David W. Hodo

Department of Electrical and Computer Engineering
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Education

Ph.D., Electrical Engineering, August 2011 (Expected); GPA: 4.00
Auburn University, Auburn, AL

M.S., Electrical Engineering, August 2007; GPA: 4.00
Auburn University, Auburn, AL

B.E.E., Electrical Engineering, December 2005; GPA: 3.91; *Summa Cum Laude*
Auburn University, Auburn, AL
Minor: Business Engineering Technology
Minor: Computer Science

Research Interests

Unmanned vehicle navigation and control, trailer/implement control, Simultaneous Localization and Mapping (SLAM), state space controls, Kalman Filter design

Work Experience

Graduate Research Assistant — **Auburn University**
GPS and Vehicle Dynamics Laboratory

Sept 2009 – Present

Project Sponsor: General Dynamics Robotic Systems. Developed an indoor navigation system for a small unmanned ground vehicle (SUGV). Developed a Simultaneous Localization and Mapping (SLAM) algorithm based on an Extended Kalman Filter (EKF) that blends measurements from wheel odometry, a MEMS inertial measurement unit (IMU), and a laser range finder to provide a position with bounded error in structured indoor and urban environments.

Apr 2006 – Present

Project Sponsor: U.S. Army Corp of Engineers. Lead engineer developing unmanned, self-guided wheeled mobile robot towing a trailer that semi-autonomously maps locations of unexploded ordnance on formerly used defense sites. Responsible for all aspects of the system development including path planning, control, navigation, software architecture, and hardware selection. Developed control system so that geophysical sensors towed by the robot accurately follow a specified path. Position information is provided by a GPS/INS system coupled with an optical encoder that provides the angle between the robot and sensor trailer. The tow vehicle used is a Segway RMP400 robot. The system is capable of being remotely operated and monitored through a custom built operator control unit (OCU) at ranges of up to 1.5 miles. The vehicle has been demonstrated by Army Corp contractors on several real-world sites.

Intern — **Northrop Grumman**
Space Technology — Warner Robins, GA

June 2005 – August 2005

Assisted in the development of a database driven hardware-in-the-loop simulation system to be used to validate fidelity of various sensors and flight hardware for military aircraft. Developed a graphical user interface so that the simulation system can be easily and quickly configured for different aircraft and sensor configurations.

Undergraduate Research Assistant — **Auburn University**
Materials Processing Center

Feb 2004 – May 2005

Designed a computer based user interface for an experiment to be flown on the International Space Station. The experiments determine material properties of various metals used in the casting industry. Provided electronics support for various other projects at the center. Designed and developed a microcontroller based stepper motor speed controller for an experiment to study the effects of particle cohesion in low gravity environments.

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Teaching Experience

Graduate Teaching Assistant **Auburn University**
Electrical Engineering Department

Summer 2008, Fall 2008, Summer 2009

Primary instructor for Linear Signals and Systems (ELEC 2120). Topics covered included system modeling using differential equations, Fourier Series, Fourier Transforms (continuous and discrete), and Laplace Transforms.

Key Skills

- Control system and estimator design, embedded system design
- Leadership and cross-functional teamwork skills learned through AU Business Engineering Technology minor
- Computer Languages: C, C++, Visual Basic 6 and .NET, C#, MATLAB, LaTeX

Professional Societies

2005 – Present: Institute of Electrical and Electronic Engineers

Honors

- Eta Kappa Nu (HKN) – Electrical Engineering Honor Society.
- Tau Beta Pi (TBΠ) – National Engineering Honor Society.
- AU Dean's List: 2002, 2003, 2004.

Publications

D. W. Hodo, D. M. Bevly, J. Y. Hung, S. Millhouse, B. Selfridge, "Optimal Path Planning with Obstacle Avoidance for Autonomous Surveying." *Proceedings of the 36th Annual Conference of the IEEE Industrial Electronics Society*, Pheonix, AZ, November 2010.

D. W. Hodo. "Ch. 6 Vehicle Control." *GNSS for Vehicle Control.* Ed. D. Bevly and S. Cobb. Artech House: Boston, 2010.

W. Travis, S. Martin, D. W. Hodo, D. Bevly, "Non-Line of Sight Automated Vehicle Following Using a Dynamic Base RTK System." Submitted to *Navigation: Journal of the Institute of Navigation.*

N. Harrison, B. Selfridge, C. Murray, and D. Hodo, "Self-guiding robotic geophysical surveying for shallow objects in comparison to traditional survey methods," Presented at the Symposium on the Application of Geophysics to Environmental and Engineering Problems (SAGEEP), Keystone, Colorado, April 2010.

N. Harrison, B. Selfridge, M. Root, C. Murray, D. Hodo, D. S. Millhouse, "Self-Guiding Robotic System Surveying and Comparison to Traditional Survey Methods." *Proceedings of the UXO / Countermine / Range Forum 2009*, Orlando, FL, August 2009.

W. Travis, D. W. Hodo, D. M. Bevly, and J. Y. Hung, "UGV trailer position estimation using a dynamic base RTK system," *Proceedings of the 2008 AIAA Guidance, Navigation and Control Conference*, Honolulu, HI, Aug 2008.

D. W. Hodo, "Development of an autonomous mobile robot-trailer system for UXO detection," Master's thesis, Auburn University, August 2007.

D. W. Hodo, J. Y. Hung, D. M. Bevly, S. Millhouse, "Linear Analysis of Trailer Lateral Error with Sensor Noise for a Mobile Robot-Trailer System." *Proceedings of the 2007 IEEE International Symposium on Industrial Electronics*, Vigo, Spain, June 2007.

D. W. Hodo, J. Y. Hung, D. M. Bevly, S. Millhouse, "Effects of Sensor Placement and Errors on Path Following Control of a Mobile Robot-Trailer System." *Proceedings of the 26th Annual American Controls Conference*, New York City, July 2007.