

John P. Swensen

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School of Engineering & Applied Science
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EDUCATION

- Ph.D. 2011** Mechanical Engineering Johns Hopkins University, Baltimore
Advisor: N. J. Cowan
Dissertation: Torsional Dynamics and Rotational Estimation of Tip-steerable Needles
- M.S. 2009** Mechanical Engineering Johns Hopkins University, Baltimore
- B.S. 2003** Electrical Engineering, Utah State University, Logan

POSITIONS HELD

- ◇ Yale University
 - 2011–present Postdoctoral Associate, GRAB Lab, Department of Mechanical Engineering & Materials Science
- ◇ Johns Hopkins University
 - 2006–2011 Graduate Research Assistant, Locomotion in Mechanical and Biological Systems (LIMBS) Laboratory, Department of Mechanical Engineering
- ◇ Ball Aerospace and Technologies Corp.
 - 2004–2006 Engineer I, Software Engineering
 - 2003–2004 Engineer Associate, Software Engineering
- ◇ Autonomous Solutions Inc.
 - 2001–2003 Engineering intern (commercial continuation of work done as undergraduate research assistant)
- ◇ Utah State University
 - 2001–2003 Team Leader, USU/Ball Aerospace Annual Robotics Competition
 - 2000–2001 Undergraduate Research Assistant, Center for Self-Organizing and Intelligent Systems
 - 1999 Undergraduate Research Volunteer, USUsat I

AWARDS AND HONORS

- ◇ **Rob Roy Fellowship**, Whiting School of Engineering, Johns Hopkins University, 2006-2007
- ◇ **Departmental Fellowship**, Department of Mechanical Engineering, Johns Hopkins University, 2006-2007
- ◇ **Magna Cum Laude**, Utah State University, 2003

PUBLICATIONS

Journal Articles (published)

- [J1] J. P. Swensen and A. M. Dollar. The connectedness of packed circles and spheres with application to conductive cellular materials. *PLoS ONE* 7(12):e51695, 12 2012,
<http://dx.doi.org/10.1371/journal.pone.0051695>.

Journal Articles (in prep)

- [J1] J. P. Swensen, R. Balasubramanian, and A. M. Dollar. Performance of serial underactuated mechanisms: Number of degrees of freedom and actuators. In prep.
- [J2] J. P. Swensen and N. J. Cowan. Estimation and control for tip-steerable needles with torsional dynamics. In prep.
- [J3] J. P. Swensen, V. Kallem, and N. J. Cowan. State estimation and control for tip-steerable needles. In prep.
- [J4] V. Kallem, J. P. Swensen, M. Dewan, G. D. Hager, and N. J. Cowan. Kernel-based visual servoing: Featureless control using spatial sampling functions. In prep.

Refereed Book Chapters/Collections

- [B1] J. P. Swensen, V. Kallem, and N. J. Cowan. Empirical characterization of convergence properties for kernel-based visual servoing. *Visual Servoing via Advanced Numerical Methods* pp. 23–38, 2010.
- [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. *Experimental Robotics XI*, vol. 54, pp. 485–494, 2009.

Refereed Conference Articles

- [C1] J. P. Swensen and A. M. Dollar. Towards hyper-redundant and super-configurable articulated structures. *Proc. ASME Conf. on Smart Materials, Adaptive Structures, and Intelligent System*, 2012.
- [C2] J. P. Swensen and N. J. Cowan. An almost global estimator on $SO(3)$ with measurement on S^2 . *Proc. of AACC American Control Conference (ACC), 2012*, pp. 1780–1786, 2012.
- [C3] J. P. Swensen and N. J. Cowan. Torsional dynamics compensation enhances robotic control of tip-steerable needles. *Proc. of IEEE International Conference on Robotics and Automation (ICRA), 2012*, pp. 1601–1606, 2012.
- [C4] V. Kallem, M. Dewan, J. P. Swensen, G. D. Hager, and N. J. Cowan. Kernel-based visual servoing. *Proc. IEEE/RSJ Int. Conf. Intell. Robots Syst.*, pp. 1975–1980, Oct. 2007.
- [C5] D. Acton, T. Towell, J. Schwenker, J. Swensen, D. Shields, E. Sabatke, L. Klingemann, A. Contos, B. Bauer, K. Hansen, et al. Demonstration of the james webb space telescope commissioning on the jst testbed telescope. *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, vol. 6265, p. 21, 2006.
- [C6] M. Torrie, D. Cripps, and J. Swensen. Joint architecture for unmanned ground vehicles (JAUGS) applied to autonomous agricultural vehicles. *Proc: Automation technology for off-road equipment*, pp. 1–12, 2002.

Non-refereed Articles Abstracts and Posters

- [A1] J. P. Swensen and N. J. Cowan. Modeling, estimation, and control of tip-steerable needles with torsional dynamics, Sept 2011. Presented at the Needle Steering Demo Session of 2011 IEEE/RSJ International Conference on Intelligent Robotics and Systems.
- [A2] J. P. Swensen, R. J. Webster III, and N. J. Cowan. Active cannulas: Applications to needle steering, Sept 2008. Presented at the Needle Steering Workshop at 2008 Medical Image Computing and Computer Assisted Intervention Society conference.
- [A3] J. P. Swensen, R. J. Webster III, and N. J. Cowan. Image guidance of active cannulas, Jan 2009. Presented at the IEEE-RAS/IFRR Winter School of Robotics Science on Medical Robotics and Computer-Integrated Interventional Systems.

INVITED SEMINARS

- ◇ Control and Estimation for Steerable Needles, Invited speaker at Pathways to Clinical Needle Steering, *International Conference on Robotics and Automations (ICRA)*, 2012
- ◇ Tip-Steerable Needles, *Foundations of Robotics Seminar Series*, Carnegie Mellon University, 2011

ADVISING AND MENTORING

Graduate Students (mentor)

- ◇ Ahsan Nawroj, Ph.D expected 2017

Undergraduate Students (mentoring and supervising)

- ◇ Chinmay Jaju, Mechanical Engineering Class of 2015
- ◇ Usman Anwer, Mechanical Engineering Class of 2013

INSTRUCTION AND COURSE DEVELOPMENT

Johns Hopkins University, 2006–present

- ◇ **ME 530.489: *The Kalman Filter*** (co-developed and co-instructed)
 - *Semesters taught (enrollment)*: Intersession 2011 (20)
 - *Course description*: Since its advent, the Kalman filter has been the workhorse for estimation of dynamical systems spanning virtually all engineering disciplines: spacecraft, airplanes, submarines, automobiles, factory automation, electronics, and more. This one credit course teaches the derivation of the Kalman filter from first principles. It covers the necessary basic probability theory and culminates with a discussion of Dr. Kalman's seminal paper on the subject, written while he was living in Baltimore in 1960.
- ◇ **ME 530.241: *Electronics and Instrumentation*** Final project advisor
 - *Semester*: Spring 2008
 - *Course responsibilities*: The final project was to develop a field-ready instrumentation amplifier for measuring electric signals in weakly electric knifefish. My role as project advisor was to teach the use of PCB software, give instruction on proper component selection and circuit layout techniques, and oversee the design, population, and testing of the student groups' circuits.
- ◇ **ME 530.241: *Electronics and Instrumentation*** Course teaching assistant
 - *Semester*: Fall 2006
 - *Course responsibilities*: I was responsible for conducting lab sessions, grading homework, holding office hours, and delivering test review sessions.

Ball Aerospace and Technologies Corp., 2003–2006

- ◇ **Embedded Linux: An IR&D alternative to VxWorks** *Co-instructor* (1995). A 3 lecture series on the development and use of embedded real-time Linux as an alternative to VxWork for cost reduction in internal research and development projects, as well as other non-flight-rated systems.
- ◇ **MicroC OS II: The Real Time Kernel** *Book club moderator* (1996). Led a book club that investigates the low level details of implementing a real-time operating system and practical consequences of real-time systems.

PROFESSIONAL ACTIVITIES

Advisory Committees

- ◇ Industrial Advisor to the Department of Electrical Engineering at Utah State University while working at Ball Aerospace and Technologies Corp., 2005-2006

Technical Reviews

- ◇ Journal reviews:
IEEE Transactions on Robotics
- ◇ Reviewer for several annual conferences, including IEEE International Conference on Biomedical Robotics and Biomechanics, IEEE International Conference on Advanced Robotics, IFAC American Controls Conference, IEEE/RSJ International Workshop on Intelligent Robots and Systems, IEEE International Conference on Computer Vision, Workshop on the Algorithmic Foundations of Robotics, IEEE Conference on Decision and Control, and The International Symposium of Robotics Research, Robots: Science and Systems.

Workshops and Tutorials

- ◇ Needle Steering Workshop Invited Speaker, *IEEE International Conference on Robotics and Automations (ICRA)*, 2012
- ◇ Speaker, *Sixth NSF/Northeast Control Workshop*, 2010
- ◇ Workshop Attendee, Speaker, and Poster Presenter, *Winter School on Medical Robotics and Computer-Integrated Interventional Systems*, 2009
- ◇ Needle Steering Workshop and Poster Presenter, *Medical Image Computing and Computer Assisted Intervention (MICCAI) conference*, 2008

Professional Memberships

- ◇ Institute for Electrical and Electronic Engineers (IEEE; Control Systems and Robotics & Automation Societies)
- ◇ American Society of Mechanical Engineers (ASME)
- ◇ Active contributor to the GNU Octave software for numerical computing

UNIVERSITY SERVICE

Johns Hopkins University, Department of Mechanical Engineering (ME)

- 2008–2011 Website Administrator, Mechanical Engineering Graduate Student Association (MEGA)
- 2006–2011 Committee Member, Mechanical Engineering Graduate Student Association (MEGA)

Utah State University, Department of Electrical and Computer Engineering (ECE)

- 1999–2003 Active Member IEEE (Treasurer: 2001–2002; Public Relations: 2002–2003)

Utah State University, College of Engineering

- 2000–2001 Student Advisory Council