

KEVIN B. FITE

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Department of Mechanical and Aeronautical Engineering
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Professional Interests Design, modeling, and control of electromechanical systems. Telerobotic systems. Applied nonlinear control. Design and control of fluid-power systems. Design and control of upper- and lower-extremity prostheses.

Education **VANDERBILT UNIVERSITY** Nashville, TN
December 2002
Doctor of Philosophy in Mechanical Engineering
Thesis: *Multivariable Loop-Shaping Control Design for a Bilateral Telemanipulator System.*
Doctoral major: System Dynamics and Control Theory.
Doctoral minor: Mathematics.

VANDERBILT UNIVERSITY Nashville, TN
May, 1999
Master of Science
Thesis: *Active Control of an Electrostatic Bearing for Microelectromechanical Devices.*

VANDERBILT UNIVERSITY Nashville, TN
May, 1997
Bachelor of Engineering *magna cum laude*

Honors and Awards NASA Graduate Student Research Program Fellowship 1997-2000
I.B.M. Fellowship, Vanderbilt University 1997-2001
B.E. *magna cum laude*, Vanderbilt University, 1997
Tau Beta Pi
Vanderbilt Undergraduate Summer Research Program 1996

Employment **Assistant Professor**, Clarkson University, August 2007 – Present

Research Associate, Vanderbilt University, January 2003 – August 2007

- August 2006 – August 2007: Conducting research entitled “Feasibility Study of MICE Powered Upper and Lower Extremity Prostheses.” Funded by ARO/Aerodyne. Role: PI. The major goal of this study involves the design, fabrication, and control of an electromagnetically actuated transfemoral prosthesis for use with a miniature internal combustion engine (MICE) generator being developed at Aerodyne Research, Inc.
- July 2005 – August 2007: Conducting research entitled “Anthropomorphic Transhumeral Prosthesis for Revolutionizing Prosthetics.” Funded by DARPA under a program entitled, “Revolutionizing Prosthetics.” This work focuses on the development of a high degree-of-freedom dexterous transhumeral prosthesis powered using chemofluidic actuation. Current research entails the design of a liquid-fueled prosthetic arm with nine actuated degrees-of-freedom with integrated power, sensing, and control.
- January 2003 – August 2005: Conducted research entitled “A Monopropellant-Powered Actuator for the Development of a Powered Exoskeleton.” Funded by DARPA under a program entitled, “Exoskeletons for Human Performance Augmentation.” Additionally

funded by NSF. This research seeks the development of a power supply and actuation system with the energy and power density appropriate for human-scale robotics. Current work entails the design and Lyapunov-based control of a liquid-fuel powered pneumatic actuator, as well as the development of high-performance liquid and hot-gas servovalves.

- September 2003 – August 2005: Participated in research entitled “Image-Guided Otologic Surgery.” Funded by NIH. The research is developing a robotic-assisted surgical system that uses 3-D CT imaging and real-time tracking of the surgical field in order to guide the control of a robot manipulator in otologic surgery, providing a means for avoiding critical anatomic structures that would otherwise be unseen in the conventional human-controlled procedure.

Research Assistant, Vanderbilt University, June 1997 - December 2002

- June 1999 – December 2002: Developed an architecture and control methodology for bilateral telemanipulation systems. Implemented a single degree-of-freedom unscaled telemanipulation system in the presence and absence of time-delay. Extended the validated approach to the multivariable case, utilizing impedance control of the manipulator pair and multivariable tools to design the controller and analyze its performance and stability. Implemented the methodology on a man-amplifier telemanipulation system and demonstrated the ability to provide teleoperative transparency and a robustly stable closed-loop system.
- September 1998 – May 1999: Developed a sliding mode control law for a compliant mechanism based micromanipulator. Experimentally validated a method for active damping of the lightly damped structure using a technique for self-sensing based on actuator states.
- June 1997 – August 1998: Conducted research entitled “Active Electrostatic Bearings for Microelectromechanical Devices.” Funded by NASA. Designed an electrostatic bearing system, conducted dimensional analysis for mesoscale evaluation, and derived a sliding mode control law to actively regulate rotor position.

Journal Publications

Fite, K. B., Mitchell, J. E., Shen, X., Wait, K. W., Withrow, T. J., and Goldfarb, M. A Gas-Actuated Anthropomorphic Prosthesis for Transhumeral Amputees. *IEEE Transactions on Robotics*, vol. 24, no. 1, 159-169, February, 2008.

Barman, A, Fite, K. B., and Goldfarb M. Unified Control of Asymmetric Systems. *ASME Journal of Dynamic Systems, Measurement, and Control*, in review.

Fite, K. B., and Goldfarb, M. Multivariable Loop-Shaping in Bilateral Telemanipulation. *ASME Journal of Dynamic Systems, Measurement, and Control*, vol. 128, no. 3, pp. 482-488, September, 2006.

Shields, B. L., Fite, K. B., and Goldfarb, M. Design, Control, and Energetic Characterization of a Solenoid Injected Monopropellant Powered Actuator. *IEEE/ASME Transactions on Mechatronics*, vol. 11, no. 4, pp. 477-487, August 2006.

Fite, K. B. and Goldfarb, M. Design and Energetic Characterization of a Proportional Injector Monopropellant-Powered Actuator. *IEEE/ASME Transactions on Mechatronics*, vol. 11, no. 2, pp. 196-204, April 2006.

Fite, K. B., Mitchell, J. E., Barth E. J., and Goldfarb, M. A Unified Force Controller for a Proportional-Injector Direct-Injection Monopropellant-Powered Actuator. *ASME Journal of Dynamic Systems, Measurement, and Control*, vol. 128, no. 1, pp. 159-164, March 2006.

Fite, K. B., Goldfarb, M., and Rubio, A. Loop Shaping for Transparency and Stability Robustness in Time-Delayed Bilateral Telemanipulation. *ASME Journal of Dynamic Systems, Measurement, and Control*, vol. 126, no. 3, pp. 650-656, September 2004.

Fite, K. B., Shao, L., and Goldfarb, M. Loop-Shaping for Transparency and Stability Robustness in Bilateral Telemanipulation. *IEEE Transactions on Robotics and Automation*, vol. 20, no. 3, pp. 620-624, 2004.

Fite, K. B., Speich, J. E., and Goldfarb, M. Transparency and Stability Robustness in Two-Channel Bilateral Telemanipulation. *ASME Journal of Dynamic Systems, Measurement, and Control*, vol. 123, no. 3, pp. 400-407, 2001.

**Conference
Publications**

Hoover, C. D. and Fite, K. B. Preliminary Evaluation of Myoelectric Control of an Active Transfemoral Prosthesis During Stair Ascent. *2010 ASME Dynamic Systems and Control Conference*, TuBT2.3, pp. 1-8, September 2010.

Tucker, M. R. and Fite, K. B. Passive Damping with Electrical Power Generation for a DC Motor Actuated Transfemoral Prosthesis. *2010 IEEE/ASME International Conference on Advanced Intelligent Mechatronics*, pp. 13-18, July 2010.

Fite, K. B., Withrow, T. J., Shen, X., Wait, K. W., Mitchell, J. E., and Goldfarb, M. Progress Towards the Development of a Highly Functional Transhumeral Prosthesis. *10th International Conference on Rehabilitation Robotics*, pp. 205-211, June 2007.

Fite, K., Mitchell, J., Sup, F., and Goldfarb, M. Design and Control of an Electrically Powered Knee Prosthesis. *10th International Conference on Rehabilitation Robotics*, pp. 902-905, June 2007.

Fite, K. B., Wait, K. W., Withrow, T. J., and Goldfarb, M. A Gas-Actuated Anthropomorphic Transhumeral Prosthesis. *In Proceedings of the IEEE International Conference on Robotics and Automation*, pp. 3748-3754, April 2007.

Fite, K. B., Wait, K. W., Withrow, T. J., and Goldfarb, M. Design of an Anthropomorphic Upper Extremity Prosthesis. *Proceedings of ASME International Mechanical Engineering Conference and Exposition*, ref. 13604, November 2006.

Fite, K. B., Withrow, T. J., Wait, K. W., and Goldfarb, M. Liquid-Fueled Actuation for an Anthropomorphic Upper-Extremity Prosthesis. *Proceedings of the 28th IEEE EMBS Annual International Conference*, pp. 5638-5642, 2006.

Fite, K. B. and Goldfarb, M. Servo Control and Energetic Characterization of a Proportionally Injected Liquid-Fueled Actuator for Power-Autonomous Mobile Robots. *Proceedings of ASME International Mechanical Engineering Conference and Exposition*, ref. 81398, November 2005.

Shields, B. L., Goldfarb, M., and Fite, K. B. Force and Position Control of a Solenoid Injected Monopropellant Powered Actuator. *Proceedings of ASME International Mechanical Engineering Conference and Exposition*, ref. 59442, November 2004.

Fite, K. B., Mitchell, J. E., Barth, E. J., and Goldfarb, M. Design and Characterization of a Rotary Actuated Hot Gas Servovalve. *Proceedings of ASME International Mechanical Engineering Conference and Exposition*, ref. 59727, November 2004.

Li, B., Barth, E. J., Fite, K., and Goldfarb, M. Design of a Hot Gas Vane Motor. *Proceedings of ASME International Mechanical Engineering Conference and Exposition*, ref. 59581, November 2004.

Fite, K. B., Mitchell, J. E., Barth, E. J., and Goldfarb, M. Sliding Mode Control of a Direct Injection Monopropellant-powered Arm. *Proceedings of the 2004 American Control Conference*, pp. 4461-4466, July 2004.

Fite, K. B. and Goldfarb, M. Multivariable Control Design for a Bilateral Telemanipulator. In *Proceedings of ASME International Mechanical Engineering Conference and Exposition*, ref. 42537, November 2003.

Fite, K. B., Goldfarb, M., and Rubio, A. Transparent Telemanipulation in the Presence of Time Delay. In *Proceedings of IEEE/ASME International Conference on Advanced Intelligent Mechatronics*, pp. 254-259, July 2003.

Fite, K. B., Speich, J. E., and Goldfarb, M. On the Use of Two Channels for Bilateral Telemanipulation. In *Proceedings of ASME International Mechanical Engineering Conference and Exposition*, pp. 1231-1238, November 2000.

Speich, J. E., Fite, K., and Goldfarb, M. Method for Simultaneously Increasing Transparency and Stability Robustness in Bilateral Telemanipulation. In *Proceedings of IEEE International Conference on Robotics and Automation*, pp. 2671-2676, April 2000.

Fite, K., and Goldfarb, M. Sensorless Velocity Estimation for Control of a Compliant Mechanism Based Micromanipulator. In *Proceedings of ASME International Mechanical Engineering Conference and Exposition*, pp. 891-896, November, 1999.

Fite, K., and Goldfarb, M. Position Control of a Compliant Mechanism Based Micromanipulator. In *Proceedings of IEEE Conference on Robotics and Automation*, pp. 2122-2127, May 1999.

Patents

Goldfarb, M., Barth, E. J., Fite, K. B., and Mitchell, J. E. "Method and Apparatus for High Bandwidth Rotary Servovalves." U.S. Patent No: 7322375. Issued January 29, 2008.

Service

Reviewer for *ASME Journal of Dynamic Systems, Measurement, and Control*
Reviewer for *IEEE/ASME Transactions on Mechatronics*
Reviewer for *ASME International Mechanical Engineering Congress & Exposition (IMECE)*
Reviewer for *American Control Conference (ACC)*

Professional Societies

Institute of Electrical and Electronic Engineers (IEEE)
American Society of Mechanical Engineers (ASME)