alterovitz (PI). For \$414,923 over two years (6/1/10–5/31/12).
4. MathWorks Inc. Contract “Modeling and Control of an Educational Haptic Robot Using Matlab / Simulink” R. J. Webster III (PI) and P. Marayong. For \$38,341 over one year (7/1/10–6/30/11).
5. NSF Engineering Research Center for Compact and Efficient Fluid Power, NSF #0540834 K. A. Stelson (PI) and many Co-Is. Project “Fluid-Powered Surgery & Rehabilitation via Compact, Integrated Systems” R. J. Webster III (PI), J. Ueda, E. J. Barth, and V. Gervasi. For \$444,258 (budgeted – budget re-evaluated each year) over two years (6/8/10–6/7/12).
6. NIH Phase II SBIR #R44CA134169: “Precisely Shaped Acoustic Ablation of Tumors Under 3D Ultrasound Image Guidance” E. C. Burdette (PI), R. J. Webster III, and E. M. Boctor. For \$1,500,000 over four years (9/1/08–8/31/12). Subcontract to Webster’s lab of \$402,337.
7. NIH R01 #R01DC10184: “Pediatric Percutaneous Cochlear Implantation: Clinical Validation and Implementation” R. F. Labadie (PI), J. M. Fitzpatrick, B. M. Dawant and R. J. Webster III. For \$2,970,077 over three years (9/1/09–8/31/12).
8. Vanderbilt Discovery Grant: “Fluid-Powered Locomotion, Sensing, and Intervention in the GI Tract” R. J. Webster III (PI), K. C. Williams, and H. Correa. For \$100,000 over two years (6/1/09–5/31/11).
9. NSF #CBET-0651803: “Active Cannulas for Bio-Sensing and Surgery” N. J. Cowan (PI), A. M. Okamura, and R. J. Webster III. For \$240,000 over three years (8/15/07–8/14/10, one year no cost extension through 8/14/11). Subcontract to Webster’s lab of \$180,589.

Completed

1. NIH Phase I SBIR #R44CA134169: “Precisely Shaped Acoustic Ablation of Tumors Under 3D Ultrasound Image Guidance” E. C. Burdette (PI), R. J. Webster III, and E. M. Boctor. For \$100,000 over one years (9/1/08-8/31/09). Subcontract to Webster’s lab of \$26,136.
2. Vanderbilt Teaching Center: “Getting a Feel for Dynamic Systems through Haptic Robots.” For \$3,000 over one semester (Fall, 2008).
3. NSF Research Experiences for Undergraduates Supplement to #CBET-0651803. For \$3,000 over one year (6/1/08-8/31/08).
4. National Defense Science and Engineering Graduate Fellowship, Robert J. Webster III. For approximately \$167,760 over three years (9/1/2002-8/31/2005).
5. National Science Foundation Graduate Fellowship, Robert J. Webster III. For approximately \$96,000 over three years (9/1/2005-12/31/07).
6. IEEE-RAD/IFRR Travel Grant, 2005.
7. National Science Foundation Travel Grants for conference attendance (5) 1999, 2000, 2002, 2004, 2006.

INVITED PRESENTATIONS

1. Rice University, Department of Mechanical Engineering and Materials Science, “Enabling Technologies for Reducing Invasiveness and Enhancing Accuracy in Robotic Surgery,” Houston, Texas, November 10, 2010.
2. Denso Manufacturing, “Medical Robotics and Prosthetics Research at Vanderbilt” Maryville, TN, August 12, 2010.
3. Scuola Superiore Sant’Anna, Center for Research in Microengineering. “Enabling Technologies for Reducing the Invasiveness of Robotic Surgery,” Pontedera, Italy, July 14, 2010.

4. Robotics, Science and Systems 2010 – Workshop on Enabling Technologies for Image-Guided Robotic Interventional Procedures “Continuously Flexible Robots, an Enabling Technology for Less Invasive Surgical Procedures,” Zaragoza, Spain, June 28, 2010.
5. IEEE International Conference on Robotics and Automation 2010 – Workshop on Snakes, Worms and Catheters: Continuum and Serpentine Robots for Minimally Invasive Surgery, ”Modeling, Shape Sensing, Image Guidance, and Therapeutic Applicator Integration: Enabling Technologies for Clinical Continuum Robots,” Anchorage, Alaska, May 3, 2010 (Presented by graduate student Jenna Toennies).
6. Scuola Superiore Sant’Anna, Center for Research in Microengineering. “Medical Robotics and Image-Guided Surgery in the MED lab at Vanderbilt,” Pontedera, Italy, July 15, 2009.
7. Carnegie Mellon University Robotics Institute, “Toward Steerable Cannula and Legged Capsule Robots in Medicine,” October 10, 2008.
8. Medical Image Computing and Computer Assisted Intervention 2008 – Workshop, Needle Steering: Recent Results and Future Opportunities, “Modeling and Control of Continuum Robots for Surgery,” New York, NY, September 6, 2008.
9. Scuola Superiore Sant’Anna, Center for Research in Microengineering Seminar, “Design, Mechanics, and Control of Surgical Continuum Robots,” Pontedera, Italy, July 10, 2008.
10. Vanderbilt University External Advisory Committee Meeting, Nashville, TN, April 25, 2008.
11. Vanderbilt University, Department of Biomedical Engineering, Nashville, TN, March 26, 2008.
12. University of Georgia, Faculty of Engineering, Athens, GA, March 19, 2007.
13. Duke University Department of Department of Mechanical Engineering and Materials Science, Durham, NC, February 27, 2007.
14. Vanderbilt University, Department of Mechanical Engineering, Nashville, TN, February 19, 2007.
15. Workshop on Medical Diagnosis, Micro Surgery, and Performance Evaluation at IEEE/RSJ International Conference on Intelligent Robots and Systems, Beijing, China, October 10, 2006.
16. Engineering Research Center for Computer Integrated Surgical Systems and Technology Seminar Series, Johns Hopkins University, Baltimore, MD, May 3, 2006.

ADVISING

Doctoral Students

- Hunter Gilbert, Ph.D. expected 2015.
- Diana Cardona, Ph.D. expected 2015.
- Philip Swaney, Ph.D. expected 2015.
- Louis Kratchman, Ph.D. expected 2014.
- Jenna Toennies, Ph.D. expected 2013.
- Ray Lathrop, Ph.D. expected 2012.
- Caleb Rucker, Ph.D. expected 2011.

Doctoral Students Co-Advised

- Jadav Das, Ph.D. 2010. Co-Advised with Nilanjan Sarkar.

Masters Students

Byron Smith, M.S. expected 2011.

Research Engineers Advised

Gregoire Blanchon, Research Engineer/M.S., Co-Advised with R. F. Labadie

Daniel Schurzig, Research Engineer/Ph.D., Co-Advised with R.F. Labadie

Postdoctoral Fellows

Jessica Burgner 2010

Undergraduate Students

Michael Jekot, 2011. Trevor Bruns, 2010. Scott Nill, 2010. Mohammed Rahman, 2010. Stephen Malanoski, 2010. J. Tyler Steier, 2010. Justin Saunders, 2010. Ben Bradshaw, 2009. Zach Smith, 2009. David Gostin, 2009. Xavier Waller, 2009. Tiffany Cheng, 2009. Sam Nackman, 2009. Jordan Croom, 2008. James Boyle, 2008. Randy Smith, 2008. Brandon Bolds, 2008. Todd Dutton, 2008. Robert Pieper, 2008. Joseph Romano, 2006. Jasenka Memisevic, 2004.

Thesis and Exam Committees

2008: Tyler Li (Ph.D.), Abhijit Barman (Ph.D. Proposal), and departmental preliminary exam in the area of Dynamic Systems and Control.

2009: Abhijit Barman (Ph.D.), Yu Tian (Ph.D.), Frank Sup (Ph.D.), Atakan Varol (Ph.D.), Keith Wait (Ph.D. Proposal), and departmental preliminary exam in the area of Dynamic Systems and Control.

2010: Ryan Farris (Ph.D. Proposal), Joel Willhite (Ph.D. Proposal, Ph.D.), Ishita Garg (Ph.D. Proposal), Yu Tian (Ph.D.), Keith Wait (Ph.D. Proposal, Ph.D.), Chao Yong (Ph.D. Proposal), Furui Wang (Ph.D. Proposal), Vikash Gupta (M.S.), Andrei Danilchenko (Ph.D. Proposal), Uttama Lahiri (Ph.D. Proposal), Liyun Guo (Ph.D. Proposal), and departmental preliminary exam in the area of Dynamic Systems and Control.

2011: Uttama Lahiri (Ph.D.), Rowina Ong (Ph.D. Proposal), Ryan Farris (Ph.D. Proposal), Hugo Quintero (Ph.D. Proposal), Andrei Danilchenko (Ph.D.), and departmental preliminary exam in the area of Dynamic Systems and Control.

INSTRUCTION AND COURSE DEVELOPMENT

Undergraduate Courses

System Dynamics Modeling and analysis of damped and un-damped, forced and free vibrations in single and multiple degree-of-freedom linear dynamical systems. Introduction to stability and control of linear dynamical systems. Implemented a new set of labs incorporating the Haptic Paddle. *Vanderbilt University: Fall 2008, Enrollment 63 students. Fall 2009, Enrollment 65 students. Fall 2010 Enrollment 71 students*

Senior Design. In the Senior Design course, students undertake a design project for a sponsoring organization (e.g. a private company, government lab, or university agency or lab). Projects in 2008 included robot design, robot motion planning, heat transfer models for industrial glass melters, rocketry, a science museum exhibit, alternative fuels research, and design of various car and motorcycle components, among others. *Vanderbilt University: Spring 2008, Enrollment 20 Students. Spring 2009, Enrollment 27 Students. Spring 2010, Enrollment 23 Students. Spring 2011, Enrollment 34 Students.*

Mechatronics (TA) Taught lab sections of this interdisciplinary course, which teaches the student to design and build mechatronic devices. Topics include mechanism design, motors and sensors, interfacing and programming microprocessors, mechanical prototyping, and creativity in the design process. Course labs and projects are performed in small student groups. Each group develops a microprocessor-controlled electromechanical device capable of producing an original piece of artwork. *Johns Hopkins University: Fall 2006. Approximately 20 students.*

Design and Analysis of Dynamic Systems (TA) Taught sections of the lab associated with this course, where students learned hands-on modeling and analysis of damped and undamped, forced and free vibrations in single and multiple degree-of-freedom linear dynamical systems. Introduction to stability and control of linear dynamical systems. *Johns Hopkins University: Spring 2004. Approximately 40 students.*

Surgery for Engineers (TA) Assisted with grading exams and teaching labs for this course for graduate engineers (biomedical, mechanical, and computer science), which provides an overview of clinical surgery and concentrates on instrument design and applying engineering principles to the practice of surgery. *Johns Hopkins Medical Institute: 2004. Approximately 12 students.*

PROFESSIONAL SERVICE

International Program, Editorial, and Review Committees

- 2010-present SPIE Medical Imaging Program Committee
- 2009-present ASME Dynamic Systems and Controls Division, Robotics Technical Committee
- 2007-present NSF Proposal Review Panelist (Many Panels)
- 2011 Joint-Agency (NIH, DOD, NSF, USDA, and DHS) Small Business Innovative Research (SBIR) Funding Opportunity Announcement (PAR10-279): Robotics Technology Development and Deployment. NIH Review Panel
- 2004 Volunteer Organizer, OR2020 Operating Room of the Future Workshop, Ellicott City, Maryland, March 18-20

Memberships

Institute of Electrical and Electronics Engineers (IEEE) - Robotics and Automation Society, Washington Computer Aided Surgery Society (WashCAS), Tau Beta Pi, Eta Kappa Nu, IEEE Mechatronics, Communications, and Power Societies, CISSRS Student Computer Integrated Surgery Society, Medical Image Computing and Computer-Assisted Intervention (MICCAI) Society

Sessions Chaired

- SPIE Medical Imaging 2011 session "Cardiac Applications".
- IEEE International Conference on Robotics and Automation 2010 session "Surgical Robot Design".
- IEEE International Conference on Robotics and Automation 2010 session "Vision and Motion Compensation for Medical Robots".
- IEEE International Conference on Robotics and Automation 2009 session "Sensing for Medical Robots."
- IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics 2008 session "Locomotion and Manipulation in Robots and Biological Systems."

Technical Reviews

- IEEE Transactions on Robotics
- International Journal of Robotics Research
- ASME Journal of Dynamic Systems, Measurement, and Control
- IEEE/ASME Transactions on Mechatronics
- Robotica

ASME Journal of Medical Devices

IEEE Sensors Journal

Journal of Medical and Biological Engineering

Journal of Applied Bionics and Biomechanics

IEEE International Conference on Robotics and Automation (ICRA)

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

Workshop on the Algorithmic Foundations of Robotics (WAFR)

IEEE International Conference on Biomedical Robotics and Biomechatronics (Bio-Rob)

Eurohaptics

Worldhaptics

International Symposium on Robot and Human Interactive Communication (RO-MAN)

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

ASME Design of Medical Devices Conference (DMD)

Workshop Organization

Robotics, Science and Systems: Enabling Technologies for Image-Guided Robotic Interventional Procedures, June 28, 2010

Workshop Participation

Snakes, Worms and Catheters: Continuum and Serpentine Robots for Minimally Invasive Surgery, ICRA, Anchorage, Alaska, May 3, 2010.

Needle Steering: Recent Results and Future Opportunities, MICCAI, September 6, 2008

WPI Robotics Symposium: Engineering the Revolution, Worcester, MA, October 16, 2007

Workshop on Medical Diagnosis, Micro Surgery, and Performance Evaluation, IEEE/RSJ International Conference on Intelligent Robots and Systems, Beijing, China, October 10, 2006

Medical Robotics and Welfare: Medical Robotics in the Surgical Theater, 2005 IEEE International Conference on Robotics and Automation, April 18, 2005

OR2020 Operating Room of the Future Workshop, Ellicott City, Maryland, March 18-20, 2004

Reality-Based Modeling of Tissues for Simulation and Robot-Assisted Surgery, 2003 IEEE/RSJ International Conference on Intelligent Robots and Systems, October 31, 2003

University Service

Vanderbilt Biomedical Engineering Faculty Search Committee.

Vanderbilt Department of Mechanical Engineering Design Curriculum Committee.

Vanderbilt Department of Mechanical Engineering Webpage Coordinator.

Vanderbilt Department of Mechanical Engineering Graduate Program Committee.

Vanderbilt School of Engineering Webpage Committee.

Vanderbilt School of Engineering Admission and Scholarship Committee.

Vanderbilt School of Engineering Committee on 1st Year Engineering Curriculum.

Vanderbilt School of Engineering Machine Shop Committee.

PERSONAL DATA

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