

# CURRICULUM VITAE

University of Idaho

**NAME:** Wall, Richard Wayne

**DATE:** August 3, 2009

**RANK OR TITLE:** Professor of Electrical Engineering

**DEPARTMENT:** Electrical and Computer Engineering

**OFFICE LOCATION AND CAMPUS ZIP:** 203 Gauss-Johnson, 1023

**OFFICE PHONE:** (208) 885-7226

**FAX:** (208) 885-7579

**EMAIL:** rwall@uidaho.edu

**DATE OF FIRST EMPLOYMENT AT UI:** August 1, 1990

**DATE OF TENURE:** July 1, 1996

**DATE OF PRESENT RANK OR TITLE:** July 1, 2006

## EDUCATION BEYOND HIGH SCHOOL:

### Degrees:

Ph.D., Electrical Engineering, University of Idaho, Moscow, Idaho, 1989, EE

M.Engr., Electrical Engineering, University of Idaho, Moscow, Idaho, 1980, EE

B.S., Electrical Engineering, Pennsylvania State University, University Park, Pennsylvania, 1968, EE

### Certificates and Licenses:

Professional Registration: State of Idaho Professional Engineer Registration Number 3271

## EXPERIENCE:

### Teaching, Extension and Research Appointments:

August 2000-present, Associate Professor, Electrical and Computer Engineering, University of Idaho

August 1997-July 2000, Associate Professor, Electrical Engineering, University of Idaho

August 1996-July 1997, Associate Professor, Electrical Engineering, University of Idaho (at Boise)

1990-July 1996, Assistant Professor, Electrical Engineering, University of Idaho (at Boise)

1988-90, Affiliate Faculty, University of Idaho, Engineering Education in Boise Program

### Academic Administrative Appointments:

August 1997-June 1999, Director, Computer Engineering Program, University of Idaho

### Non-Academic Employment including Armed Forces:

1985-90, Senior Development Engineer over Test and Development Group, Distribution Engineering Department, Idaho Power Co., Boise, Idaho.

1977-85, Engineer III for Protective Relay Group, Substation Engineering Department, Idaho Power Co., Boise, Idaho.

1973-77, Engineer II in Communications Department, Idaho Power Co., Boise, Idaho.

1968-73, USAF, Repair and calibration of electronic test equipment and avionics.

### Consulting:

1990-99, Principal Owner of Northwest Signals and Systems. Area of expertise:

1. Communications, instrumentation, and control system design employing embedded controllers for transportation and robotics applications.
2. Simulation of power system electrical transients using an electromagnetic transient program for personal computers. This program was developed as an integral part of Ph.D. research and is commercially marketed.
3. Analog and digital signal processing, filtering, and automated control.

**Short Courses:**

- 1999, R. Wall "High level language programming in microcontroller design" Advanced Input Devices.
- 1999, B.K. Johnson, and R.W. Wall, "EMTP and Power System Modeling," Schweitzer Engineering Laboratories.
- 1994, B.K. Johnson, and R.W. Wall, "Fundamentals of TACS," Idaho Power Company and Schweitzer Engineering Laboratories.
- 1994, B.K. Johnson and R.W. Wall, "Synchronous Machine Modeling with EMTP," Idaho Power Company and Schweitzer Engineering Laboratories, Pullman, Washington.
- 1992, R.W. Wall, and J.N. Peterson, "Digital Signal Processing for Power System Protection," Idaho Power Co., Boise, Idaho.
- 1991, R.W. Wall, "Fundamentals of EMTP," Idaho Power Co., Boise, Idaho.
- 1991, J.N. Peterson and R.W. Wall, "Fundamentals of Digital Control," EG&G, Idaho Falls, Idaho.

**Industry Consulting:**

- June 2003-August 2003, LEA International, Hayden Lake, Idaho, Status Monitor for Industrial MOV Transient Suppression Systems.
- May 1999-August 2000, Schweitzer Engineering Labs, Pullman, Washington: Writing New Text – *Power System Protection*.
- June-August 1998, Schweitzer Engineering Labs, Pullman, Washington: EMTP study of 500KV transmission system in Brazil.
- August 1997, Mobile Computing Corporation, Toronto, Canada: Developed 12VDC power line carrier network communications for advanced front end loader with CEBus technology.
- June 1996, Simplot R&D Chemical Division, Pocatello, Idaho: developed controller code for commercial center pivot using Echelon 480VAC communications for networking on center pivot irrigation systems.
- June-August 1994, Schweitzer Engineering Labs, Pullman, Washington. Work responsibilities: Research project investigating the opportunities for efficient power system instrumentation using networked protective relays. The study identified computational and hardware requirements for real-time instrumentation and control for power system protection.
- June-August 1993, Power Engineers, Hailey, Idaho. Work responsibilities: Power system transient study to determine insulation requirements for a new 345KV - 90 mile transmission line. The study determined the maximum transient voltage at predetermined points on the transmission line by switching operations. The analysis was based upon the statistical results of 1600 simulations using a transient analysis program that I developed as part of my Ph.D. research.
- June-August 1992, ARAGO Robotics Inc., Anchorage Alaska. Work responsibilities: Design of a six axis robot with one axis position feedback using an Intel i80C196KD processor. Design responsibilities included development of a real-time operating system for the 80C196, hardware design of the processor board and design of the multiprocessor protocol.
- June-August 1991, Mobile Computing Company, Toronto, Canada. Work responsibilities: Design of an 8051 controller for aircraft fuel delivery and on-site billing system.

**TEACHING ACCOMPLISHMENTS:**

**Areas of Specialization:**

Embedded computing, distributed sensor networks, digital filtering, digital control, power system protection, electrical transients, capstone design

**Courses Taught:**

ECE 240 Digital Logic, Sp06  
 ECE 340 Microprocessors, F03, F04-Sp05, Sp06-F09  
 ECE 341 Microcontrollers Lab, F03, F04, Sp07, Sp08  
 ECE 443 Distributed processing and Embedded Networks F05, F06, F07, F08, F09  
 ECE 476 S09  
 ECE 471 Digital Control Systems, F05, S07  
 ECE 482 Senior Design I for COE, F03  
 ECE 483 Senior Design II for COE, Sp04  
 ECE 499 Advanced Microcontrollers Sp06  
 ECE 504 Digital Signal Processors, Sp09  
 ECE 526 Power System Protection II, Sp05(V)  
 ECE 599 Advanced Microcontrollers Sp06  
 EE 404 Embedded Control, Sp01(V), Sp04  
 EE 301 Linear Systems Theory, Sp88  
 EE 320 Electric Machinery, Sp91  
 EE 340 Introduction to Digital Logic, Sp94  
 EE 443 Embedded Micro-Controllers, F90-98, F01 and F02  
 EE 470 Control Systems, F91  
 EE 476 Digital Filtering and DSP, Sp92, Sp02(V), Sp09  
 EE 480 Senior Design I, F88, F90-96, F98, F00, and F02  
 EE 481 Senior Design II, Sp89, Sp90-97, Sp01-F01, and Sp03  
 EE 499 Distributed Control for Cooperative Autonomous Vehicles, Sp03  
 EE 504 Power System Transients - EMTP, Su91(V)  
 EE 504 Special Topics, System Identification, Sp93(V)  
 EE 504 Advanced Embedded Microcontrollers, Sp94, F96, Sp02, Sp04  
 EE 504 Distributed Processing and Control Networks, Sp97, S99  
 EE 504P Advance Power System Protection, Sp03(V)  
 EE 504 Digital Signal Processors, Sp09  
 EE 525 Power System Relaying, F00(V)

#### Students Advised:

Undergraduate Students:

30 computer and electrical engineering students

Graduate Students Advised to Completion of Degree:

Ph.D. Dissertation Supervised:

Jody Gambles, "Design for Advanced VLSI Fault Simulation," Ph.D., 1996.

Dave Whitehead, in progress, expected graduation date – 5/2010

Master Thesis Supervised:

Gabriel DeRuwe, "Smart Signals Pedestrian Controls for the Vision Impaired", University of Idaho, May, 2009

Dustin DeVoe, "Application of Intelligent Transportation System Protocols for Controlling a Distributed Network of Advanced Traffic Devices", University of Idaho, May, 2009

Sanjeev Giri, "Application of a Safety Critical Network For Distributed Smart Pedestrian Signals in a Road Traffic Intersection System", Master Science in Computer Engineering, University of Idaho, January 2008

Andrew Huska, "Application of Plug and Play Distributed Sensor Networks to Traffic Control Signals," Master Science in Computer Engineering, University of Idaho, May 2006

Troy Cuff, "A Communications Interface for Configuration and Control Management in Fleets of Autonomous Vehicles," MS COE 2006

Aghogho Ekpruke, "Design Methodology and Performance Evaluation of IEEE 1451.2 Plug and Play Instrumentation and Control Networks," MS COE 2003.

Randy Reeder, "Kalman Filtering applied to Optimal Irrigation," MSEE, 2002.

Kevin Thompson, "Fuzzy Logic Control of Bi-Phase Induction Motors," MSEE, 1995.

James Patrick Wiggins, "Real-Time Simulation of Transformers Including Nonlinear Characteristics," MSEE, 1994.

## Masters of Engineering Supervised to completion

Jeff Vicario, Jianqiang Zeng, Laura Watson, Daniel Johnson, David Duhadway, Dan Wermers,  
Adam Johnson, Chris Atkins, Van Truong

## Master Thesis Supervised in progress:

Craig Craviotto, "NTCIP Networked Advanced Accessible Pedestrian System", in progress,  
expected graduation date – 5/2010

Eugene Bordenkircher, "Hardware in the Loop Testing of Traffic Controllers," in progress,  
expected graduation date – 5/2010

Zane Sapp, "Pedestrian Control Networks" expected graduation date – 5/2010

## Graduate Students Served as Committee Member:

## PhD Committee Member:

David Buehler

## Master of Science Committee:

**Corry Thuen**, Truong Van, Joel Alberts, Douglas Welling, Michael Hoyt, Manjunatha  
Reddy-Jayarama, Mike Staihar, Mark Hurst, Ojas Dharia, Jon Christopherson, Akira Okamoto,  
Thomas A. Bean, Bradley N. Baker

## Master of Engineering:

David Hebert, Miguel Moreno, Jennifer Westburg, Cody Krogh

**Materials Developed:**

Microcontrollers laboratory for the Cypress PSoC mixed signal processor (2008)

Microcontrollers laboratory for the Rabbit Semiconductor 3000 processor (2004)

CD based short course for microprocessor development CAD tools, 2002

**Courses Developed:**

2009, Added Analog Devices ADSP 21364 digital signal processor lab experiments to ECE 476.

2004, Junior level microcontrollers course with lab ECE 340 and 341 centered on new microprocessor.

Designed a new microprocessor project system using UI teaching and Learning grant.

2003, Distributed Processing for Networked Based Embedded Systems; new course for ECE 443

2002, Added DSP laboratory to EE476 and designed experiments for off-campus students using PC based instrumentation and WEB based instruction.

2002, Developed distance education hardware based lab for Digital Filtering Course EE 476.

1997, Developed a distributed processing and control networks laboratory for the CAN I<sup>2</sup>C, AccNet, CEBus, and Echelon Real-Time control networking technologies.

1996, Developed an advanced microcontroller laboratory that focuses on networked distributed embedded control and high speed embedded processing using RISC and DSP processors. Processors include, i860, i960, TI DSP320C50, AT&T DSP32C, SMC COM20051, i80C196MD, i80C196CA, and i80C196KR.

1994, Developed laboratory equipment for power electronics laboratory with senior design students.

1992, Specified and supervised the acquisition of laboratory equipment for an expanded digital laboratory.

Developed new laboratory manual for an advanced course in embedded microcontrollers.

1992, Supervised the construction of a new senior design laboratory. Facilitated the acquisition of laboratory test equipment and computer resources for design activities.

1990, Supervised the construction of a new undergraduate power laboratory. Solicited industry and professional society financial contributions to offset construction costs. Facilitated the acquisition of laboratory machinery and instrumentation. Developed a new laboratory manual for the undergraduate machinery course.

1990, Implemented EE443 on embedded microcontrollers that included laboratory exercises as an integral part of the course. Developed laboratory experiments based on demonstration hardware and software. Secured donations for partial construction funding from industry and professional organizations.

**Non-credit Classes, Workshops, Seminars, Invited Lectures, etc.:**

2002, "C from A to Z," Robert Rinker and Wall, R.W., 3 hour tutorial on fundamentals of C programming.

**SCHOLARSHIP ACCOMPLISHMENTS:****Publications:****Refereed Journals:**

DeVoe, D.\*, S. Giri\*, and R.W. Wall, "A Distributed Ethernet Network of Advanced Pedestrian Signals", Transportation Research Board Record, Washington, DC, 2009, Access # 01125542, Report # 09-3256

King, B.A., R.W. Wall, and T.F. Karsky. "Center-Pivot Irrigation System for Independent Site-Specific Management of Water and Chemical Application," *Journal of Applied Engineering in Agriculture*, Vol. 25, No. 2, 2009, pp.187-198.

Giri, S. and R.W. Wall, "A Safety Critical Network for Distributed Smart Signals" IEEE Instrumentation and Measurement Magazine, Vol. 11, No. 6, December 2008, pp 10-16.

King, B. A., R.W. Wall, and T. Larsky, "Center Pivot Irrigation System for Independent Site-Specific Management of Water and Chemical Application," *Journal of Applied Engineering in Agriculture*, Manuscript ID SW-07617-2008, Submitted July 29, 2008.

King, B.A., J.C. Stark, and R.W. Wall. "Comparison of Site-Specific and Conventional Uniform Irrigation Management for Potatoes," *Journal of Applied Engineering in Agriculture*, Vol. 22, No. 5, 2006, pp.677-688.

King, B.A., and R.W. Wall. "Field Testing of a variable Rate Sprinkler and Control System for Site Specific Water and Nutrient Application," *Journal of Applied Engineering in Agriculture*, Vol. 21, No. 5, 2005, pp.847-843.

King, B.A., and R.W. Wall, "Distributed Control and Data Acquisition System for Closed-Loop Site Specific Irrigation Management with Center Pivots," *Journal of Applied Engineering in Agriculture*, Vol. 21, No. 5, 2005, pp.871-878.

Wall, R.W. and B.A. King, "Network Protocol for Multi-Media Ad Hoc Data," *Journal of Applied Engineering in Agriculture*, Vol. 21 No. 2, 2005, pp.285-293.

King, B.A., R.W. Wall and J.P. Taberna, Jr. 2001. Visual Soil Water Status Indicator for Improved Irrigation Management. *Computers and Electronics in Agriculture* Vol. 32:31-43.

King, B.A., and R.W. Wall. "Distributed Instrumentation for Optimum Control of Variable Speed Electric Pumping Plants with Center Pivots." *Journal of Applied Engineering in Agriculture*. Vol. 16 No. 1, July 2000, pp. 45-50.

King, B.A., and R.W. Wall. "Supervisory Control and Data Acquisition System for Site-Specific Center Pivot Irrigation," *Journal of Applied Engineering in Agriculture*, Vol. 14(No. 2, 1998, pp. 135-144.

Wall, R.W., and H.L. Hess. "Design of Microcontroller Implementation of a Three Phase SCR Power Converter," *Journal of Circuits, Systems, and Computers*, Vol. 6, No. 6, March 1997, pp. 619-633.

Wall, R.W., and B.J. Johnson. "Using EMTP and TACS to Teach Protective Relaying Fundamentals." *IEEE Transactions on Power Delivery*, Vol. 12, No. 1, February 1997, pp. 3-10.

Peterson, J.N., and R.W. Wall. "Interactive Relay Controlled Power System Modeling." *IEEE Transactions on Power Delivery*, Vol. 6, No. 1, January 1991, pp. 96-102.

Peterson, J.N., and R.W. Wall. "Cooperative Engineering Design Class Program for Industry and

Universities.” *IEEE Transactions on Power Systems*, Vol. 4, No. 1, February 1989, pp. 368-371.

### Refereed Conference Papers:

Wall, R. W., C. Craviotto\*, C. Browne\*, Z. Sapp\*, P. Tata, “An Advanced Accessible Pedestrian Signals Using Distributed Control Technology”, Submitted to the 89<sup>th</sup> Annual Meeting of the Transportation Research Board, Washington, DC, January 10-14, 2010

DeVoe, D.\*, S. Giri\*, and R.W. Wall, “A Distributed Ethernet Network of Advanced Pedestrian Signals”, The 88<sup>th</sup> Annual Meeting of the Transportation Research Board, Washington, DC, January 11-15, 2009, Paper # 09-3256

DeRuwe, G.\* and R. W. Wall, “Pedestrian Navigation and Integration with Distributed Smart Signal Traffic Controls”, The 34th Annual Conference of the IEEE Industrial Electronics Society, Orlando, FL, November 11, 2008, Paper # HD-010979

DeVoe, D\*. and R.W. Wall, “A Distributed Smart Signal Architecture for Traffic Signal Controls”, 2008 IEEE International Symposium on Industrial Electronics, Cambridge, UK, July 2, 2008 , paper #004928

Wall, R.W., T. Urbanik, D. Bullock, S. Allen\*, M. Busby\*, D. DeVoe\*, A. Huska\*, T. Rallens\* “Distributed Traffic Signal Control: Improving Pedestrian Control as A First Step”, Transportation Research Board 2007 Annual Meeting, Washington D.C. January 21-25, 2007, Paper No. 07-0989

Wall, R.W., A. Huska\*, and D. Bullock, “Application of Plug and Play Distributed Signal Technology to Traffic Signals,” Transportation Research Board 2006 Annual Meeting, Washington D.C., January 22-26, 2006, Paper No. 06-2728.

Wall, R.W. and A. Huska\*, “Design Platform for Plug-and-Play IEEE 1451 Traffic Signal,” The 31st Annual IEEE Industrial Electronics Conference, Raleigh, NC, Nov 6-10, 2005, Paper No. RD-001973.

Mynam, M.V.\*, R. Nelson\*, R.W. Wall, and B.K. Johnson, “Stochastic Approach For Modeling Arcing Faults In Cables From Experimental Data,” Proceedings of the 2005 International Conference on Power Systems Transients (IPST 2005). Montreal, Quebec, Canada, Paper No. IPST05-123-18c, June 19-23, 2005.

Wall, R.W. and B.A. King, “Field Experiences with Power Line Carrier of Automated Sprinkler Control for Precision Agriculture,” 9<sup>th</sup> Annual Symposium on Power-Line Communications and Its Applications, April 6-8, 2005, Vancouver, Canada. pp 109-115.

Li, Z., B.J. Johnson, A. Abdel-Rahim, R.W. Wall, and M. Kyte, “An Automated Tool to Test the Functionality of a Traffic Signal Controller Functionality,” 84<sup>th</sup> Annual Meeting of the Transportation Research Board, Washington DC, January 9-13, 2005, paper No. 05-2452.

Johnson, B.J., R.W. Wall, A. Abdul-Rahim, E.M. Suwal, T.R. Cuff, and B.E. Hammett, “Modeling Advanced Traffic Signal Control Systems: A Communication Network Prototype,” IEEE conference on Intelligent Transportation Systems, October 2004.

Suwal, E.M.\* , T.R.\* Cuff, B.E.\* Hammett, B.K. Johnson, R.W. Wall, and A. Abdel-Rahim. “Modeling Advanced Traffic Signal Control Systems: A Communication Network Prototype,” 2004 IEEE Intelligent Transportation Systems Conference, Washington, D.C., USA, October 3-6, 2004, pp 367-371.

Wall, R.W., and L.R. Wall, “Generating Verifiable Microprocessors State Machine Code with HDL Design Tools,” IEEE IECON 03, Roanoke, Virginia, November 2-6, 2003, pp. 2441-2446.

- Wall, R.W., "Simple Methods for Detecting Zero Crossing," IEEE IECON 03, Roanoke, Virginia, November 2-6, 2003, pp 2477-2481.
- Wall, R.W., and A. Ekpruke\*, "Developing an IEEE 1451.2 Compliant Sensor for Real-time Distributed Measurement and Control in an Autonomous Log Skidder," IEEE IECON 03, Roanoke, Virginia, November 2-6, 2003, pp. 2482-2487.
- Wall, R.W. and B.K. Johnson, "Regenerative Train Control Networks for Gas Turbine Powered High-Speed Rail Locomotive with Flywheel Energy Storage" IEEE IECON'02, Sevilla, Spain, November 5-8, 2002.
- Wall, R.W., J. Bennett\*, K. Lichy, E. Owings\*, and G. Eis, "Creating A Low Cost Autonomous Vehicle," Accepted for IEEE IECON'02 Sevilla, Spain, November 5-8, 2002.
- Wall, R.W., and K. Belknap, "Capstone Design for Education and Industry: Past Graduates and Industry Perspectives," Session #1532, Proceedings of American Society of Engineering Education Annual Conference, Washington, D.C., June 23-26, 1996.
- Hess, H.L., R. Rinker, R.W. Wall, J.N. Petersson, and K. Belknap, "Two-University Cooperation: Paradigm for the Future of Statewide Engineering Education." Proceedings of American Society of Engineering Education Annual Conference, Washington, D.C., June 23-26, 1996.
- Wall, R.W., and B.K. Johnson, "Using EMTP and TACS to Teach Protective Relaying Fundamentals." *IEEE Power Engineering Society Transactions*, presentation at IEEE Power Engineering Society 1996 Winter Meeting, January 21-25, 1996, Baltimore, Maryland.
- Wall, R.W., and T. Tibbals, "Design and Application of a Table-Top EMTP Test System," 17<sup>th</sup> Annual Western Protective Relay Conference, October 24, 1990, Spokane, Washington.
- Wall, R.W., and J.N. Peterson, "Relay Modeling with a Computer Power System Transient Program," 15<sup>th</sup> Annual Western Protective Relay Conference, October 26, 1988, Spokane, Washington.

**Conference Publications:**

- Biedler, G\* and R. Wall, "Low Cost Distributed Control System for Autonomous Vehicles", IEEE Oceans '06 Asian Pacific, Singapore, May 17, 2006, Paper No. 060226-01
- Cuff, T and R. Wall, "Support platform and Communications to Manage Cooperative AUV Operations", IEEE Oceans '06 Asian Pacific, Singapore, May 18, 2006, Paper No. 051221-04
- King, B.A., J.C. Stark, and R.W. Wall. "Site-Specific Water And Nitrogen Management For Potatoes With Center Pivot Irrigation," 26th Annual International Irrigation Show, Phoenix, Arizona, November 6, 2005
- King, B.A., J.C. Stark, and R.W. Wall, "Increased Gross Return from Site-Specific Water Management for Potatoes Under Center Pivot Irrigation," 2004 ASAE/CSAE Annual International Meeting, Ottawa, Ontario, Canada, August 1-4, 2004, Paper No.
- Wall, R.W. and B.A. King, "Incorporating Plug and Play Technology into Measurement and Control Systems for Irrigation Management," 2004 ASAE/CSAE Annual International Meeting, Ottawa, Ontario, Canada, August 1-4, 2004, Paper No. 042189.
- Ekpruke, A.\* and R.W. Wall, "Low-Cost Sensor System for Alarm Reporting," North American Power Symposium, Moscow, Idaho, August 9-10, 2004, Paper No. MD-000011.

- King, B.A., R.W. Wall, and J.P. Taberna, Jr., "New Proportional Chemical Injection System for Improved Chemigation Uniformity with Center Pivots," 2003 ASAE Annual International Meeting, Las Vegas, Nevada, July 27-30, 2003, paper number 032911.
- D.C. Flegel\*, R.O. Nelson, R.W. Wall, H.L. Hess, and B.K. Johnson, "An Analog Model Power System for Research and Classroom Use," North American Power Symposium 2003, Rolla Missouri, October 20-21, 2003.
- Wall, R.W. and B.A. King, "Network Protocols for Efficient Distributed Control in Agriculture," 2002. ASAE Annual International Meeting / CIGR XV<sup>th</sup> World Congress, Hyatt Regency Chicago, Chicago, Illinois, July 28-July 31, 2002.
- Mangapathirao, M.V.\*, R. Nelson\*, R.W. Wall, and B.K. Johnson, "Stochastic Approach For Modeling Arcing Faults In Cables From Experimental Data," North American Power Symposium 2002, Tempe, Arizona, October 14-15, 2002.
- King, B.A., R.E. Reeder, R.W. Wall, and J.C. Stark, "Comparison of Site-Specific and Conventional Uniform Irrigation Management for Potatoes," 2002 ASAE Annual International Meeting / CIGR XV<sup>th</sup> World Congress, Hyatt Regency Chicago, Chicago, Illinois, July 28-July 31, 2002.
- Wall, R.W. and B.A. King, "Network Protocols for Efficient Distributed Control in Agriculture," 2002 ASAE Annual International Meeting / CIGR XV<sup>th</sup> World Congress, Hyatt Regency Chicago, Chicago, Illinois, July 28-July 31, 2002.
- King, B.A., R.E. Reeder, R.W. Wall, and J.C. Stark, "Comparison of Site-Specific and Conventional Uniform Irrigation Management for Potatoes," 2002 ASAE Annual International Meeting / CIGR XV<sup>th</sup> World Congress, Hyatt Regency Chicago, Chicago, Illinois, July 28-July 31, 2002.
- Wall, R.W. and B.A. King, "Tiered Networks," IECON'01 Proceeding of the 27<sup>th</sup> Annual Conference of the IEEE Industrial Electronics Society, Denver, Colorado, pp. 1816-1821, November 29-December 2, 2001.
- King, B.A. and R.W. Wall, "Secondary, Spatially Variable Chemical Application System for Site-Specific Crop Management using Continuous-Move Irrigation Systems," St. Joseph, Michigan, July 30-August 1, 2001, ASAE Paper No. 01-2021.
- King, B.A., R.W. Wall, and L.R. Wall. "Supervisory Control and Data Acquisition System for Closed-Loop Center Pivot Irrigation," ASAE Paper No. 00-2020, St. Joseph, Michigan, 2000.
- King, B.A., J.P. Taberna, Jr., and R.W. Wall. "Field Evaluation of a Visual Soil Water Monitoring System," Presented at the 1999 Pacific Northwest Region Meeting of ASAE.
- King, B.A. and R.W. Wall, "Center Pivot System Distributed Pressure Feed-Back Controller for Variable Rate Pumping Systems," Final Project Completion Report, Idaho Power Company, Boise, Idaho, 1998.
- King, B.A., R.W. Wall, and J.P. Taberna, Jr., "Visual Soil Water Monitoring System for Improved Irrigation Management," ASAE Paper No. 98-2102, St. Joseph, Michigan, 1998.
- Miller, A.A.\*, W. Qian\*, B.K. Johnson, J.D. Law, and R.W. Wall. "High Speed Locomotives with Energy Storage," North American Power Symposium, Bozeman, Montana, October 1997.
- King, B.A., R.W. Wall, D.C. Kincaid, and D.T. Westermann, "Field Scale Performance of a Variable Rate Sprinkler for Variable Water and Nutrient Application," ASAE Paper No. 97-2216, St. Joseph, Michigan, 1997.
- King, B.A. and R.W. Wall, "Digital Power Line Carrier Control System for Optimum Operation of

Variable Speed Pumping Plants with Center Pivots,” ASAE Paper No. 97-2191, St. Joseph, Michigan, 1997.

Wall, R.W. and B.A. King, “Center-Pivot Irrigation System Control and Data Communications Network for Real-Time Variable Water Application,” *Proceedings of the 3<sup>rd</sup> International Conference on Precision Agriculture*. Robert, P.C., R.H. Rust and W.E. Larson (Eds.), ASA, Madison, Wisconsin, July 1996. pp. 757-766.

Hess, H.L., R.W. Wall, and D. Zattiero\*, “A Microcontroller-Based Pulsed Width Modulated Voltage Source Inverter,” North American Power Symposium, Bozeman, Montana, October 2, 1995.

Wall, R.W., “Capstone Design for Education and Industry,” 57<sup>th</sup> Annual Conference, Pacific Northwest Section, American Society of Engineering Education, Boise, Idaho, April 20, 1995.

Wall, R.W. “Report on 80C196 Based Networked Controller Board,” Morrison Knudsen, Inc., Internal Report, 1994.

Wall, R.W. “Analysis of Networked Distributed Power System Instrumentation of Protective Relaying,” Schweitzer Engineering Laboratories Internal Report, 1994.

Wall, R.W., and B.K. Johnson, “Digital Filtering and Relaying,” EMTP Tech Notes, Issue 94-4, October 1994, pp. 3-21.

Wall, R.W., “Sprinklers and Power Lines,” IEEE Computer Applications in Power, Vol. 14, No. 2, April 2001, pp. 25-29.

Wall, R.W. “How to Increase Interrupts in an MCU Design,” *Embedded System Programming*, January 2000, Vol. 13, No. 1, pp. 82-86.

Wall, R.W., and L.R. Wall\*, “Microprocessor Implementation of PLD Designs,” *Embedded Systems Programming*, January 1998, Vol. 11, No. 1, pp. 54-72.

Wall, R.W. “High Tech Pioneers.” *Innovator*, Vol. 5, Number 2, Intel’s Newsletter for the Academic Community, Summer 1992.

Wall, R.W. and J.N. Peterson. “TOC Relay Modeling with a Computer Power System Transient Program.” Pennsylvania Electric Association Relay Committee Spring Meeting, May 31, 1990, White Haven, Pennsylvania.

#### **Conference Presentations:**

Wall, R.W. “Advanced Accessible Pedestrian Signals Research”, Palouse Chapter of IEEE, Moscow, ID, January 22, 2009

Wall, R.W. “Advances in Pedestrian Signals”, Penn State Transportation Engineering and Safety Conference, State College, PA, December 10<sup>th</sup>, 2008

Wall, R.W., “Smart Signals Technology”, Rocky Mountain Chapter of the Association for Education and Rehabilitation of the Blind and Visually Impaired, Idaho Falls, ID, October, 1, 2008

Wall, R.W., “Countdown Pedestrian Signals & Role of Power line Carrier”, International Municipal Signal Association Northwest Section 2008 Conference, Richland, WA., September 17, 2008

Wall, R.W., “Smart Signals Research at the University of Idaho, Road Builders Clinic”, Coeur d’Alene, ID, February 2007.

Wall, R.W., “Smart Signals, ATS America – Japan Seminar”, Washington D.C., January 2007.

- King, B.A., J.P. Taberna, Jr., and R.W. Wall, "Field Evaluation of a Visual Soil Water Monitoring System," The Pacific Northwest Region Meeting of ASAE and CSAE, Sherwood Hills Resort, Logan, Utah, 1999.
- King, B.A., J.C. Stark, and J.P. Taberna, Jr., "In-Season Spatial Variability of Potato Petiole Nitrogen," The 4<sup>th</sup> International Conference on Precision Agriculture. St. Paul, Minnesota, 1998.
- King, B.A., R.W. Wall, and J.P. Taberna, Jr., "Visual Soil Water Monitoring System for Improved Irrigation Management," The ASAE Annual International Meeting. Orlando, Florida, 1998.
- Wall, R.W., "Agricultural Irrigation System Control and Data Communications Network for Real-Time Variable Water Application," LonUsers 11<sup>th</sup> International Conference, San Jose, California, May 1997.

**Patents:**

- Tate, P., R.W. Wall, G. DeRuwe, and C. C Craviotto, "Advanced Accessible Pedestrian System for Signalized Traffic Intersections", provisional patent filed, August 27, 2008.
- Wall, R.W. and G. DeRuwe, "Advanced Accessible Pedestrian Control System for the Physically Disabled", U.S. Patent Application No. 12/411,306, March 25, 2009.
- Wall, R.W. and A. Huska, "Plug and Play Traffic Signals," Patent Application Docket No. 05-018-1/1079 filed on July 8, 2005, Patent Application, July 7, 2006.

**Grants and Contracts Awarded:**

- Wall, R.W. (PI), (80%) , M. Kyte, and B.K. Johnson, "Closed Loop Operation of Network Based Accessible Pedestrian Signals", USDOT UTC, August 2009-August 2010, \$106,992.
- Wall, R.W. (PI), Networked Accessible Pedestrian Signals, Campbell Company, Boise, ID., September 2008 through August 2009. \$60,520
- Frenzel J.(PI), R.W Wall, (45%) , and B.K. Johnson, "Commercialization and Field Distribution of Smart Pedestrian Call Signals", USDOT UTC, August 2008-August 2009, \$117,357.
- Abdel Rahim, A. and R.W. Wall, An Automated Testing Tool for Traffic Signal Controller Functionalities, Idaho Transportation Department, Boise ID, Jan. 9 2008 through Feb. 15, 2009, \$49,246.
- Wall, R.W. (PI), J.F. Frenzel, "Advanced Interactive Signals for Able-bodied and Disabled Pedestrians", Idaho State Board of Education Higher Education Grant, January 2008 through December 2008, \$75,000.
- Edwards, D, M. Anderson and R.W. Wall (10%), M. O'Rourke, J. Frenzel, T. Soule, "Developing Vision Systems for an Autonomous Forest Vehicle", Idaho State Board of Education Higher Education Grant, January 2008 through December 2008, \$75,000.
- Edwards, D, M. Anderson and R.W. Wall (15%), M. O'Rourke, J. Frenzel, T. Soule, " Magnetic Signature Assessment System using Multiple Autonomous Underwater Vehicles", Office of Naval Research, Grant # N00014-08-1-0799, April 2008 through April 2009, \$1,425,100.
- Edwards, D, M. Anderson and R.W. Wall (16%), M. O'Rourke, J. Frenzel, " Cooperative Autonomous Underwater Vehicles used to Search Large Ocean Areas for Mines", Office of Naval Research, Grant # N00014-08-1-0799, February 2008 through July 2009, \$456,400,000.
- Wall, R.W (PI) , J. Frenzel and B.K. Johnson, "Pilot Deployment of PnP Smart Traffic Signals Phase II," NIATT, USDOT UTC, August 2007-August 2008, \$81,000.

- Wall, R.W. (PI), J.F. Frenzel, and B.K. Johnson, "Street Deployment of Pedestrian Control Smart Traffic Signals," NIATT, USDOT UTC, August 2007-August 2008, \$93,707.
- Wall, R.W (PI) and B.K. Johnson, "Conflict Monitor for Plug and Play Distributed Smart Signals and Sensors for Traffic Controllers," NIATT, USDOT UTC, August 2006-August 2007, \$100,000.
- Wall, R.W (PI) and B.K. Johnson, "Full Scale Implementation of Plug and Play Smart Traffic Signal and Pedestrian Wait/Walk Display with PED button," NIATT, USDOT UTC, August 2005-August 2006, \$9,000.
- McCann, I., B. Felton, B.A. King, R.W. Wall, and J. Starr, "Conserving Water and Nitrogen by Using New Sensor, Control Systems and Information Technology to Improve O-farm Irrigation Scheduling in the Delmarva Peninsula," Natural Resources Conservation Service, September 2005-August 2008, \$46,333. (Wall portion \$13K).
- Wall, R.W. (PI), B.K. Johnson, and D. Bullock, "Plug and Play (PnP) Smart Sensor Traffic Signals System," NIATT, USDOT UTC, June 2004-June 2005, \$99,556.
- Edwards, D, M. Anderson and R.W. Wall, "Developing Fleets of Autonomous Underwater Vehicles," Office of Navel Research, April 2005-March 2006, \$1,370,036(Wall portion – 25%).
- Edwards, D, M. Anderson and R.W. Wall, "Fabrication of a Fleet of Mini-AUVs," Office of Navel Research, September 2004-August 2005, \$65,000 (Wall portion – 65%).
- Edwards, D., M. Anderson and R.W. Wall, "Communications and Control Fleet of Autonomous Underwater Vehicles," Office of Navel Research, April 2004-May 2005, \$730,855 (Wall portion – 25%).
- Feeley, J., D. Edwards, M. Anderson, and R.W. Wall, "Decentralized Control of Multiple Autonomous Underwater Vehicles," Office of Navel Research, June 2003-May 2005, \$880,000 (Wall portion – 15%).
- Feeley, J., D. Edwards, M. Anderson, and R.W. Wall, "Decentralized Control of Multiple Autonomous Crawlers and Swimmers," Office of Navel Research, May 2003-April 2004, \$374,573 (Wall portion – 10%).
- Johnson, B.K., and R.W. Wall, "Remote-Access Hardware-in-the-Loop Simulation Lab," University Transportation Centers Program, Research and Special Programs Division, U.S. Department of transportation, August 2002-July 2003, \$55,189.
- Wall, R.W.(PI) and Johnson, B.K. "Model Real-Time Highway Traffic Control System," University Transportation Centers Program, Research and Special Programs Division, U.S. Department of Transportation, September 1, 2002-August 31, 2003, \$44,107.
- Johnson, B.K., and R.W. Wall, "Next Generation Controller Interface Device Development," University Transportation Centers Program, Research and Special Programs Division, U.S. Department of transportation, September 1, 2002-August 31, 2004, \$97,474 .
- Wall, R.W.(PI) and B.K. Johnson, "Model Real-Time Highway Traffic Control System," University Transportation Centers Program, Research and Special Programs Division, U.S. Department of transportation, September 1, 2002-August 31,2003.
- King, B.A., J.C. Stark, and R.W. Wall, "Conjunctive In-Season Water & Nitrogen Management for Improved Production Efficiency," USDA-CREEES, September 1, 2002-August 31, 2004, \$156,000 (Wall portion 20%).
- Johnson, B.K. and R.W. Wall, "Fault Impedance Analysis," Office of Naval Research through DDL Omni Engineering, June-December 2002, \$12,279 (Wall portion 90%).:
- Johnson, B.K. and R.W. Wall, "Fault Impedance Modeling," Office of Naval Research through ANTEON

Corporation, January-May 2002, \$16,147 (Wall portion 60%).

Johnson, B.K., H.L. Hess, and R.W. Wall, "Protection and Configuration of Zonal Distribution Systems," DoD EPSCoR, Office of Naval Research, April 1, 2000-March 31, 2003, \$332,895 (Wall portion 10%).

Wall, R.W. (PI) and J.F. Frenzel, "Communications for Bore Hole Probe," Bechtel BWXT, Idaho, LLC, June-December 2001, \$20,258.

Wall, R., "Spent Nuclear Fuel Containment Vessel Monitor, Phase II," Bechtel BWXT, Idaho, LLC, January-July 2001, \$20,798.

Wall, R.W. (PI), "Spent Nuclear Fuel Containment Vessel Monitor," Bechtel BWXT, Idaho, LLC, May-September 2000, \$24,946.

Wall, R.W. (PI), "Develop Protective Relaying Education Program," Schweitzer Engineering Labs, Research Center, 1999, \$27,566.

King, B.A., R.W. Wall, and J.C. Stark, "Closed Loop Precision Irrigation for Improved Water Management," USDA NRICGP. September 1, 1999-August 31, 2001, \$98,000 (Wall portion 50%).

King, B.A., R.W. Wall, and J.C. Stark, "Closed Loop Precision Irrigation for Improved Water Use Efficiency," USDA CSREES NRICGP. September 1, 1998-August 31, 1999, \$10,120 (Wall portion 50%).

Wall, R.W. (PI), J.D. Law, B.K. Johnson, and J.N. Peterson., "Intelligent Power Management System," Morrison Knudsen Company, Federal Railroad Administration, November 6, 1995-May 2, 2002, \$309,843.

King, B.F., and R.W. Wall., "Control Network for Variable Irrigation Management," Precision Irrigation System Grant, 1995, \$33,500.

Wall, R.W. "Functional Testing of Automatic Train Interface Controller and Automatic Station Interface Controller," Morrison Knudsen Company, 1995, \$24,170.

Wall, R.W. (PI), and B.F. King. "Precision Irrigation Control Systems, Inc. (PICS)," Small Business Innovation Research, 1995, \$9,000.

Wall, R.W. "Performance Analysis of two 80C196xx Processors," Preco, Inc., 1995, \$566.

Wall, R.W. "Distributed Rail-Systems Instrumentation and Control," Morrison Knudsen Company, 1993, \$78,230.

#### **Internal Grants Awarded:**

Wall, R.W., University of Idaho Small Travel Grant, December 2004, \$900.

Wall, R.W., "Low Cost Platform for an 'Anywhere' Microcontroller laboratory," Teaching and Learning Grant, University of Idaho Vice Provost for Academic Affairs, May 2003-May 2004, \$2,200.

Wall, R.W. University of Idaho Small Travel Grant, 1996, \$900.

Hess, H.L., and R.W. Wall. "Using EE480 Senior Design projects to develop power-electronic converters for hands-on investigation," University of Idaho Teaching/Learning Mini-Grant, 1994, \$2,000.

Wall, R.W. "Analysis of Computational Requirements for Interactive Real-Time Powers Systems Simulation," Research Council Seed Grant, 1992, \$6,000.

#### **Research Equipment Grants:**

- Wall, R.W., "i80C196 "C" programming integrated development environment software for W95 for the Embedded microcontroller laboratory," IAR Systems software donation, 1997, \$16,452.
- Wall, R.W., "CEBus Cbench development system for IS60 power line carrier networks residential and commercial building automation," Intellon Corporation donation, 1997, \$7,391.
- Wall, R.W., "Research grant for EV80C196MD Evaluation Embedded Microcontroller systems to investigate variable speed AC Drives. Intel Corporation," Research and Laboratory Equipment Grant, 1993, \$4,200.
- Wall, R.W., "Student Travel Grant for Pat Wiggins to attend the IEEE PES 1992 Summer Meeting," Power Engineers, \$500; National Science Foundation, \$610.
- Wall, R.W., "Three i960 High Speed Embedded Processor Evaluation Systems for high speed transformer simulation," Intel Corporation, Research and Laboratory Equipment Grant, 1992, \$8,380.
- Wall, R.W., "In-Circuit Emulator replacement parts," Intel Corporation, Research and Laboratory Equipment Grant, 1991, \$2,400.
- Wall, R.W., "Two 80C196KC Microcontroller Development Systems and development software for use in EE480/481 and EE443," Intel Corporation, Research and Laboratory Equipment Grant, 1991, \$10,600.

**Donations:**

- Wall, R. W., Cypress Microprocessor Development systems, Cypress Corporation, \$15,511.50, November 2008,
- Wall, R.W., Power System Relay Lab Equipment, Schweitzer Engineering Labs, July 2002, \$3,730.
- Wall, R.W., Power System Relay Lab Equipment, Schweitzer Engineering Labs, May 2002, \$32,690.
- Wall, R.W., ADSP 21065L Digital Signal Processing Development Equipment and Software, Analog Devices, December 2001, \$9,660.
- Wall, R.W., Power System Relay Lab Equipment, Schweitzer Engineering Labs, July 2000, \$49,672.
- Wall, R.W., Education donation of EV80C246-50 Evaluation Microcontroller systems hardware and software for use in Advanced Microcontrollers Course, Intel Corp. Research and Laboratory Equipment Grant, 1997, \$5,000.
- Wall, R.W., Education donation of EV80C196KD-20 Evaluation Embedded Microcontroller systems hardware and software for use in the undergraduate senior design course. Intel Corporation, Research and Laboratory Equipment Grant, 1997, \$3,950.
- Wall, R.W., DSP320C3x evaluation system for teaching DSP processing in advanced microcontroller class. Texas Instruments, 1996, \$600.
- Wall, R.W., Morrison Knudsen Company, donation, laboratory instrumentation equipment, 1994. Fluke Scope Meter, \$1,985.
- Wall R.W., John Fluke Manufacturing Company, donation, laboratory instrumentation equipment, 1994, \$15,345.
- Wall, R.W., EV80C196KD and EV80C196KR embedded microcontroller systems for support of the networking embedded microcontroller research and the advanced embedded control classes. Intel Corporation, Research and Laboratory Equipment Grant, 1994, \$3,925.
- Wall, R.W., Embedded microcontroller hardware and software for use in the undergraduate embedded controller course. Intel Corporation, Research and Laboratory Equipment Grant, 1993, \$25,740.

Wall, R.W., John Fluke Manufacturing Company, Research and Laboratory Equipment Grant, 1993, \$4,113, laboratory test equipment and instrumentation.

Wall, R.W., Intel Corporation, donation, technical literature, 1992, \$1,497. Course material for EE443.

Wall, R.W., Hewlett Packard Corporation, donation, manufacturing and instrumentation equipment, 1991, \$196,812.

### **Industry Sponsored Senior Design Projects:**

Wall, R.W., Southwest Idaho Chapter of IEEE, donation, power and machines laboratory development, 1991, \$1,000.

2003-04: Advanced Input Devices sponsored two projects for membrane keyboard cover testing and wireless audio streaming for dictation.

2003-04: Microsoft Corporation: Demonstration of Home Automation using MS-SCP, \$3,000 (est.) equipment grant.

2002-03: Advanced Input Devices sponsored two projects: prototype for a motionless joy stick (joint ME – ECE) and wireless keyboard. \$5,000 cash grant.

2002-03: Manning Applied Technology: FT-IR Spectrometry Controller.

1996-97: Micron Semiconductor sponsored project for the design of a portable DRAM Identification Reader for interrogating DRAM production codes. \$3,254 cash grant.

1996-97: McCallaster Engineering sponsored project for the design and testing of a Kelvin Probe device to measure the work function of materials. \$1,250 cash grant.

1995-96: J. R. Simplot Mineral and Chemical Group Research and Development sponsored project for developing a model that demonstrates spatially variable agricultural irrigation systems using networked power line carrier communications.

1994-95: Santa Clara Plastics sponsored project designing a state-space control system for coupled fluid controls. \$5,000 equipment grant.

1994-95: Idaho Power Company sponsored project for developing a distribution automated control of VAR compensation on utility distribution lines using substation monitoring for local optimization and EMS communications for area wide optimization. \$1,000 cash grant.

1994-95: Preco, Inc. sponsored project developing a precision agriculture embedded controller using J1939 (CAN) networked tractor-implement communications. \$4,000 cash grant.

1993-94: Morrison Knudsen Company sponsored adjustable speed drive for a three phase, 2 HP induction motor using an Intel i80C196MD processor.

1993-94: Morrison Knudsen Company sponsored project investigating power-line carrier applications to rail-systems communications.

1993-94: Idaho Power Company sponsored project for developing a power factor monitor for predicting power insulator bushing failures. \$850 cash contribution.

1991-92: Idaho Power Company sponsored project for developing a photo-voltaic energy system instrumentation using networked embedded microcontroller systems. \$1,500 cash contribution.

1990-91: Private funding for developing the Robie Creek photo-voltaic powered home instrumentation and resource management.

1989-90: Idaho Power Company sponsored project developing an energy monitor for utility station batteries.

### **Honors and Awards:**

University of Idaho Naval Officer Education Program Faculty Excellence Award, May 16, 2009

University of Idaho Alumni Award for Teaching Excellence. December 9, 2007

Best Session Paper, The 28<sup>th</sup> Annual Conference of the IEEE Industrial Electronics Society, IEEE IECON'02, Sevilla, Spain, November 5-8, 2002.

Best Session Paper, The 27<sup>th</sup> Annual Conference of the IEEE Industrial Electronics Society, Denver, Colorado, November 29, December 2, 2001.

Sabbatical Leave, July 1999-June 2000, Schweitzer Engineering Labs, write new text on computer based power system protection.

**SERVICE:****Major Committee Assignments:**

NIATT Director search Committee, 2009  
 ECE ABET committee 2007 to present  
 ECE Lab Committee Chairman, September 2000-present  
 Computer Engineering Program Committee, January 1995-present  
 Graduate Faculty, Member, 1991-present  
 ECE Computer Engineer faculty search chairmen 2006-2007  
 University of Idaho Safety and Loss Control Committee, August 2004-2007  
 ECE Faculty Search Committee, September 2000-March 2001  
 Computer Engineering Program Director, August 1997-May 1999  
 Electrical Engineering Search Committee, 1997-98 (2 CompE positions)  
 Electrical Engineering Lab Committee, 1990-97  
 Electrical Engineering Search Committee, 1993 (CompE position)  
 Electrical Engineering Search Committee, 1992 (3 Boise positions)  
 Electrical Engineering Search Committee, 1991 (EE position for Idaho Falls)  
 Electrical Engineering Power Laboratory, 1990-91

**Professional and Scholarly Organizations:**

Transportation Research Board, 2005 - 2008  
 IEEE, Senior Member, Power Engineering Society 1976 - present  
     Power Engineering Committee, 1999-2006  
     Towers, Poles and Conductors Committee, Bare Overhead Conductor Transient Rating Task Force  
     1986-96  
     Reviewer, 1993  
 IEEE Student Chapter Faculty Advisor, 1992-1995

**Outreach Service:**

Organizer of Advanced Accessible Pedestrian Signals Workshop, April 27,, 2009, Boise, ID  
 Organizer of Advanced Accessible Pedestrian Signals Workshop, April 25,, 2008, Moscow, ID  
 Organizer of Advanced Accessible Pedestrian Signals Workshop, January 21, 2008, Moscow, ID  
 Organizer of 2006 Smart Signals Workshop, Nov 2, 2006, University of Idaho, Moscow, ID  
 Chair for Vision and Imaging Systems Session II-02 at IEEE IECON'05, Raleigh, North Carolina,  
     November 7-10  
 Paper reviewer for Transportation Research Board, 2005 -present  
 Paper reviewer for IEEE Intelligent Transportation Systems 2006  
 IEEE Industrial Electronics society reviewer, 2001-present  
 IEEE Spectrum reviewer, 1996-present  
 Book reviewer for J. Wiley on microcontroller and embedded computing, 2003  
 Submission Chair for IECON 03, Roanoke, Virginia, 2003  
 North Idaho Consortium Computer Engineering Program (Gonzaga, WSU, and UI) 2001-present  
 Organizer and Co-Chair for Special Session on Intelligent Transportation Systems Technologies at IEEE  
     IECON'02, Sevilla, Spain, November 5-8  
 Workshop on embedded system design with structured high level computer languages, Advanced Input  
     Devices, 1999  
 Organized IEEE Student Chapter at Boise Engineering Program, 1992

**PROFESSIONAL DEVELOPMENT:****Research:**

TRB Traffic Signals Systems annual meeting, Washington DC, 2005- present

TRB Traffic Signals Systems midyear meeting 2004-2007  
ITE annual meeting 2007

**Teaching:**

Fundamentals of Transmission System Protection, Schweitzer Engineering Laboratories Protection course # 407, June 2002. \$1,995 scholarship awarded.

Faculty Development Workshop on Learning and Teaching Styles, IEEE PES, Seattle, Washington, July 2000.

Faculty Development Workshop on Writing across the Curriculum, University of Idaho, Moscow, Idaho, January 1999.

Faculty Development Workshop on Verilog HDL, University of Colorado at Colorado Springs, June 1997.

Faculty Development Workshop on Process Education, University of Idaho, Moscow, Idaho, May 1996.