

Kyle B. Reed

kylereed@eng.usf.edu

• <http://reedlab.eng.usf.edu>

• (813) 974-2385

last updated April 17, 2012

RESEARCH INTERESTS

My primary research interests are in designing intelligent devices that interact with humans, particularly doctors and physical therapists. I strive to develop robots that follow implicit human interactions instead of requiring users to adapt to the apparatus. Additionally, I am continuing to study how the perception of a robot and surrounding environment affects the performance of an individual.

EDUCATION

Northwestern University, Evanston, Illinois

Ph.D. in Mechanical Engineering

June, 2007

- Thesis: *Understanding the Haptic Interactions of Working Together* (Advisor: Michael A. Peshkin)

Northwestern University, Evanston, Illinois

M.S. in Mechanical Engineering

December, 2004

- Thesis: *Specialization in Dyadic Shared Manual Tasks*

University of Tennessee, Knoxville, Tennessee

B.S. in Mechanical Engineering

May, 2001

- Minors in Material Science and Engineering Communications

RESEARCH EXPERIENCE

University of South Florida, Assistant Professor

August, 2009 – present

- Mechanical Engineering Department

Johns Hopkins University, Post-Doctoral Fellow

September, 2007 – July, 2009

- Mentored by Allison M. Okamura and Noah J. Cowan
- Contributed to the design of a steerable needle with image based feedback for medical interventions.
- Formulated control algorithms to compensate for torsional friction in the steerable needle.
- Integrated stochastic models of the steerable needle with planning and control algorithms.
- Conceived and designed a portable mechanism to correct irregular walking patterns in patients with cerebellar damage.

Northwestern University, Graduate Research Assistant

2002 – 2007

- Designed and built an experimental testbed for studying human-human and human-robot physical interaction. Conceived and performed psychophysical experiments.
- Discovered an unsuspected latent capacity for haptic communication between partners. Dyads developed a new emergent strategy to divide the task while improving task performance.
- Modeled and implemented the human interaction in a robotic partner that surreptitiously took the place of one participant.
- Programmed the graphics, control algorithms, data acquisition, and servo control in C on QNX.

Los Alamos National Lab – Mechanical Engineer Intern

Summers of 2000 & 2001

- Finite element and probabilistic analysis to determine the strength of explosion confinement vessels. Designed simulations to compare theoretical to actual results with high correlations.

Los Alamos National Lab – Computer Programmer Intern

Summers of 1998 & 1999

- Designed and wrote data analysis software for a missile explosion simulation.

REFEREED JOURNAL PUBLICATIONS

- [J1] I. Handzic, E. Barno, E. V. Vasudevan, and K. B. Reed, “Design and pilot study of a gait enhancing mobile shoe,” *Journal of Behavioral Robotics, Special Issue on Assistive Robotics*, vol. 2, no. 4, pp. 193–201, 2012.
- [J2] K. B. Reed, A. Majewicz, V. Kallem, R. Alterovitz, K. Goldberg, N. J. Cowan, and A. M. Okamura, “Robot-assisted needle steering: Technology to improve medical interventions,” *IEEE Robotics & Automation Magazine*, vol. 18, no. 4, pp. 35–46, 2011.
- [J3] S. Misra, K. B. Reed, B. W. Schafer, K. T. Ramesh, and A. M. Okamura, “Mechanics of flexible needles robotically steered through soft tissues,” *Int. J. Robot. Res.*, vol. 29, no. 13, pp. 1640–1660, 2010.
- [J4] K. B. Reed, A. M. Okamura, and N. J. Cowan, “Modeling and control of needles with torsional friction,” *IEEE Trans. Biomed. Eng.*, vol. 56, no. 12, pp. 2905–2916, 2009.
- [J5] K. B. Reed and M. A. Peshkin, “Physical collaboration of human-human and human-robot teams,” *IEEE Trans. on Haptics*, vol. 1, no. 2, pp. 108–120, 2008.
- [J6] K. B. Reed, M. A. Peshkin, M. J. Hartmann, M. Grabowecy, J. Patton, and P. M. Vishton, “Haptically linked dyads: Are two motor-control systems better than one?,” *Psychological Science*, vol. 17, no. 5, pp. 365 – 366, 2006.

BOOK CHAPTERS

- [B1] N. J. Cowan, K. Goldberg, G. S. Chirikjian, G. Fichtinger, R. Alterovitz, K. B. Reed, V. Kallem, W. Park, S. Misra, and A. M. Okamura. “Robotic Needle Steering: Design, Modeling, Planning, and Image Guidance”. In J. Rosen, B. Hannaford, and R. Satava, Eds., *Surgical Robotics - Systems, Applications, and Visions*, Springer, December, 2011, ISBN: 978-1-4419-1125-4.
- [B2] K. B. Reed. “Cooperative Physical Human-Human and Human-Robot Interaction”. In A. Peer and C. Giachritsis, Eds., *Immersive Multimodal Interactive Presence*, Springer Series on Touch and Haptic Systems, 2012, ISBN: 978-1-4471-2754-3.

REFEREED CONFERENCE PUBLICATIONS

- [C1] K. B. Reed, “Assessment of student’s confidence of learned knowledge,” in *American Society for Engineering Education (ASEE) Annual Conference*, 2012. in press.
- [C2] I. Handzic, E. Vasudevan, and K. B. Reed, “Developing a gait enhancing mobile shoe to alter over-ground walking coordination,” in *Proc. IEEE Int. Conf. Robot. Autom.*, 2012. in press.
- [C3] S. McAmis and K. B. Reed, “Application of haptic feedback to a combot,” pp. 553–557, March 2012.
- [C4] J. R. Cooper, M. M. Wernke, and K. B. Reed, “The effects of incongruent feedback on bimanual task performance,” pp. 301–305, March 2012.
- [C5] K. Khokar, R. Alqasemi, K. B. Reed, and R. Dubey, “Laser assisted combined teleoperation and autonomous control,” in *13th Robotics & Remote Systems for Hazardous Environments*, 2011.
- [C6] S. McAmis and K. B. Reed, “Symmetry modes and stiffnesses for bimanual rehabilitation,” in *Proc. IEEE Int. Conf. Rehabilitation Robotics*, pp. 1106–1111, 2011.
- [C7] C. Honeycutt, J. Sushko, and K. B. Reed, “Asymmetric passive dynamic walker,” in *Proc. IEEE Int. Conf. Rehabilitation Robotics*, 2011.
- [C8] I. Handzic and K. B. Reed, “Motion controlled gait enhancing mobile shoe for rehabilitation,” in *Proc. IEEE Int. Conf. Rehabilitation Robotics*, 2011.

- [C9] H. G. Malabet, R. A. Robles, and K. B. Reed, “Symmetric motions for bimanual rehabilitation,” in *Proc. IEEE/RSJ Int Intelligent Robots and Systems (IROS) Conf*, pp. 5133–5138, 2010.
- [C10] K. Khokar, K. Reed, R. Alqasemi, and R. Dubey, “Laser-assisted telerobotic control for enhancing manipulation capabilities of persons with disabilities,” in *Proc. IEEE/RSJ Int. Conf. Intell. Robots Syst.*, pp. 5139–5144, IEEE.
- [C11] A. Majewicz, T. Wedlick, K. B. Reed, and A. M. Okamura, “Evaluation of needle steering in ex vivo tissue,” in *Proc. IEEE Int. Conf. Robot. Autom.*, pp. 2068–2073, May 2010.
- [C12] W. Park, K. B. Reed, A. M. Okamura, and G. S. Chirikjian, “Estimation of model parameters for flexible needles,” in *Proc. IEEE Int. Conf. Robot. Autom.*, pp. 3703–3708, May 2010.
- [C13] S. Misra, K. B. Reed, K. T. Ramesh, and A. M. Okamura, “Observations of needle-tissue interactions,” in *Conf. Proc. IEEE Eng. Med. Biol. Soc.*, pp. 262–265, September 2009.
- [C14] K. B. Reed, A. M. Okamura, and N. J. Cowan, “Controlling a robotically steered needle in the presence of torsional friction,” in *Proc. IEEE Int. Conf. Robot. Autom.*, pp. 3476–3481, May 2009.
- [C15] S. Misra, K. B. Reed, B. W. Schafer, K. T. Ramesh, and A. M. Okamura, “Observations and models for needle-tissue interactions,” in *Proc. IEEE International Conference on Robotics and Automation ICRA '09*, pp. 2687–2692, May 12–17, 2009.
- [C16] A. de Groot, R. Decker, and K. B. Reed, “Gait enhancing mobile shoe (GEMS) for rehabilitation,” in *Proc. Joint Eurohaptics Conf. and Symp. on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, pp. 190–195, March 2009.
- [C17] K. B. Reed, “Compensating for torsion windup in steerable needles,” in *Proc. IEEE Conf. Biorob*, (Scottsdale, AR, USA), pp. 936–941, October 2008.
- [C18] K. B. Reed, V. Kallem, R. Alterovitz, K. Goldberg, A. M. Okamura, and N. J. Cowan, “Integrated planning and image-guided control for planar needle-steering,” in *Proc. IEEE Conf. Biorob*, (Scottsdale, AR, USA), pp. 819–824, October 2008.
- [C19] S. Misra, K. B. Reed, A. S. Douglas, K. T. Ramesh, and A. M. Okamura, “Needle-tissue interaction forces for bevel-tip steerable needles,” in *Proc. IEEE Conf. Biorob*, pp. 224–231, October 2008.
- [C20] K. B. Reed, J. Patton, and M. Peshkin, “Replicating human-human physical interaction,” in *Proc. IEEE Int. Conf. Robot. Autom.*, pp. 3615–3620, April 2007.
- [C21] K. B. Reed, M. Peshkin, M. J. Hartmann, J. Patton, P. M. Vishton, and M. Grabowecy, “Haptic cooperation between people, and between people and machines,” in *Proc. IEEE/RSJ Int. Conf. Intell. Robots Syst.*, pp. 2109–2114, October 2006.
- [C22] K. B. Reed, M. Peshkin, M. J. Hartmann, J. E. Colgate, and J. Patton, “Kinesthetic interaction,” in *Proc. IEEE Int. Conf. Rehabilitation Robotics*, pp. 569–574, June 2005.
- [C23] K. B. Reed, M. Peshkin, J. E. Colgate, and J. Patton, “Initial studies in human-robot-human interaction: Fitts’ law for two people,” in *Proc. IEEE Int. Conf. Robot. Autom.*, pp. 2333–2338, April 2004.

NON-REFEREED CONFERENCE ARTICLES, ABSTRACTS, AND POSTERS

- [A1] C. Honeycutt, J. Sushko, and K. B. Reed, “Passive Dynamic Walkers and Their Effect on Gait Rehabilitation”, USFs Eighth Annual Undergraduate Research Symposium, Tampa, April, 2010.
- [A2] K. B. Reed, “Haptic Collaboration of Human-Human and Human-Robot Teams,” IEEE/RSJ International Conference on Intelligent Robotic Systems, Workshop on Haptic Human-Robot Interaction, St. Louis, USA, October, 2009.

- [A3] A. de Groot, R. Decker, and K. B. Reed. “Design of the Gait Enhancing Motion Shoe (GEMS) for the Improvement of Gait Irregularity Due to Stroke,” Colonial Academic Alliance Undergraduate Research Conference, Baltimore, USA, April, 2009.
- [A4] K. B. Reed, N. Cowan, and A. Okamura. “Torsion Windup in Steerable Needles,” Needle Steering Workshop during Medical Image Computing and Computer-Assisted Intervention (MICCAI), New York, USA, September, 2008.

GRANTS AND CONTRACTS

Current

1. National Institutes of Health 1R21HD066200-01: “Gait Enhancing Mobile Shoe for Rehabilitation” K. B. Reed (PI) and Amy Bastian. \$102,876; 9/13/10 - 8/31/12, including one-year no-cost extension.

Completed

1. New Florida Clustering Award Program (New Florida Initiate) in cooperation with UF and UCF, PI: Tom Weller, awarded \$200,000 to USF, 2011.
2. National Science Foundation Travel Grant for visiting foreign research labs and conference, 2009.
3. National Science Foundation Graduate Fellowship, K. B. Reed. For approximately \$110,000 over three years (9/1/02-8/31/05).

ADVISING

Doctoral Students

- Ismet Handzic - Gait Enhancing Mobile Shoe for Rehabilitation Ph.D. expected in 2014
- Samuel McAmis - Symmetric Bimanual Trainer for Stroke Ph.D. expected in 2015

Masters Thesis Students

- Ahmad Manasrah - Motion Tracking using Multiple Kinect Sensors Master’s expected Summer, 2012
- John Sushko, M.S. in Mechanical Engineering, 2011. “Asymmetric Passive Dynamic Walker Used to Examine Gait Rehabilitation Methods”.
- Craig Honeycutt, M.S. in Mechanical Engineering, 2011. “Utilizing a Computational Model for the Design of a Passive Dynamic Walker”.
- William Christian, M.S. in Mechanical Engineering, 2010. “Exploring the Human Interactivity with a Robot to Obtain the Fundamental Properties of Materials”.

Undergraduate Students

- Joseph Gaskell - Force Feedback Glove Honors Thesis expected Spring, 2012
- Ben Matlack - Gait Efficiency Enhancing Shoe
- Nicole Valles - Overriding Natural Force Attenuation Summer, 2011
- Sarah Salgado - Bimanual Motion Symmetries Summer, 2011
- Tahiem Williams - Evaluation of Vibration Properties of Boney and Soft Tissues 2011
- Laura Carpp - Gait Enhancing Mobile Shoe for Rehabilitation 2009/2010
- Hernando Gonzalez Malabet - Symmetric Bimanual Trainer for Stroke 2009/2010
- Rafael Alvarez Robles - Robot-Assisted Balance Trainer 2009/2010
- Ryan Decker - Gait Enhancing Mobile Shoe for Rehabilitation 2008
- Allison de Groot - Gait Enhancing Mobile Shoe for Rehabilitation Summer, 2008
through the NSF Research Experience for Undergrads (REU) Program

High School Students

- Ethan Huber - Robot-Assisted Balance Trainer Summer, 2010
- Kyle Dunn - Robot-Assisted Balance Trainer Summer, 2010

Thesis Committees

- Derek Lura, Ph.D. in Mechanical Engineering, 2012. "The Creation of a Robotics Based Human Upper Body Model for Predictive Simulation of Prostheses Performance," Major Professor R. Dubey.
- Joseph Pishnery, M.S. in Mechanical Engineering, 2012. "A Statically Balanced Shape-Shifting Surface," Major Professor C. Lusk.
- John Sushko, M.S. in Mechanical Engineering, 2011. "Asymmetric Passive Dynamic Walker Used to Examine Gait Rehabilitation Methods," Major Professor K. B. Reed.
- Craig Honeycutt, M.S. in Mechanical Engineering, 2011. "Utilizing a Computational Model for the Design of a Passive Dynamic Walker," Major Professor K. B. Reed.
- William Christian, M.S. in Mechanical Engineering, 2010. "Exploring the Human Interactivity with a Robot to Obtain the Fundamental Properties of Materials," Major Professor K. B. Reed.
- Ismet Handzic, M.S. in Mechanical Engineering, 2011. "Design and Testing of a Motion Controlled Gait Enhancing Mobile Shoe (GEMS) for Rehabilitation," Major Professor K. B. Reed.
- Chester Smith, M.S. in Mechanical Engineering, 2011. "Modeling and Parameter Study of Bistable Spherical Compliant Mechanisms," Major Professor C. Lusk.
- Patrick McKnight, M.S. in Mechanical Engineering, 2010. "Finite Element Analysis of Thermoelectric Systems with Applications in Self Assembly and Haptics," Major Professor N. Crane.
- Jon Freeberg, M.S. in Mechanical Engineering, 2010. "A Study of Omnidirectional Quad-Screw-Drive Configurations for All-Terrain Locomotion," Major Professor S. Wilkinson.
- James Tuckerman, M.S. in Mechanical Engineering, 2010. "Capillary Self-Assembly and its Application to Thermoelectric Coolers," Major Professor N. Crane.
- Punya A. Basnayaka, M.S. in Mechanical Engineering, 2010. "Low-Level Programming of a 9-Degree-of-Freedom Wheelchair-Mounted Robotic Arm with the Application of Different User Interfaces," Major Professor R. Dubey.
- Fabian Farelo, M.S. in Biomedical Engineering, 2009. "Task Oriented Simulation and Control of a Wheelchair Mounted Robotic Arm," Major Professor R. Dubey.

INSTRUCTION AND COURSE DEVELOPMENT

Haptics , University of South Florida	Spring, 2012
Mechanical Controls , University of South Florida	Fall, 2011
Advanced Engineering Mathematics II , University of South Florida	Fall, 2011
Haptics , University of South Florida	Spring, 2011
Mechanical Controls , University of South Florida	Fall, 2010
Haptics , University of South Florida	Spring, 2010
Mechanical Controls , University of South Florida	Fall, 2009
Electronics and Instrumentation , Johns Hopkins University	Spring, 2009
Guest Lecturer , Northwestern University	Spring quarters of 2006 & 2007
Strain Gauge Workshop , Northwestern University	June, 2004

- Formulated and taught a workshop on installing and instrumenting devices with strain gauges. Instructed graduate students and faculty in the Mechanical and Biomedical Engineering departments.

English Teacher, Shenzhen, China **2001 – 2002**

- Designed and taught a two month course on engineering English to workers at Foxconn, an electronics manufacturing company.
- Created and taught English as a second language classes to high school and middle school students.

Teaching Assistant for Freshman Engineering, University of Tennessee **1999 – 2001**

- Managed design teams, taught labs, and conducted help sessions for an integrated Freshman Engineering curriculum. Helped create a video of the program for advertising.

INVITED PRESENTATIONS

1. Guest lecturer in Movement Science 2 (PHT 6178) at USF School of Physical Therapy & Rehabilitation Sciences on “Haptics for Physical Therapists”, March, 2012.
2. Invited talk on “Interacting with human-centered rehabilitation devices at Florida Institute for Human and Machine Cognition (IHMC), 2011.
3. Invited presentation on “Home-based Rehabilitation” at the Emergency Management & Robotics for Hazardous Environments conference, 2011.
4. Workshop on Haptic Human-Robot Interaction at Int. Conf. on Intelligent Robots and Systems (IROS), to occur in October, 2009.
5. Computational Neuroscience Laboratory, Advanced Telecommunications Research (ATR) Institute International, Kyoto, Japan, May, 2009.
6. Workshop on Innovation of Medical Robotics at IEEE Int. Conf. on Robotics and Automation (ICRA), May, 2009.
7. School of Engineering and Textiles, Philadelphia University, Philadelphia University, PA, March, 2009.
8. Winter School Mini-Symposium on Medical Robotics and Computer-Integrated Interventional Medicine, Johns Hopkins University, Baltimore, Maryland, January, 2009.
9. Mechanical Engineering Department, University of South Florida, Tampa, FL, January, 2009.
10. Institute of Automatic Control Engineering, Technical University of Munich, Germany, December, 2008.
11. Mechanical and Aerospace Department, Nanyang Technological University, Singapore, April, 2008.
12. Laboratory for Computational Sensing and Robotics, Johns Hopkins University, Baltimore, MD, February, 2007.
13. Mechanical Engineering Department, Union College, Schenectady, NY, February, 2007.

HONORS AND AWARDS

da Vinci award for NÜberwalker, by National Multiple Sclerosis Society **2006**

- Team project to design a body weight support system for rehabilitation.

Awarded the National Science Foundation (NSF) Graduate Research Fellowship **2001**

Tau Beta Pi Engineering Honor Society induction **1999**

Pi Tau Sigma Mechanical Engineering Society induction **1999**

Finner Family Scholarship awarded twice. **1998 and 1999**

PROFESSIONAL ACTIVITIES

Advisor for the USF Robotics Interest Group.

Session Chair of Medical, Rehabilitative, and Assistive Robotics session at the Emergency Management & Robotics for Hazardous Environments conference (EPRRS), 2011.

Associated Editor for International Conference on Intelligent Robots and Systems (IROS) Invited Session: “Human-Robot-Human Interaction for Rehabilitation”, 2010.

Session co-Chair at International Conference on Robotics and Automation (ICRA), 2010.

Member of the American Society of Mechanical Engineers (ASME).

Member of the Institute of Electrical and Electronics Engineers (IEEE).

Reviewer for:

National Science Foundation (NSF) Panel

Journal of Neurophysiology

IEEE Transactions on Haptics

IEEE Transactions on Robotics

IEEE Transactions on Biomedical Engineering

IEEE Transactions on Automation Science and Engineering

IEEE Transactions on Systems, Man, and Cybernetics–Part A: Systems and Humans Presence

ASME Journal of Mechanical Design

IEEE/ASME International Conference on Advanced Intelligent Mechatronics

Workshop on the Algorithmic Foundations of Robotics (WAFR)

IEEE International Conference on Robotics and Automation (ICRA)

World Haptics Conference (WHC)

Haptics Symposium

International Conference on Rehabilitation Robotics (ICORR)

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

International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)

American Society of Engineering Education (ASEE)

IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob)

COMMUNITY SERVICE

Lab tour to 40 Girl Scouts, June, 2011.

Help setup and give a lab tour to 60 5th graders from Robles Elementary School, April, 2011.

Haptics demonstrations to two classes of 5th graders at Robles Elementary School, April, 2011.

Judge for the Research Experience for Undergraduates (REU) Symposium, April, 2011.

Lab tour to high school students from Plant High School, July, 2010.

Judge for the Research Experience for Undergraduates (REU) Symposium, April, 2010

Judge for the College of Engineering Research Day Poster Competition, October 2009.

Volunteered at Asian Youth Services serving underprivileged children in Chicago, 2003-2007.

- Mentored and tutored kids (grades 7-12) weekly in all subjects.
- Setup and maintained 10 Linux computers for daily use by the kids and the director.
- Coauthored a proposal to the Hewitt Associates Foundation for funding. The \$15,000 grant was awarded to Asian Youth Services in December, 2006.

Organized lab tours of the Laboratory for Intelligent Mechanical Systems (LIMS).

- Robot operating buddies of Schaumburg, 2006; Bring you daughters to work day, 2005, 2006, & 2007; Cubscouts, 2005; Middle school students from surrounding schools, 2005.

Judge for the Tennessee State Science Olympiad competition in 2000 and 2001.

Last updated: April 17, 2012

<http://www.eng.usf.edu/~kylereed/CV.pdf>