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EDUCATION

Ph.D. E.E.: Systems (1995): THE UNIVERSITY OF MICHIGAN, Ann Arbor MI
Major Kernel: Signal Processing/Systems; Minor Kernel: Electromagnetics/Remote Sensing
Dissertation Title: *Forward and Inverse Scattering for Discrete Lossy 1-D and Lossless 2-D Media*
Advisor: Andrew E. Yagle

MSEE (1988): UNIVERSITY OF SOUTHERN CALIFORNIA, Los Angeles CA
Specialization: Signal/Image Processing & Communication Theory

BSEE (1986): UNIVERSITY OF SOUTH ALABAMA, Mobile AL
Concentration: Communications, Digital Design & Controls

EXPERIENCE

UNIVERSITY OF VERMONT, Burlington, VT
Interim Associate Director – School of Engineering Aug 09 – date
Resident Scientist (sabbatical) Aug 08- Jun09
Sierra Nevada Aquatic Research Lab, University of California - Santa Barbara
Associate Professor of Engineering Apr 08 - date
Assistant Professor in Electrical Engineering Aug 02 – Apr 08
Research and Instruction in the areas of Telecommunications and Signal Processing.
Courses Taught: Signals and Systems, Intro to Communication Systems, Digital Communication Systems, Wireless Communication Systems, Wireless Sensor Networks, First-Year Design, Telecommunications Lab, Estimation Theory, Capstone Design

TENNESSEE TECHNOLOGICAL UNIVERSITY, Cookeville, TN Aug 98 – Aug 02
Assistant Professor in Electrical and Computer Engineering. Research and Instruction in the areas of Telecommunications, Physical Phenomena and Signal Processing.
Courses Taught: Introduction to Telecommunications, Telecommunications Theory, Random Processes in Electrical Systems, Wireless Communications, Fiber Optics Lab, Wireless Sensor System Design, Introduction to MEMS Technology.

INDEPENDENT CONSULTANT Aug 95-Jul 98
Shinawatra, Thailand. Research in the area of advanced broadband satellite systems.
Hughes Aircraft Company. Consultation in the areas of communication spacecraft design and testing.
Binariang Sdn. Bhd., Malaysia. Monitored the build of two high power communication satellites.

HUGHES AIRCRAFT COMPANY, Los Angeles, CA Sep 86-Jul 95
Hughes Information Technology Co.: Acoustic and vibration signal analysis for fault detection and classification in rotating automobile components.
Space and Communications Group: Spacecraft system engineer directly responsible for payload on numerous commercial communication satellites.

JOURNAL PUBLICATIONS

Technical (Mentored students underlined)

- D. Qian, J. Marshall and J. Frolik, *Control analysis for solar panel dust mitigation using an electric curtain*, Renewable Energy, Vol. 41, December 2011.
- L. Chen and J. Frolik, *Self-aware, distributed consensus building for sensor networks*, ISRN (International Scholarly Research Network) Communications and Networking Journal, Vol. 2011, Article ID: 860936, December 2011.
- G. Carpenter and J. Frolik, *Frequency selection for WSN beamforming*, in review, IEEE Wireless Communications Letters, revised and resubmitted: December 2011.
- I. Nassar, T. Weller and J. Frolik, *A compact, 3-D harmonic repeater for passive wireless sensing*, in review, IEEE Trans. Microwave Theory and Techniques, submitted: October 2011.
- D. Matolak and J. Frolik, *Worse-than-Rayleigh fading: experimental results and theoretical models*, IEEE Communications Magazine, Vol. 49, No. 4, April 2011.
- L. Chen, G. Carpenter, S. Greenberg, J. Frolik and X. Wang, *An implementation of decentralized consensus building in a sensor network*, IEEE Sensors Journal, Vol. 11, No. 3, March 2011.
- J. Frolik, T. Weller, S. DiStasi and J. Cooper, *A compact reverberation chamber for hyper-Rayleigh channel emulation*, IEEE Trans. Antennas and Propagation, Vol. 57, No. 12, December 2009.
- B. Liang, J. Frolik and X. Wang, *Energy-efficient dynamic spatial resolution control for wireless sensor clusters*, Int. Journal of Distributed Sensor Networks, Vol. 5, No. 4, July 2009.
- L. Bakir and J. Frolik, *Diversity gains in two-ray fading channels*, IEEE Trans. Wireless Communications, Vol. 8, No. 2, February 2009.
- R. Ketcham, J. Frolik and J. Covell, *Propagation characterization for in-aircraft wireless sensor systems*, IEEE Trans. Aerospace and Electronic Systems, Vol. 44, No. 4, October 2008.
- J. Frolik, *On appropriate models for characterizing hyper-Rayleigh fading*, IEEE Trans. Wireless Communications, Vol. 7, No. 12, December 2008.
- J. Kay and J. Frolik, *An expedient wireless sensor automation with system scalability and efficiency benefits*, IEEE Trans. Systems, Man and Cybernetics, Part A, Vol. 38, No. 6, November 2008.
- J. Frolik, *A case for considering hyper-Rayleigh fading channels*, IEEE Trans. Wireless Communications, Vol. 6, No. 4, April 2007.
- J.L. Frolik, *On the feasibility of impulse reflection response data from one-dimensional multilayered lossy media*, IEEE Trans. Ant. and Prop., Vol. 51, No.2, February 2003.
- J.L. Frolik, M. Abdelrahman and P. Kandasamy, *A methodology for the self-validation, synthesis and fusion of quasi-redundant sensors*, IEEE Trans. Instrumentation and Measurement, Vol. 50, No. 6, December 2001.
- J.L. Frolik, *Reconstruction of multilayered lossy media from one-sided plane wave impulse reflection responses: the bistatic case*, IEEE Trans. Geo. & Rem. Sens., Vol. 39, No. 9, September 2001.
- J.L. Frolik and A.E. Yagle, *Forward and inverse scattering for discrete layered lossy and absorbing media*, IEEE Trans. Circuits and Systems-II, Vol. 44, No. 9, September 1997.
- A.E. Yagle and J.L. Frolik, *On the feasibility of impulse reflection response data for the two-dimensional inverse scattering problem*, IEEE Trans. Ant. and Prop., Vol. 44, No. 12, December 1996.
- J.L. Frolik and A.E. Yagle, *A discrete-time formulation for the variable wave speed scattering problem in two dimensions*, Inverse Problems, Vol. 12, No. 6, June 1996.
- J.L. Frolik and A.E. Yagle, *An asymmetric discrete-time approach for the design and analysis of periodic waveguide gratings*, IEEE J. Lightwave Tech., Vol. 13, No. 2, February 1995.
- J.L. Frolik and A.E. Yagle, *Reconstruction of multi-layered lossy dielectrics from plane wave impulse responses at two angles of incidence*, IEEE Trans. Geo. & Rem. Sens., Vol. 33, No. 2, February 1995.

Education

- J. Frolik, P. Flikkema, T. Weller, C. Haden, W. Shiroma and R. Franklin, *Leveraging multi-university collaboration to develop portable and adaptable course content*, in review, IEEE Transactions on Education, submittal: August 2011.
- J. Frolik, T. Weller, P. Flikkema and C. Haden, *Implementing an inverted classroom using Tablet PCs for content development*, The Impact of Tablet PCs and Pen-based Technology on Education: Going Mainstream, Purdue University Press, 2010.

- J. Frolik, *Implementation Handheld, RF Test Equipment in the Classroom and the Field*, IEEE Trans. Education, Vol. 50, No. 3, August 2007.
- J. Frolik and M. Fortney, *A Low-Cost Wireless Platform for First Year, Interdisciplinary Projects*, IEEE Trans. Education, Vol. 49, No. 1, February 2006.
- J. Frolik and J.B. Zurn, *Evaluation of Tablet PCs for engineering instruction and content development*, ASEE Computers in Education Journal, Vol. 15, No. 3, July-September 2005.
- J.L. Frolik and T.M. Weller, *Wireless sensor system design: an approach for a multi-university design course offering*, IEEE Trans. Education, Vol. 45, No. 2, May 2002.

CONFERENCE PAPERS, PRESENTATIONS, & POSTERS SINCE 2008

Technical

- L. Chen and J. Frolik, *Active consensus over sensor networks via randomized communication*, in review, 2012 IEEE Conference on Sensor, Mesh, and Ad Hoc Communications and Networks (SECON 2012), Seoul, Korea, June 18-21, 2012.
- A. Hilshey, P. Rezaei, P. Hines and J. Frolik, *Electric vehicle charging: Transformer impacts and smart, decentralized solutions*, in review, IEEE Power and Energy System General Meeting, San Diego CA, July 22-26, 2012.
- J. Frolik and P. Hines, *Random access, electric vehicle charge management*, in review, 1st IEEE International Electric Vehicle Conference, Greenville, SC, March 4-8, 2012.
- J. Frolik, A. Lentine, C. Palombini and A. Seier, *An automaton-based approach for μ grid communications control*, in review, 2012 IEEE International Conference on Communications (ICC 2012), Ottawa, ON, June 10-15, 2012.
- J. Frolik, *Wireless sensor networks: lessons for the smart grid?*, presentation at Sandia National Laboratory, Albuquerque NM, July 14, 2011.
- T. Weller, J. Wang, J. Frolik, I. Nassar, J. Dewney, R. Davidova, and V. Sakamuri, *A wireless interrogator - passive sensor approach for deeply embedded sensing applications*, IEEE Int. Symposium on Antennas and Propagation, Spokane, WA, July 4-11, 2011.
- G. Carpenter, L. Chen, and J. Frolik, *A distributed consensus approach for locating the centroid of WSN nodes*, w/demonstration, 2011 IEEE Conference on Sensor, Mesh, and Ad Hoc Communications and Networks (SECON 2011), Salt Lake City, UT, June 27-30.
- J. Frolik, P. Flikkema and D. Rizzo, *Overcoming the Challenges of Multi-X Collaborations*, organized workshop at annual conference of Association of Environmental Studies and Sciences (AESS'11), Burlington, VT, June 23-26, 2011.
- M. Walker, C. Moeser, C. Skalka and J. Frolik, *Application of a wireless sensor network for distributed snow water equivalence estimation*, proceedings of the 2011 Western Snow Conference.
- M. Walker, C. Moeser, C. Skalka and J. Frolik, *Application of a distributed wireless network for quantifying areal snow depth and water equivalence*, presentation, 2011 Western Snow Conference, Stateline, NV, April 18-21.
- V. Sakamuri and J. Frolik, *Design of a 2.4 GHz interrogator for a rectenna-based, wireless sensor system*, 2011 Wireless and Microwave Technology Conference (WAMICON 2011), Clearwater, FL, April 18-19.
- M. Casari, A. Vize, B. Holmén, and J. Frolik, *A portable ultrafine particle sizer (PUPS) for in-situ engine exhaust monitoring*, 29th American Association for Aerosol Research Conference (AAAR), Portland OR, Oct. 25-29, 2010.
- C. Skalka, J. Frolik; M. Walker and C. Moeser, *Development of a distributed in situ instrument for snowpack monitoring*, 2009 American Geophysical Union (AGU) Fall Meeting, San Francisco CA, Dec. 14-18.
- J. Frolik and C. Skalka, *'Scaling down' remote sensing technologies for in situ monitoring of snowpacks*, 2009 American Geophysical Union (AGU) Fall Meeting, San Francisco CA, Dec. 14-18.
- M. Casari, A. Vize, B. Holmén, and J. Frolik, *A portable ultrafine particulate sizer for in-situ engine exhaust monitoring*, 28th American Assoc. Aerosol Research Conference (AAAR), Minneapolis MN, Oct. 26-30, 2009.

- J. Frolik, *in situ monitoring of snowpacks (and other harsh environments) using wireless sensor networks*, invited presentation, Jones Seminar on Science Technology and Society, Dartmouth, Oct. 23, 2009.
- J. Cooper, S. DiStasi, T. Weller and J. Frolik, *An electrically reconfigurable reverberation chamber for the emulation of severe multipath channels*, 2009 Wireless and Microwave Technology Conference (WAMICON 2009), Clearwater, FL, April 20-21, 2009.
- J. Frolik, C. Skalka and B. Wemple, *An Investigation of new snow water equivalence sensing modalities*, American Geophysical Union (AGU) Fall Meeting, San Francisco, December 15-19 2008.
- J. Frolik, *Wireless strategies for harsh environments*, invited presentation, Center for Wireless and Microwave Information Systems, University of South Florida, Oct. 20, 2008.
- C. Skalka, J. Frolik, B. Wemple and T. Neuman, *A distributed in situ measurement systems for snowwater equivalence*, International Snow Science Workshop (ISSW), Whistler CAN, Sept. 21-27, 2008.
- C. Chen and J. Frolik, *Improved footprint modeling for wireless sensor networks*, IEEE Int. Symposium on Antennas and Propagation, San Diego, CA, July 5-12, 2008.
- S. DiStasi, S. Melais, R. Ketcham, B. Zivonovic, J. Cooper, J. Frolik and T. Weller, *A compact, reconfigurable chamber for emulating severe multipath fading*, submitted to the IEEE Int. Symposium on Antennas and Propagation, San Diego, CA, July 5-12, 2008.

Education

- J. Frolik, P. Flikkema, and D. Rizzo, *Overcoming the challenges of multi-X collaborations*, panel session, Association for Environmental Studies and Sciences (AESS) Annual Conference, Burlington VT, June 23-26, 2011
- P. Flikkema, C. Haden T. Weller, and J. Frolik, *Wireless-integrated embedded real-time control*, 2011 ASEE Annual Conference, Vancouver BC, June 26-29.
- T. Weller, W. Shiroma, R. Franklin, C. Haden, P. Flikkema and J. Frolik, *The portability of systems-centric content to existing sub-discipline courses*, 2011 ASEE Annual Conference, Vancouver BC, June 26-29.
- P. Flikkema and J. Frolik, *Overcoming the challenges of multi-institutional TUES projects*, PI breakout session, NSF AAAS CCLI/TUES PI Meeting, Washington DC, January 66-28, 2011.
- J. Frolik, P. Flikkema, T. Weller, W. Shiroma and C. Haden, *MUSE – Multi-University Systems Education*, poster, NSF AAAS CCLI/TUES PI Meeting, Washington DC, January 66-28, 2011.
- P. Flikkema, R. Franklin, J. Frolik, C. Haden, W. Shiroma, and T. Weller, *MUSE – Multi-University Systems Education Mini-Workshop*, FIE 2010, Washington DC, October 27-30.
- J. Frolik, T. Weller, P. Flikkema, and C. Haden, *Implementing an inverted classroom using Tablet PCs for content development*, WIPTE 2010 - Workshop on the Impact of Pen-based Technology on Education, Blacksburg VA, October 25-26.
- J. Frolik, *“MUSE: A technology-enhanced learning paradigm for 2^{1st} Century engineering education,”* invited presentation, IEEE Wireless and Microwave Technology Conference, Melbourne FL, April 12-13, 2010.
- P. Flikkema, T. Weller, J. Frolik and C. Haden, *Experiential learning of complex engineered systems in the context of wireless sensor networks*, 2010 ASEE Annual Conference, Louisville KY, June 20-23.
- C. Haden, P. Flikkema, T. Weller, J. Frolik, W. Verrei-Berenback and W. Shiroma, *Assessment of a hybrid, online/in-class course developed at multiple universities*, 2009 ASEE Annual Conference, Austin, TX, June 14-17.
- J. Frolik, T. Weller, P. Flikkema and W. Shiroma, *Work in Progress: MUSE - Multi-University Systems Education*, FIE 2008, Saratoga Springs NY, October 22-25.
- A. Chidanandan, P. Ferro, J. Frolik, M. Hirotnani, K. Schmidt, D. Walter, J. Williams, *Panel Session - Pen-based Computing in the Engineering and Science Classroom: Implementation Scenarios from Three Institutions*, FIE 2008, Saratoga Springs NY, October 22-25.

CONFERENCE PAPERS & PRESENTATIONS 2002- 2008

- S. DiStasi, J. Galbreath, R. Ketcham and J. Frolik, *Wireless sensors, sensing wireless (WSSW) for the characterization of multipath fading*, Sixth International Conference on Information Processing in Sensor Networks (IPSN07), w/demonstration, April 25-27, 2007, Cambridge, MA.
- R. Ketcham and J. Frolik, *A low-complexity, compact antenna for mitigating frequency-selective fading*, Sixth International Conference on Information Processing in Sensor Networks (IPSN07), w/demonstration, April 25-27, 2007, Cambridge, MA.
- X. Sean Wang and J. Frolik, *EnArchi: A robust and manageable approach for dynamic large-scale sensor networks*, 2006 AGU Fall Meeting, San Francisco CA, December 11-15.
- R. Ketcham, J. Frolik, B. Zivanovic, S. Melais, and T. Weller, *Effectiveness of simple diversity methods in mitigating hyper-Rayleigh fading environments*, 2006 IEEE Wireless and Microwave Conference, Clearwater FL, December 4-5.
- J. Kay and J. Frolik, *Derandomization of channel access in wireless sensor networks using simple automata*, International Conference on Autonomic and Autonomous Systems (ICAS06), Silicon Valley, CA July 19-21, 2006.
- J. Galbreath and J. Frolik, *Channel allocation strategies for wireless sensors statically deployed in multipath environments*, Fifth International Conference on Information Processing in Sensor Networks (IPSN06), special track on Sensor Platform, Tools and Design Methods for Networked Embedded Systems (SPOTS), April 19-21, 2006, Nashville, TN.
- B. Capsuto and J. Frolik, *A system to monitor signal fade due to weather phenomena for outdoor sensor systems*, Fifth International Conference on Information Processing in Sensor Networks (IPSN06), demonstration for special track on Sensor Platform, Tools and Design Methods for Networked Embedded Systems (SPOTS), April 19-21, 2006, Nashville, TN.
- R. Ketcham and J. Frolik, *Demonstration of high bandwidth sensor acquisition utilizing a mesh network topology*, Fifth International Conference on Information Processing in Sensor Networks (IPSN06), demonstration for special track on Sensor Platform, Tools and Design Methods for Networked Embedded Systems (SPOTS), April 19-21, 2006, Nashville, TN.
- B. Liang, J. Frolik and X. Wang, *A predictive QoS strategy for wireless sensor networks*, 1st International Workshop on Resource Provisioning and Management in Sensor Networks (RPSMN05), Washington DC, November 7-10, 2005.
- D. Kaminsky, R. Ketcham, D. Pechenick, J. Klein, F. Flynn, J. Thompson-Figueroa, S. Lang, C. Irvin, J. Bates and J. Frolik, *Imaging Lung Tissue Strain by Elastography Using Computerized Tomography*, 2005 International Conference of the American Thoracic Society (ATS), San Diego, May 20-25.
- C. Fitzhugh, J. Frolik, J. Covell, R. Ketcham and T. Meyer, *2.4 GHz multipath environments in airframes*, 2005 Wireless and Microwave Technology Conference (WAMICON 2005), Clearwater, FL, April 7-8, 2005.
- J. Kay and J. Frolik, *Quality of Service analysis and control for wireless sensor networks*, 1st IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS 2004), Ft. Lauderdale, FL., Oct. 25-27, 2004.
- Fredman, J. Frolik and B. Garra, *Lung strain profiles using computed tomography elastography*, 2004 IEEE Engineering in Medicine and Biology Conference (EMBS04), San Francisco, Sept. 1-5, 2004.
- P. Flikkema and J. Frolik, *From Circuit to Network: Engineering Across Layers and Disciplines in Wireless Sensor Networks*, invited presentation at the 2004 Wireless and Microwave Technology Conference, Clearwater, FL, April 15-16, 2004.
- J. Frolik, *QoS control for random access wireless sensor networks*, 2004 Wireless Communications and Networking Conference (WCNC04), Atlanta, March 21-25, 2004.
- L. Yeary, G. Cunningham, N. Panduga, J. Frolik, C. Darvennes, K. Walsh, M. Crain, R. Cohn and S. Harfenist, *Design, analysis, and testing of electrostatically actuated micromembranes*, 2003 ASME International Congress and Exposition, Washington D.C., November 16-21, 2003.
- Fanimokun and J. Frolik, *Effects of natural propagation environments on wireless sensor network coverage area*, 2003 Southeastern Symposium on System Theory (SSST03), Morgantown, WV, March 16-18, 2003.
- J. Howell and J. Frolik, *An Internet-based, inverse-GPS system for monitoring and tracking mobile aquatic sensors*, IEEE Sensors 2002, Orlando, FL, June 12-13.
- George, J. Knight and J. Frolik, *A nine-position, electrostatic microstage*, IEEE SECON 2002, Columbia, SC, April 5-7.

Education

- J. Frolik, *Integration of Tablet PCs into collaborative learning environments*, 2007 ASEE Annual Conference: Computers in Education Division, Honolulu HI, June 24-27.
- J. Frolik, F. Sansoz, D. Rizzo and A. Sadek, *A multidisciplinary curricular effort incorporating wireless sensors*, 2007 ASEE Annual Conference: Multidisciplinary Engineering Division, Honolulu HI, June 24-27.
- M. Fortney and J. Frolik, *Adaptation of a low-cost wireless sensor for freshman and outreach programs*, 2005 ASEE New England Section Conference, Fairfield, CT, April 8-9.
- J. Frolik, *Laboratory-enhancement of digital and wireless communications courses*, invited submittal, 2005 ASEE Annual Conference, Portland, OR, June 12-15.
- J. Frolik and T. Keller, *Wireless Sensor Networks: An interdisciplinary topic for freshman design*, 2005 ASEE Annual Conference, Portland, OR, June 12-15.
- J. Frolik, *A Comprehensive, Laboratory-Enhanced Communications Curriculum*, poster presentation at NSF EEC Grantees meeting, Washington DC, February 17-18, 2005 and the Wireless and Microwave Technology Conferences, Clearwater, FL, April 15-16, 2005 & April 7-8, 2005.
- J. Frolik, *Implementation of Tablet PCs in engineering laboratory and design environments*, poster presentation, HP Higher Ed Technology for Teaching Recipient Workshop, Monterey, CA, Nov. 4-5, 2004.
- J. Frolik, *A Comprehensive, Laboratory-Enhanced Communications Curriculum*, invited paper, 2004 ASEE Annual Conference, Salt Lake City, UT, June 20-23, 2004.
- J. Frolik and J.B. Zurn, *Evaluation of Tablet PCs for engineering instruction and content development*, 2004 ASEE Annual Conference, Salt Lake City, UT, June 20-23, 2004.
- J. Frolik, J. Biernacki, G. Cunningham and S. Mahajan, *An introductory multidisciplinary, design course in MEMS*, 2002 ASEE Annual Conference, Montreal, June 16-19.

CONFERENCE PAPERS PRIOR TO 2002

Technical

- Mahatvaraj, N. Vora, J. Bush, G. Cunningham, J. Biernacki and J. Frolik, *Surface micro-machined mirrors using simple floating and fixed hinge designs for three-layer process*, 2001 ASME Congress - MEMS Symposium, New York, November 11-16.
- M. Lou, M. Abdelrahman and J. Frolik, *Fusion of sensors with multisampling rates using wavelet transforms*, 2001 American Control Conference, Arlington, VA, June 25-27.
- J.L. Frolik and M. Abdelrahman, *Synthesis of quasi-redundant sensor data: a probabilistic approach*, 2000 American Control Conference, Chicago, June 28-30, 2000.
- P.V. Chaganti, S. Orth, J. Frolik and M. Abdelrahman, *Fuzzy rules for sensor self-validation and confidence measure*, 2000 American Control Conference, Chicago, June 28-30, 2000.
- M. Abdelrahman, P. Kandasamy and J. Frolik, *A methodology for fusion of redundant sensors*, 2000 American Control Conference, Chicago, June 28-30, 2000.
- H. Zhu and J.L. Frolik, *A hybrid hardware/software receiver architecture for wireless sensor systems*, 2000 Southeastern Symposium on System Theory, Tallahassee, Florida, March 5-7, 2000.
- V. Vijayakumar and J.L. Frolik, *A convenient methodology for the hardware implementation for fusion of quasi-redundant sensors*, 2000 Southeastern Symposium on System Theory, Tallahassee, Florida, March 5-7, 2000.
- J.L. Frolik, *Time-domain techniques for reconstructing lossy layered media from one-sided scattering*, 1999 AP-S International Symposium, Orlando, July 11-16, 1999.
- J.L. Frolik, *Applying Monte Carlo methods to neural network development*, 31st Southeastern Symposium on System Theory (SSST 99), Auburn University, March 21-23, 1999.
- J.L. Frolik, *Reconstruction of multi-layered lossy dielectrics from one-sided oblique TE and TM plane wave impulse responses*, IGARSS 98, Seattle, July 6-10, 1998.
- J.L. Frolik and A.E. Yagle, *On the feasibility of impulse reflection responses of 1-D absorbing discrete layered electromagnetic media*, PIERS 1995, Seattle, July 24-28, 1995.
- J.L. Frolik, *Optimal pre-processing of spectral vibration data for defect detection and classification using neural networks*, © Copyright 1994, Hughes Aircraft Company.

Education

- J. Frolik and T. Weller, *An internet-based approach to multi-university course offerings*, 2001 ASEE-Southeastern Section Meeting, Charleston, April 2001.

FUNDING FOR RESEARCH AND EDUCATION

Research

- Co-PI (w/ M. Dewoolkar and D. Huston): *Prediction and Mitigation of Scour for Vermont Bridges* (\$310k), Vermont Agency of Transportation & UVM Transportation Research Center (01/12-12/14).
- Co-PI (w/ P. Hines and J. Marshall): *Electric Vehicles and Their Impact on the Electric Power Distribution System* (\$202k), USDOT/RITA UVM/Spire (06/12-05/13).
- PI (w/ J. Bongard, CS): *Evolving Flight Control Algorithms for Rotating-Wing, Autonomous MAVs* (\$32.5k), GRA recipient: G. Carpenter, NASA/Vermont Space Grant Consortium (05/11-06/12).
- Research-PI (w/ W. Lakin (PI), Lyndon State College and Vermont Tech. College): *The Vermont Frozen Landscape Monitoring Project* (\$185k), NASA EPSCoR – CDC [Consortium Development Competition] (09/10 – 04/12).
- Co-PI (w/ C. Skalka, CS): *Complementing Static In Situ Sensing with Mobile Gateway Resources for Improved Environmental Monitoring* (\$38.9k), GRA recipient: S. Greenberg, NASA/Vermont Space Grant Consortium (05/10-06/11).
- co-PI (w/ W. Lakin (PI), Norwich Univ. and Vermont Tech. College): *2009 Consortium Development Competition* (\$345k), NASA EPSCoR (10/09 – 5/11).
- PI: *GOALI/Collaborative Research: Passive, Diamagnetic Inertial Sensing Integrated with High-Sensitivity Telemetry* (\$136k of \$405.7k), NSF (9/09-8/12), Grant No. ECCS-0925728, Collaborators: M. Dewoolkar (UVM) and J. Wang and T. Weller (Univ. South Florida).
- PI: *Developing a Symbiotic Sensing System with Wireless Sensor Networks and MAVs* (\$30k), GRA recipient: G. Carpenter, NASA/Vermont Space Grant Consortium (05/09-06/10).
- co-PI (w/ W. Lakin (PI), J. Marshall (ME), D. Hitt (ME), and J. Wu (Physics)): *Active Surface Technologies for Dust Mitigation in Martian and Lunar Environments* (\$750k), NASA (9/08 - 9/11).
- co-PI (w/ B. Holmén (EnvE, PI), D. Huston (ME), R. Jenkins (ME), L. Gregory (CDAE), T. Macias (Soc) and T. Streeter (Soc)): *Signature Project # 2: Emissions and Performance of Alternative Vehicles in Northern Climates (Year 1: \$262k direct of \$1.1M 4-year total)*, UVM National University Transportation Center (9/07 – 9/11).
- PI (w/ C. Skalka, CS; B. Wemple, Geography and T. Neumann, Geology): *An in situ, snow water equivalent monitoring system with improved temporal and spatial resolution* (\$30k), NASA/Vermont Space Grant Consortium (6/07 - 9/08).
- co-PI (w/ X. Wang, CS): *The use of autonomous agents in dynamic, complex and robust sensor networks* (\$15k), Sponsoring Organization: Vermont EPSCoR, recipient: B. Liang (1/08-6/08).
- co-PI (w/ X. Wang, CS): *A wireless sensor network research testbed* (\$11.5k), Sponsoring Organization: CEMS Next Generation Initiative, (2007).
- PI: *Wireless sensor networks for aircraft support systems* (\$157.9k), Sponsoring Organization: Goodrich Fuel and Utility Systems (1/06-12/07).
- PI: *Channel characterization for aerospace wireless sensor networks* (\$65k), Sponsoring Organization: Goodrich Fuel and Utility Systems (6/04-12/05).
- PI: Vermont EPSCoR Equipment Grant (\$19k) for a 6 GHz portable spectrum analyzer with tracking generator (2005).
- co-PI (w/ X. Wang, CS): *Wireless sensor network optimization with application QoS requirements* (\$25k), Sponsoring Organization: Vermont EPSCoR, recipient: B. Liang (6/04-5/04).
- PI: *A low-cost linear-response wireless temperature sensor for extreme environments* (\$15.6k), Sponsoring Organization: Vermont EPSCoR, recipient: M. Fortney (9/04-5/05).
- PI: *Collaborative signal processing for wireless sensor networks* (\$18.75k), Sponsoring Organization: Vermont EPSCoR, recipient: L. Mayer (9/03-5/04).
- Faculty sponsor for UVM's Undergraduate Research Endeavors Competitive Awards (URECA!). Project: *Determining water content in snow-packs through gamma radiation measurements*, recipient: C. Tardie (\$4k - 2011).

Project: *Integrating RFID and mobile robotic hardware in a swarm scheme*, recipient: G. Carpenter (\$4k - 2007).

Project: *Integrating Radio Frequency Identification and Wireless Sensor Network Technologies*, recipient: H. Taylor (\$4k - 2006).

Project: *Wireless Node Tracking Using the Low Power, Highly Robust ZigBee Standard*, recipient: R. Ketcham (\$3k - 2005).

Project: *A study of wireless sensor network routing protocols*, recipient: B. Capsuto (\$4k - 2004).

Project: *An investigation of propagation characteristics for outdoor campus environments for common wireless frequency bands*, recipient: J. Murch (\$4k - 2003). This latter work was also supported by national Sigma Xi GIAR award.

- Faculty sponsor for McNair Scholars Program (\$3.3k) for underrepresented undergraduate students: *Defining application constraints for wireless sensor networks* (2005, H. Taylor) and *Implementation of a testbed for wireless sensor network research* (2004, C. Luyinduladio).
- co-PI: *TTU MEMS Initiative 2000 (\$125k)*; Sponsoring Organizations: TTU College of Engineering, Centers for Water Resources, Electric Power and Manufacturing, ORNL and Intellisense, Inc.
- PI: *A wireless sensor system for monitoring aquatic specie behavior and environment* (\$20k), TTU Faculty Research Grant, TTU Center for Water Resources (8/00-5/02).
- Faculty Investigator: *Intelligent Integrated Industrial Process Sensing and Control (I3PSC) System Applied to and Demonstrated on Cupola Furnaces (\$35.3k of \$964k)*; Sponsoring Agency: DOE, TTU Center for Manufacturing Research (1/99-12/01).
- PI: *Remote Monitoring and Classification of Bioelectric Signals as a Measure of Water Toxicity (\$25k)*; Sponsoring Agency: TTU Center for Water Resources (1/99 - 8/00).
- co-PI, *Novel techniques for pattern classification*, Hughes Aircraft IR&D Funding (1994).

Education

- co-PI (P. Hines – PI): *Solar Power and Smart Grid Technology for UVM* (\$27k), UVM Clean Energy Fund, 2010.
- PI: *MUSE: A model for undergraduate learning of complex-engineered systems* (\$159k of \$500k), NSF (9/07-8/10), Grant No. DUE-0717326, Collaborators: T. Weller (Univ. South Florida), P. Flikkema (Northern Arizona Univ.) and W. Shiroma (Univ. Hawaii)
- PI: *A curriculum development laboratory for sensor system courses* (\$10k), UVM Center for Teaching and Learning/College of Engineering and Mathematical Sciences (6/06-12/07).
- co-PI (J. Kraushaar - PI): *Educational Value and Validity - Student Adaptation to Tablet PC Technology in Business and Engineering Curriculums* (\$100k), Microsoft Corp. (6/06-5/08).
- PI: *Integration of service-learning into a first-year engineering design course* (\$3k), UVM Community-University Partnerships and College of Engineering and Mathematical Sciences (12/05-12/06).
- PI: *Implementation of Tablet PCs in engineering laboratory and design environments* (\$69.6k), HP Technology for Teaching Grant (5/04-4/06).
- PI: *A comprehensive, laboratory-enhanced signals and communications curriculum* (\$115k), NSF and UVM (8/03-8/05), Grant No. DUE-0310150
- PI: *Evaluation of Table PCs for engineering course content development and for senior design environments* (\$3.7k), UVM Center for Teaching and Learning (7/03-8/04).
- co-PI: *A hands on design course for electrical and computer engineering and mechanical engineering freshman: EE/ME 1* (\$6.7k), UVM Center for Teaching and Learning (7/03-8/05).
- Coordinator: *Digital Communications Test Bench* (\$72k), Contributors: Bell South, private donors, Dept. ECE and College of Engineering, December 2001. (TTU)
- Coordinator: *Cellular Communications Test Bench*, Contributor: Ericsson, February 2002. (TTU)
- PI: *Communication system simulation software for undergraduate education* (\$52k), Elanix, Inc., May 2000. (TTU)

PATENTS AND APPLICATIONS

- *Method of making a decision on the status of a mechanical system using input and response data acquired in situ*, US Patent No. 7,395,167 (Issued: July 1, 2008); US Patent No. 7,831,403 (November 9, 2010).
- *Zero-order energy smart antenna and repeater*, w/ Tom Weller, University of South Florida (USF). US Patent No. 7,720,437 (Issued: May 18, 2010).
- *Compact reconfigurable channel emulator*, w/ T. Weller, University of South Florida (USF). US Patent Application Serial No. 60/973,915 (Filed: September 20, 2007).
- *A distributive, non-destructive real-time approach to snowpack monitoring*, w/ C. Skalka, University of Vermont, Application Serial No. 12/566,797 (Filed: February 26, 2009).
- *Portable ultrafine particle sizer*, w/ M. Casari, A. Vize and B. Holmén, University of Vermont (Disclosure filed: October 2009).
- *A method and means for user-influenced organization of multi-media content*, w/ T. Weller, University of South Florida (USF) and P. Flikkema, Northern Arizona University (NAU) (Disclosure filed: May 2011).

GRADUATE STUDENTS

Present UVM Students

- L. Chen, *Distributed consensus building in wireless sensor networks*, PhD EE, Expected graduation: May 2012.
- G. Carpenter, *The development of an autonomous micro-aerial vehicle and wireless sensor network symbiotic sensing system*, MSEE, Expected graduation: May 2012.
- M. Casari, *TBD*, MSEE, Expected graduation: May 2012.
- A. Seier, *TBD*, MSEE, Expected graduation: Spring 2013.

Graduated Students

- J. Kay, *Energy and channel efficient control of wireless sensor network clusters*, PhD EE dissertation, UVM, March 2007. Employed at Goodrich Aerospace.
- V. Sakamuri, *A 2.4 GHz interrogator for a rectenna-based wireless sensor*, MSEE thesis, UVM, May 2012.
- A. Vize, *Design, fabrication and characterization of a corona ionizer for in-situ engine exhaust monitoring*, MSEE thesis, UVM, May 2012. Employed at IBM.
- D. Qian, *Efficiency analysis of solar panel dust mitigation using an electric curtain*, MSME thesis, UVM (co-advised with J. Marshall), October 2011.
- K. Clark, *Evolution of sensor control strategies for over-deployed wireless sensor networks*, MSCS project, UVM (co-advised with X. Wang), May 2009. Employed w/ State of Vermont.
- S. DiStasi, *In situ measurement and emulation of severe multipath environments*, MSEE thesis, UVM, October 2008. Employed at MicroStrain.
- C. Chen, *Footprint molding and connectivity analysis for wireless sensor networks*, MSEE thesis, UVM, October 2008. Employed at TechExcel.
- R. Ketcham, *Characterization and mitigation of hyper-Rayleigh fading*, MSEE thesis, UVM, October 2007. Employed at MicroStrain.
- M. Fortney, *A low-cost, linear response wireless temperature sensor for extreme environments*, MSEE thesis, UVM, March 2007. Employed at UVM.
- B. Capsuto, *Characterization and impact of radio signal variation for statically deployed wireless sensors*, MSEE thesis, UVM, October 2006. Employed at OSIsoft.
- C. Fitzhugh, *Multipath characterization of enclosed environments*, MSEE thesis, UVM, March 2006. Employed at EWA Government Systems Inc.
- J. Galbreath, *Channel allocation strategies for wireless sensor networks statically deployed in multipath environments*, MSEE thesis, UVM, March 2006. Employed at MicroStrain.

- L. Mayer, *On the robustness of wireless sensor network target tracking algorithms*, MSEE thesis, UVM, October 2004. Pursued PhD at Tufts.
- S. Maciejowski, *Development of a low-cost, low-power wireless sensor network*, MSEE thesis, UVM, October 2003. Employed at Earth Turbines (previously Omni Measurements).
- A. Fredman, *Lung strain profiles using computed tomography elastography*, MSEE thesis, UVM, October 2003. Employed at Open Systems International.
- A. Fanimokun, *Performance of randomly deployed wireless sensor networks in different propagation environments*, MSEE thesis, TTU (co-advised with P.K. Rajan), April 2003. Pursued MBA.
- J. Howell, *Internet-based monitoring and tracking utilizing ultrasonic transmitters and hyperbolic multilateration*, MSEE thesis, TTU, August 2002. Employed at Analysis and Measurement Services Corp.
- A. Balasubramanian, *Formulation and evaluation of serial concatenated turbo codes*, MSEE thesis, TTU, May 2001. Employed at Stryker Endoscopy.
- S. Seshan, *Comparison and performance of MPEG2 and fractal compression methods on moving images*, MSEE thesis, TTU, May 2001. Employed at Cingular Wireless.
- P. Chaganti, *An evaluation of CMA for blind deconvolution of 16-ary QAM signals*, MSEE thesis, TTU, March 2001. Employed at ATT Wireless.
- H. Zhu, *A hybrid hardware/software receiver for wireless sensor systems*, MSEE thesis, TTU, July 2000. Employed at Qualcomm.

AWARDS

- IEEE Green Mountain Section Faculty of the Year Award: *Seminal Improvements to the State of the Art of Multi-Disciplinary Engineering Education* (2011)
- IEEE Green Mountain Section Innovation Award: *Leadership and Innovation in Support of IEEE Students* (2007)
- ASEE Southeastern Section New Teacher Award (2002)
- Co-recipient: TTU's L.E. Sissom Innovation and Creativity Award (2002): *The Interdisciplinary Development of Academic and Research Programs in MEMS*
- TTU's L.E. Sissom Innovation and Creativity Award (2000): *An Internet-Based Multi-University Collaborative Design Course*
- Hughes Aircraft Co. Fellowship for Doctoral Study (1991-94)

OTHER

- Faculty advisor to the Alternative Energy Racing Organizations (AERO) at UVM (2006-date)
- IEEE Student Branch faculty advisor at UVM (2002-2009)
- IEEE Green Mountain Section Student Activities Coordinator (2004-2009)
- HKN faculty advisor at TTU (1999-2002)
- Cycling club faculty advisor at TTU (2002)
- TPC Member for Radio and Wireless Symposium (RWS 2008)
- TPC Member for International Sensors Conference (Sensors 2007)
- TPC Member for International Conference on Distributed Computer Systems (ICDCS 2007)
- TPC Member for the Wireless and Microwave Technology Conference (WAMICON 2005, 2006, 2009, 2010); Session Chair (2004-2006), Tutorial co-chair (2006)
- TPC Member for International Conference of Sensor Networks (SENET 2005)
- TPC Member for the International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP 2005)
- Journal Reviewer for IEEE Transactions on Vehicular Technology, IEEE Transactions on Wireless Communications, IEEE Communications Magazine, IEEE Transactions on Mobile Computing, IEEE Transactions on Systems, Man and Cybernetics – Part A, IEEE Transactions on Education, IEEE Transactions on Industrial Electronics, IEEE Transactions on Instrumentation and Measurement, IEEE Antennas and Wireless Propagation Letters, IEEE Transactions on Aerospace and Electronic Systems, IEEE Transactions on Communications, Advances in Engineering Education, Computers and

Industrial Engineering, International Journal of Sensor Networks, IEEE Sensors Journal, IEEE Wireless Communications Letters.

- Conference Reviewer for American Society for Engineering Education, Frontiers in Education, American Controls Conference, Conference on Decision and Control, European Workshop on Wireless Sensor Networks, GlobeCom, ICC Wireless Communications Symposium, International Conference on Distributed Computing Systems, International Conference on Systems and Networks Communications, IEEE Sensors, IASTED Wireless Sensor Networks, IEEE Wireless Communications and Networking Conference.
- Proposal Reviewer for Vermont EPSCoR Pilot, Vermont EPSCoR SBIR, NASA Post-Doc Fellowship, ORAU Junior Faculty Fellowship, NASA EPSCoR, NSF DUE-CCLI, NSF ECCS, NSF EEC, NSF DUE-STEP, NSF EAR-IF.