

David A. Smallwood

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EDUCATION

- Ph.D. Mechanical Engineering, The Johns Hopkins University, Baltimore, MD, 2003.
- M.S. Mechanical Engineering, The Johns Hopkins University, Baltimore, MD, 1999.
- B.S. Mechanical Engineering, University of Miami, Coral Gables, FL, 1997, with Honors.

CAREER OBJECTIVE

My objective is to obtain a multi-disciplinary position in the area of robotics, dynamical systems, control theory, and systems integration.

EXPERIENCE

3/2003 – Present Senior Electro-Mechanical Engineer, Systems Engineering Department, Diagnostic Products Corporation, Instrument Systems Division, Flanders, NJ.

Sample Management System Technical Lead, 3/2003 – Present

I am the technical lead on the Sample Management System (SMS) and supervise a technical direct report. This pick and place robot was launched in May 2003 and is the backbone of a new product line in automated immunoassay instrumentation. By working closely with the software, electrical, mechanical, and manufacturing engineering team members, I ensure the overall integrity of the product and help guide its future development. I evaluate new mechanical components and new software modules as well as evaluating new technologies in an effort to improve the product.

Recent accomplishments include designing a new algorithm to intelligently manage the SMS robotic arm and two automated immunodiagnostic analyzers to maximize throughput of immunoassay tests.

Project Manager, SMS II Project, 10/2003 – 6/2004

I lead a 6 person team that cut costs and improved manufacturability and reliability of the Sample Management System (SMS) robotic system through design changes and selection of improved commercially available components. The project finished 1 month ahead of schedule. The project was successful in lowering material cost by 27% or \$8,264 (\$2.48 million/year), exceeding the initial goal of \$6,000. As project manager and technical project lead I:

- Coordinated design efforts through weekly meetings and periodic design reviews
- Ensured overall system performance through daily design input and system validation testing
- Prototyped and oversaw implementation of a new software release
- Updated the company President and Vice-President through monthly presentations
- Created and maintained all required quality assurance and regulatory documentation
- Oversaw/carried out assembly and testing of prototype units

Nucleic Acid Testing Automation, 5/2004 – Present

I am responsible for the design and assembly of a research and development instrument for in-house experimental work in the area of nucleic acid testing. Specifically this R and D instrument will automate the manual testing processes currently in use and will be used by the assay and reagent development teams at DPC corporate headquarters in Los Angeles. I managed two engineering interns from 6/2004 to 9/2004

resulting in a custom software program running on a commercially available pipette station which will perform sample preparation.

1/1997-5/2003 Research Assistant, Dynamical Systems and Controls Laboratory, Department of Mechanical Engineering, G.W.C. Whiting School of Engineering, The Johns Hopkins University.

I designed and built a new remotely operated underwater robotic vehicle, the Johns Hopkins University Remotely Operated underwater robotic Vehicle (JHUROV). As the principal engineer of the JHUROV, I was responsible for designing custom mechanical and electrical components as well as integrating commercial off-the-shelf parts. All construction, either mechanical or electrical, was either performed or contracted out by myself. I also wrote software for Graphical User Interfaces (GUI) on Windows desktop PC's, multi-threaded control algorithms running on a Linux desktop PC, and embedded software running on a PC/104 form factor PC inside the JHUROV. The control system written and developed for the JHUROV was recently deployed on the National Deep Submergence Facility underwater robot Jason II, at the Woods Hole Oceanographic Institution. In the near future it will be deployed on new underwater robotic vehicles such as the DSL-120A of the National Deep Submergence Facility, a remotely operated vehicle under development at the Institute for Exploration in Mystic, CT, and the Isis vehicle of the United Kingdom's Deep Submergence Facility.

My responsibilities also included the procurement of all parts, involving direct communication with commercial suppliers and mechanical machine shops, as well as budget management for the project.

9/1997 – 1/2001 Teaching Assistant, Department of Mechanical Engineering, G.W.C. Whiting School of Engineering, The Johns Hopkins University.

5/1999 – 8/1999 Scientist/Sensor Technician, Woods Hole Oceanographic Institution, Woods Hole, MA.

I participated in a scientific expedition in the Eastern Mediterranean aboard the *M.V Northern Horizon*. I created bathymetric maps using software that I helped develop along with colleagues at The Johns Hopkins University and the Woods Hole Oceanographic Institution. Additionally, I operated single-beam scanning head and multi-beam fixed head sonar units as well as controlling various underwater cameras and recording devices. The expedition resulted in the thorough exploration of, including photographic and acoustic surveys, and recovery of artifacts from, two 750 BC Phoenician shipwrecks.

HONORS/AWARDS

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| 2001 | Award for Best Teaching Assistant, Department of Mechanical Engineering. |
| 1999 | Best student paper, 11 th International Symposium on Unmanned Untethered Submersible Technology, Durham, New Hampshire, USA. |
| 1998, 1999 | Achievement Rewards for College Scientists (ARCS Foundation). |
| 1997 | Alan H. Stenning Award for Outstanding Academic Achievement. |
| 1997 | C. Edward Anderson Award for Demonstration of Outstanding Leadership. |
| 1993-1997 | Henry King Stanford Academic Scholarship. |

PUBLICATIONS

Refereed Journal Publications

- [J1] David A. Smallwood and Louis L. Whitcomb. Model Based Dynamic Positioning of Underwater Robotic Vehicles: Theory and Experiment. *IEEE Journal of Oceanic Engineering*, (29)1:169-186 January 2004.
- [J2] David A. Smallwood and Louis L. Whitcomb. Adaptive Identification of Dynamically Positioned Underwater Robotic Vehicles. *IEEE Transactions on Control Systems Technology*, (11)4:505-515 July 2003.

Refereed Conference Publications

- [C1] David A. Smallwood and Louis L. Whitcomb. Preliminary Identification of a Dynamical Plant Model for the Jason 2 Underwater Robotic Vehicle. In *Proceedings of IEEE/MTS Oceans'2003*. San Diego, CA. 2003. In Press.
- [C2] David A. Smallwood and Louis L. Whitcomb. The Effect of Model Accuracy and Thruster Saturation on Tracking Performance of Model Based Controllers for Underwater Robotic Vehicles: Experimental Results. In *Proceedings of the 2002 IEEE International Conference on Robotics and Automation*, Pages 1081-1086, Washington, D.C., May 11-15, 2002.
- [C3] David A. Smallwood and Louis L. Whitcomb. Toward Model Based Dynamic Positioning of Underwater Robotic Vehicles. In *Proceedings of IEEE/MTS Oceans 2001*, Pages 1106-1114, Hawaii, November 5-8, 2001.
- [C4] David A. Smallwood and Louis L. Whitcomb. Preliminary Experiments in the Adaptive Identification of Dynamically Positioned Underwater Robotic Vehicles. In *Proceedings of the 2001 IEEE/RSJ International Conference on Intelligent Robots and Systems*, Pages 1803-1810, Hawaii, October 29 – November 3, 2001.
- [C5] David A. Smallwood and Louis L. Whitcomb. Toward Model Based Trajectory Tracking of Underwater Robotic Vehicles: Theory and Simulation. In *Proceedings of the 12th International Symposium on Unmanned Untethered Submersible Technology*, Durham, New Hampshire, USA, August 27-29, 2001.
- [C6] David A. Smallwood, Ralf Bachmayer, and Louis L. Whitcomb. A New Remotely Operated Vehicle for Dynamics and Control Research. In *Proceedings of the 11th International Symposium on Unmanned Untethered Submersible Technology*, Pages 370-377, Durham, New Hampshire, USA, August 23-25, 1999. Best Student Paper Award.
- [C7] James C. Kinsey, David A. Smallwood, and Louis L. Whitcomb. A New Hydrodynamics Test Facility for UUV Dynamics and Control Research. In *Proceedings of IEEE/MTS Oceans'2003*. San Diego, CA. 2003. In Press.
- [C8] Louis L. Whitcomb, Jonathon C. Howland, David A. Smallwood, Dana R. Yoerger, and Timothy E. Thiel. A New Control System for the Next Generation of US and UK Deep Submergence Oceanographic ROVS. In *Proceedings of the 1st IFAC Workshop on Guidance and Control of Underwater Vehicles – GCUV 2003*, Newport, South Wales, UK, April 9-11, 2003.

TEACHING

M.E. 530.420 Robot Sensors and Actuators

Date: Spring 1999, Spring 2000
Students: 30 to 40 students, composed of third or fourth year undergraduates and a few graduate students.
Role: Teaching Assistant. I conducted multiple lab sessions each week, holding office hours and grading lab reports.
Description: Introduction to modeling and hands-on use of actuators and sensors in mechatronic design. This cumulative sequence concludes with students integrating the modules they have developed (incremental encoders, a quadrature decoder chip, a current-mode power-amplifier, interface to a microcomputer, BASIC-stamp microcomputer, and BASIC programs) to perform closed-loop position and velocity control on a DC electric motor.

M.E. 530.650 Dynamics and Control of Marine Vehicles

Date: Spring 2001
Students: 5
Role: Guest Lecturer
Description: I guest lectured on the identification and experimental validation of a finite dimensional dynamical plant model for the Johns Hopkins University Remotely Operated underwater robotic Vehicle.

M.E. 530.103 Introduction to Mechanical Engineering

Date: Fall 1997
Students: 30-40
Role: Teaching Assistant. I graded weekly reports, held office hours, and arranged a trip to a city courthouse for the final exam.

Description: Survey course for freshman in Mechanical Engineering. Weekly classes consisted of guest lecturers equally drawn from academia and industry lecturing on their experiences and interests in Mechanical Engineering. Students submitted a summary report each week of the lecture.

PROFESSIONAL ACTIVITY

Technical Reviews

1. IEEE Journal of Oceanic Engineering
2. MIT SEA GRANT Program

Professional Society Membership

1. American Society of Mechanical Engineers (ASME)
2. Institute of Electrical and Electronics Engineers (IEEE)
3. Pi Tau Sigma - President, University of Miami, 1996-1997

OTHER DATA

Licenses

1. Engineering Intern (FE/EIT) – Florida State Board of Professional Engineers, Certificate No. 497ET298
2. Nauti Openwater Scuba Diver

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