

Raymond H. Byrne, Ph.D.

EDUCATION

- M.S. in Financial Mathematics, University of Chicago**, GPA = 3.81 June 2009
- Ph.D. in Electrical Engineering, University of New Mexico** May 1995
Dissertation - Robust Lateral Control of Highway Vehicles, GPA = 3.96
- M.S. in Electrical Engineering, University of Colorado, Boulder** May 1989
Concentration - Control Theory and Electronics, GPA = 3.98
- B.S. in Electrical Engineering, University of Virginia** May 1987
Concentration - Control Theory and Electronics, GPA = 3.78

EXPERIENCE

- Sandia National Laboratories**, Albuquerque, NM May 1989 - Present
Distinguished Member of Technical Staff
Energy Storage and Transmission Analysis Department
- Analytics, Economics, and Policy team lead
- University of New Mexico**, Albuquerque, NM January 1996 - present
Adjunct Professor
- Instructor for EECE 495 - Introduction to Mobile Robots (Spring 1996, 1997)
 - Instructor for EECE 595 – Introduction to Embedded Systems (Fall 2000)
 - Instructor for CS251 - C++ Programming (Spring 2001)
- University of Colorado**, Boulder, CO August 1987 - May 1988
Teaching Assistant - Taught three electronics labs each semester
- Texas Instruments**, Dallas, TX May 1986 - August 1986
Summer Internship - Investigated production problems in the guidance section of the HARM missile.

PROFESSIONAL SOCIETIES

- President, University of Virginia Eta Kappa Nu (1986 - 87)
Chairman, Vice-Chairman, Treasurer, and Secretary; Albuquerque IEEE Section (1992- Present)
Other memberships include: Tau Beta Pi, Eta Kappa Nu, Sigma Xi, IEEE
Professional Ski Instructors of America (1994-1995)

OTHER ORGANIZATIONS

- President, Vice-President, Winter Trips, and Treasurer; High Desert Ski Club (1989-2000)
Trip Coordinator, University of Colorado Ski Club (1987-89)
A-League Director, Sandia Golf Association (1992-96)
Sun Country Amateur Golf Association, Tournament Director 2000-2001, Secretary 2001-2002, Treasurer 2002 – 2003, President 2004 – 2008, Vice President 2010-present
United States Golf Association, Senior Amateur Committee, 2000-present

ACTIVITIES

Golf, skiing, mountain biking, roller-blading

AWARDS

Recipient of IEEE Millenium Medal (May 2000), U.S. Mid-Amateur Qualifier (1996, 1997, and 1999), Who's Who in Science and Engineering and Who's Who in America, Time Magazine 2001 Invention of the Year in Robotics, Sun Country Match Play Champion (2002)

PUBLICATIONS

Journal Papers

- R. H. Byrne, D. R. Adkins, S. E. Eskridge, and J. J. Harrington, E. J. Heller, and J. E. Hurtado, "Miniature mobile robots for plume tracking and source localization research," *Journal of Micromechatronics*, vol. 1, no. 3, pp. 253-262, 2002.
- R. H. Byrne and C. T. Abdallah, "Design of a model reference adaptive controller for vehicle road following," *Mathematical Computer Modelling*, vol. 22, no. 4-7, pp. 343-3554, 1995.
- R. H. Byrne and P. Klarer, "Sandia national laboratories military robotic technologies," *Unmanned Systems*, vol. 10, no.2, pp.42-47, 1992.

Magazine Articles

- R. H. Byrne, C. T. Abdallah, and P. Dorato, "Experimental results in robust lateral control of highway vehicles," *IEEE Control Systems Magazine*, vol. 18, no. 2, pp. 70-76, April 1998.
- R. H. Byrne, "A practical implementation of a hierarchical control system for telerobotic land vehicles," *Aerospace and Electronics Systems Magazine*, IEEE, Volume: 7, Issue: 10, Oct. 1992.

Workshops

- J. T. Feddema, R.D. Robinett, and R.H. Byrne, "An optimization approach to distributed controls of multiple robotic vehicles," Workshop on Control and Cooperation of Intelligent Miniature Robots, 2003 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS2003), October 27-31, 2003.
- J. Hurtado, R. Byrne, S. Eskridge, and J. Harrington, "Miniature mobile robots for plume tracking and source localization research," Workshop on Mobile Micro-Robots, 2000 IEEE International Conference on Robotics and Automation, April 28, 2000.

Invited Presentations

- "An Overview of Embedded Systems Applications in Robotics", invited presentation at the Chilean Electronics Industry Association International Seminar on Microelectronics and Embedded Systems, Santiago, Chile, June 18-19, 2002.

Conference Presentations

- R. H. Byrne, "Valuation of Energy Storage: Arbitrage and the Regulation Market," Electricity Storage Association 22nd Annual Meeting, Washington, D.C., May 2-4, 2012.
- R. H. Byrne, J. C. Neely, C. A. Silva-Monroy D. A. Schoenwald, D. J. Trudnowski, M. K. Donnelly, "Evaluation of Energy Storage Technologies for Damping Control," Modeling, Simulation, And Optimization for the 21st Century Electric Power Grid, Lake Geneva, WI, October 21-25, 2012.

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Conference Papers

- R. Byrne, M. Griesmeyer, R. Schmidt, J. Shaddix, and D. Bodette, "Benefits of a Geosynchronous Orbit (GEO) Observation Point for Orbit Determination," Proceedings of the 2011 Advanced Maui Optical and Space Surveillance Technologies Conference, (Maui, HI), September 13-16, 2011.
- A. Clauset, B. Tanner, R. Byrne, C. T. Abdallah, "Controlling Across Complex Networks," Proceedings of the IFAC Time-delay Symposium, (Nantes, France), September 17-19, 2007.
- A. Regmi, R. Sandoval, R. Byrne, H. Tanner, and C. T. Abdallah, "Experimental Implementation of Flocking Algorithms in Wheeled Mobile Robots," Proceedings of the 2005 American Control Conference, June 8-10, (Portland, OR), pp. 4917-4922.
- R. Sandoval-Rodriguez, C. T. Abdallah, H. Jerez, and R. H. Byrne, "Experimental Results on the Effects of 802.11b WLAN on Networked Control Systems," Proceedings of the 13th Mediterranean Conference on Control and Automation, June 27-29, 2005.
- R. Sandoval-Rodriguez, C. T. Abdallah, P. F. Hokayem, E. Schamiloglu, and R. H. Byrne, "Robust Mobile Robotic Formation Control Using Internet-Like Protocols," in *Proceedings of the 42nd IEEE Conference on Decision and Control*, (Maui, Hawaii), vol. 5, pp. 5109-5112, December 2003.
- D. Adkins, E. Heller, R. Byrne, and S. Casalnuovo, Proceedings of the 2001 International Mechanical Engineering Congress and Exposition, (New York, NY), November 11-16, 2001.
- R. Byrne, S. Eskridge, J. Harrington, J. Hurtado, "Micro robots and applications," in *Proceedings of the Unmanned Vehicle System Technology Conference*, (Brussels, Belgium), December 6-7, 2001.
- C. T. Abdallah, M. Arioloa, and R. Byrne, "Statistical-Learning of an ABR Explicit Rate Algorithm for ATM Switches," in *Proceedings of the 39th IEEE Conference on Decision and Control*, (Sydney, Australia), December 2000.
- R. Byrne, C. Anderson, and R. Robinett, "Design of a miniature robotic vehicle," in *Proceedings of the 18th IASTED International Conference on Modeling, Identification, and Control*, (Innsbruck, Austria), pp. 428-430, February 15-18, 1999.
- A. Hvezda, J. Garcia, P. Klarer, R. Byrne, G. Heileman, and C. Abdallah, "LOBOTomous: an autonomous platform for indoor environments," in *Proceedings of the Fourteenth National Conference on Artificial Intelligence (AAAI-97)*, (Providence, RI), July 27-31, 1997.
- R. Byrne, B. Rainwater-Sturgis, and R. Robinett, "A moving mass trim control system for reentry vehicle guidance," in *Proceedings of the AIAA Atmospheric Flight Mechanics Conference*, (San Diego, CA), July 29-31, 1996.
- R. Byrne, B. Rainwater-Sturgis, and R. Robinett, "Moving mass trim control system design," in *Proceedings of the AIAA Guidance, Navigation, and Control Conference*, (San Diego, CA), July 29-31, 1996.
- R. H. Byrne, C. T. Abdallah, and P. Dorato, "Experimental results in robust lateral control of highway vehicles," in *Proceedings of the 34th IEEE Conference on Decision and Control*, (New Orleans, LA), vol.4, pp. 3572-3575, 1995.
- R. H. Byrne and C. T. Abdallah, "Robust lateral control of highway vehicles," in *Proceedings of the Intelligent Vehicles '94 Symposium*, (Paris, France), pp. 375-380, October 24-26, 1994.

Conference Papers (continued)

- C. Abdallah, P. Dorato, J. Benitez-Read, and R. Byrne, "Delayed positive feedback can stabilize Oscillatory Systems," in *Proceedings of the American Control Conference*, (San Francisco, CA), pp. 3106-3107, 1993.
- R. H. Byrne, P. R. Klarer, J. B. Pletta, "Military robotic technologies," in *Proceedings of the American Nuclear Society Fifth Topical Meeting on Robotics and Remote Sensing*, (Knoxville, TN), April 26-29, 1993.
- R. Byrne and J. Harrington, "Cooperation of mobile robots for accident scene inspection," in *Robotics and Manufacturing, Recent Trends in Research, Education, and Applications*, (Santa Fe, NM), pp. 531-537, November 11-13, 1992.
- R. H. Byrne, "A practical implementation of a hierarchical control system for telerobotic land vehicles," in *Proceedings of the National Telesystems Conference*, (Washington, D.C.), pp. 10.1-10.5, 1992.

Technical Reports

- R. H. Byrne, B. W. Bush, and T. Jenkin, "Long-term modeling of natural gas prices," Tech. Rep. SAND2013-2898, Sandia National Laboratories, April 2013.
- R. H. Byrne, R. T. Elliott, J. C. Neely, C. A. Silva-Monroy, D. A. Schoenwald, and L. L. Grant, "Renewable Source Controls for Grid Stability," Tech. Rep. SAND2012-10416, Sandia National Laboratories, Albuquerque, NM, December 2012.
- R. H. Byrne and C. A. Silva-Monroy, "Estimating the maximum potential revenue for grid connected electricity storage: Arbitrage and the regulation market," Tech. Rep. SAND2012-3863, Sandia National Laboratories, Albuquerque, NM, December 2012.
- R. H. Byrne, J. T. Feddema, and C. T. Abdallah, "Algebraic Connectivity and Graph Robustness," Tech. Rep. SAND2009-4494, Sandia National Laboratories, Albuquerque, NM, July 2009.
- J. Lewis, C.D. Harrison, D. K. Melgaard, D. S. Myers, D. S. Lee, J. J. Carlson, R. H. Byrne, "Application Specific Compression: Final Report," Tech. Rep. SAND2008-6566, Sandia National Laboratories, Albuquerque, NM, December 2008.
- K. N. Groom, R. H. Byrne, G. A. Laguna, B. R. Rohrer, D. G. Wilson, R. D. Robinett, J. J. Harrington, R. J. Bickerstaff, J. B. Rigdon, "Design Tools for Complex Dynamic Security Systems," Tech. Rep. SAND2007-0433, Sandia National Laboratories, Albuquerque, NM, January 2007.
- R. H. Byrne, J. C. Neely, S. Buerger, J. T. Feddema, D. K. Novick, S. E. Rose, B. L. Spletzer, B. R. Sturgis, and D. G. Wilson, "Advanced Robot Locomotion," Tech. Rep. SAND2007-1466, Sandia National Laboratories, Albuquerque, NM, January 2007.
- K. N. Groom, R. H. Byrne, G. A. Laguna, B. R. Rohrer, D. G. Wilson, R. D. Robinett, J. J. Harrington, R. Bickerstaff, and B. J. Rigdon, "Design Tools for Complex Dynamic Security Systems," Tech. Rep. SAND2007-0433, Sandia National Laboratories, Albuquerque, NM, January 2007.
- Ron Baker, Ethan Blansett, Ray Byrne, Joe Lyle, Ted Wrobel, "Peregrine PE97201 Optical Transceiver Proton Single-Event Upset Radiation Test Final Report," Internal Technical Report, Sandia National Laboratories, June 2005.

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Technical Reports (continued)

- J. T. Feddema, R. H. Byrne, J. J. Harrington, D. M. Kilman, C. L. Lewis, R. D. Robinett, B. P. Van Leeuwen, and J. G. Young, "Advanced Mobile Networking, Sensing, and Controls," Tech. Rep. SAND2005-1661, Sandia National Laboratories, Albuquerque, NM, March 2005.
- Ron Baker, Ethan Blansett, Ray Byrne, Charlie Kuznia, Joe Lyle, Ted Wrobel, "Peregrine Optical Transceiver PSC97201 Heavy Ion Single-Event Upset Test," Internal Technical Report, Sandia National Laboratories, January 2005.
- J. T. Feddema, R. D. Robinett, and R. H. Byrne, "Military Airborne and Maritime Application for Cooperative Behaviors," Tech. Rep. SAND2004-4764, Sandia National Laboratories, Albuquerque, NM September 2004.
- R. Byrne, L. Jones, P. Klarer, B. Rainwater Sturgis, M. Vaughn, "Moving mass control system feasibility study," Tech. Rep. SAND2004-2921, Sandia National Laboratories, Albuquerque, NM June 2004.
- R. H. Byrne, S. E. Eskridge, J. E. Hurtado and E. L. Savage, "Algorithms and analysis for underwater vehicle plume tracing," Tech. Rep. SAND2003-2643, Sandia National Laboratories, Albuquerque, NM, July 2003.
- D. Schmitt, R. Byrne, J. Feddema, G. Fischer, J. Harrington, C. Little, J. Neely and B. Rigdon, "Intelligent Mobile Land Mine (IMLM) system," Tech. Rep. SAND2003-1186, Sandia National Laboratories, Albuquerque, NM, May 2003.
- R. Byrne, E. Heller, J. Feddema, T. Weber, K. Wessendorf, B. Spletzer, C. Anderson, J. Bryan, and C. Landron, "Final report: Integration of micro-sensor technology into a miniature robotic vehicle," Tech. Rep. SAND2000-0777, Sandia National Laboratories, Albuquerque, NM April 2000.
- R. H. Byrne, B. R. Sturgis, M. R. Vaughn, C. T. Coffin, R. D. Robinett, D. V. Zuiden, and J. B. Pulaski, "Moving-Mass Trim Control for Precision-Strike Warheads," Tech. Rep. SAND97-2341, Sandia National Laboratories, Albuquerque, NM, October, 1977.
- R. Byrne, J. Pletta, R. Case, and P. Klarer, "Commercial vehicle incident monitors," Tech. Rep. Prepared for FHWA, OMC, Sandia National Laboratories, Albuquerque, NM, February, 1997.
- R. H. Byrne and W. A. Amai, "Driver monitoring," Tech. Rep., Sandia National Laboratories, Albuquerque, NM April 1995.
- R. H. Byrne, "The mobile unit tester," Tech. Rep. SAND92-0833, Sandia National Laboratories, Albuquerque, NM May 1994.
- R. H. Byrne, "Global positioning system receiver evaluation results," Tech. Rep. SAND93-0827, Sandia National Laboratories, Albuquerque, NM September 1993.
- J. B. Pletta, W. A. Amai, P. R. Klarer, D. Frank, J. Carlson, and R.H. Byrne, "The remote security station (RSS) final report," Tech. Rep. SAND92-1947, Sandia National Laboratories, Albuquerque, NM October 1992.
- R. H. Byrne, P. R. Klarer, and J. B. Pletta, "Techniques for autonomous navigation," Tech. Rep. SAND92-0457, Sandia National Laboratories, Albuquerque, NM March 1992.

Book Chapters

J. T. Feddema, D. A. Schoenwald, R. D. Robinett, and R. H. Byrne, "Distributed Controls of Multiple Robotic Systems, An Optimization Approach", Chapter in Springer Verlag book, Encyclopedia of Complexity and Systems Science (ed. Warren Dixon), 2009.

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PATENTS

- ◆ "Cooperative System and Method using Mobile Robots for Testing a Cooperative Search Controller", U.S. Patent Number 6,408,226, issued 6/18/2002.
- ◆ "Portable Control Device for Networked Mobile Robots", U.S. Patent 6,438, 456, issued 8/20/2002.
- ◆ "Cooperating Mobile Robots", U.S. Patent number 6,687,571, issued 2/3/04

SUMMARY OF CREATIVE WORK

- ◆ Designed and developed RAYBOT, a teleoperated robotic vehicle for accident site inspection (1989-1991).
- ◆ Designed the command and control system for a remotely operated fuel-air explosive (1991).
- ◆ Designed the computer control system for a remotely operated mine-clearing landing craft for Operation Desert Storm (1991).
- ◆ Evaluated GPS receivers for DOE escort vehicles (1992).
- ◆ Developed an ultrasonic ranging and obstacle detection system for the Telemanaged Security Station (TMSS) robotic vehicle (1992).
- ◆ Doctoral Study Program (1993-1994). Investigated lateral control systems for automated highways. Also, developed an automated highway testbed at a DOE test track. Conducted lateral control experiments on a GMC S-15 blazer as part of dissertation research.
- ◆ Developed a control system for a moving mass reentry vehicle control system. Algorithms were evaluated with centrifuge testing (1995-1996).
- ◆ Developed a control system for an interferometer used in a non-invasive glucose monitoring system (1996-97).
- ◆ Developed a control system for a prototype eye surgery robot (1996-98).
- ◆ Taught a mobile robot class at the University of New Mexico (1996 and 1997). Each year the students entered a robot in the AAI (American Association for Artificial Intelligence) mobile robot competition. In 1997, they took first place in the vacuuming competition.
- ◆ Developed miniature mobile robots to deploy a Sandia-developed chemical sensor (1997-1999). These mobile robots are only 0.5 cubic inches in volume and include obstacle avoidance sensors, an infrared communications link, and onboard processing. The continuation of this project won Time Magazine's invention of the year award in robotics in 2001.
- ◆ Developed miniature mobile robots for plume tracking and source localization research (1999).
- ◆ Designed a radio communications system for a group of autonomous hopping robots. This involves designing a custom radio and a custom network protocol (2000).
- ◆ Developed a computer control system that controls an autonomous hopping robot (2000-2002).
- ◆ Developed custom STB-Bus data acquisition and control hardware for a Navy crane project (2002).
- ◆ Project leader and principal investigator for a DARPA-funded underwater robotics project (2001-2003).
- ◆ Developed the electronics design for a prosthetic knee control system (2002).
- ◆ Development of a rad-hard high-speed fiber optic link for satellites (2002-2008).
- ◆ Scene-based-processing team lead (2009-2011).