Curriculum Vitae for
William R. Michalson

Research Associates, LLC
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1. Personal:

1.1 Education

Ph.D. in Electrical Engineering, 1989, Worcester Polytechnic Institute, Worcester, Massachusetts.

Dissertation: *A Parallel Computer Architecture for Real-Time Decision Making*. The dissertation develops a hierarchical, multiple processor, computer architecture for executing artificial intelligence programs in real-time. Dissertation Directors: Dr. Peter E. Green and Dr. R. James Duckworth.

Minor Areas: Minor sequences completed in Mathematics and Physics.

Specialties: Area examinations passed in the fields of Computer Architecture, Probabilistic Systems Analysis, and State Space Analysis.

M.S. in Electrical Engineering, 1985, Worcester Polytechnic Institute, Worcester, Massachusetts.

Specialties: The courses taken stressed Computer Architecture, Communications Systems, and Solid-State Physics.

B.S. in Electrical Engineering, 1981, Syracuse University, Syracuse, New York.

1.2 Work experiences - Academic.

1991-Present **Worcester Polytechnic Institute**
Professor of Electrical and Computer Engineering; also holds collaborative appointments as a Professor of Computer Science, a Professor of Mechanical Engineering and a Professor of Robotics Engineering.

Effective Sep, 2016 Granted a collaborative appointment as a Professor of Mechanical Engineering.

Effective July 1, 2005 Promoted to the rank of Full Professor (Professor of Electrical and Professor of Computer Science)

Samsung v. Hermes
IPR2025-00953
Exhibit 1003

November 17, 2004	Appointed dual professorship, adding the title of Associate Professor of Computer Science.
July 1, 1998	Granted tenure and promoted to the rank of Associate Professor.
August 1, 1992	Assistant Professor of Electrical Engineering (tenure-track).
August 1, 1991	Visiting Assistant Professor of Electrical Engineering.
January 1, 1990	Adjunct Assistant Professor of Electrical Engineering.

1.3 Work experiences other than teaching (chronological).

2024-Present US Coast Guard Auxiliary

Member of the US Coast Guard Auxiliary, focusing on public education, communications, and boat crew operations.

2022-Present BLS, LLC

BLS, LLC is a company formed in 2022 which focuses on the development of non-intrusive technologies for improving firearm safety.

2012-2014 Grid Roots, LLC

Grid Roots, LLC is a company which was formed in 2012 for the purpose of commercializing a navigation and tracking device for use by children and the elderly to allow caregivers to non-intrusively monitor their activities. The system under development integrates GPS, inertial and beacon-based navigation technologies to develop a system for users to track deployed devices. My responsibilities within Grid Roots, LLC relate to hardware and software engineering, as well as the development of IP related to tracking individuals.

1995-Present Research Associates, LLC

Research Associates, LLC is a company I formed in which I perform engineering and consulting in the areas of computer systems, communications and navigation. All of my litigation-related and other consulting activities are performed through Research Associates, LLC.

1988-1991 Raytheon Company

Subsequent to receiving my Ph. D., I returned to the Equipment Division of the Raytheon Company. Shortly after I returned, I was promoted to a title of Engineer, Design and Development which was the highest title I could hold based on my level of education and years of experience. Within a year, I was selected to sit on the engineering staff of a newly formed System Engineering Department of the Division's Computer and Displays Laboratory. In this department I acted primarily as a consultant to other departments within the laboratory. My responsibilities ranged from leading the hardware/software development of supercomputer-class computer systems to performing applied research into the exploitation of new technology. My

role was similar to that of a Principle Investigator in an academic setting as I was responsible for securing funding and personnel, leading research efforts, interacting with the research sponsor, and reporting results. At the time of my departure I was involved with the following projects:

Fault-Tolerant Multiprocessor

The development of a highly fault tolerant, highly reliable, real-time computer system intended for long-duration spaceborne applications. This system is designed to produce in excess of one gigaoperation per second of raw processing power.

Optimal Task Allocation

A program of applied research into the use of Genetic Algorithms for deriving optimal mappings of software tasks to the hardware processing elements in distributed systems.

Performance Modeling and Scaling

This project focused on the development of simulation models for characterizing the performance of a large scale multiple processor system. These models formed a basis for predicting system performance for several different hardware configurations to ensure compliance with system specifications.

High Clutter Signal Detection

A program of applied research into the use of Neural Networks to detect the presence of targets in extremely high clutter environments.

Power Efficient Computing

A program of applied research into an Integrated Optical computer structure that is designed to maximize the number of computations that can be performed per unit of power.

1985-1988 Raytheon Company (Leave of Absence)

In 1985 I became one of two people in the Equipment Division to receive Aldo Miccioli Fellowships. This Fellowship was awarded to allow me to pursue full-time study towards the Ph.D. degree. I returned to Raytheon during the summer of 1986, but otherwise remained on leave of absence to dedicate my time to my studies.

1982-1985 Raytheon Company

Engineer in the VLSI Design Department of the Computer and Displays Laboratory within Raytheon's Equipment Division. I was lead engineer for the design of several semi-custom VLSI circuits for both signal and data processing applications.

1981-1982 Raytheon Company

Engineer in the Cursive Displays Department of the Computer and Displays Laboratory. I designed and debugged circuit assemblies which were used in vector displays for air traffic control applications.

1.4 Consulting experiences.

1.4.1 Law-Related

Commonwealth of Massachusetts v. Bradley Rein
Retained by Fund & FitzGerald as an expert on behalf of defendant Bradley Rein. Case before the Commonwealth of Massachusetts Plymouth, SS. Superior Court Department. Docket No. 2383CR0080). Retained 3/24.

Harley Kaplan and Sybil Kaplan v. New England Paragliding and Hang Gliding Club, *et al*.,
Retained by Campbell Conroy & O'Neil as an expert on behalf of defendant Matthew Foster. Case before the Commonwealth of Massachusetts Plymouth, SS. Superior Court Department. Docket No. 2183CV0331). Retained 3/24 – 5/24. Submitted expert disclosure. Case dismissed.

Textron Innovations INC. v. SZ DJI Technology Co, LTD. *et al.*
Retained by Baker Botts, LLP as an expert on behalf of plaintiff Textron. Case before the United States District Court for the Eastern District of Texas (Case No. 2:22-cv-351). Retained 6/23 – 3/24.

Geoscope Technologies Pte. Ltd. V. Google LLC
Retained by William & Connolly LLP on behalf of defendant Google. Case before the United States District Court for the Eastern District of Virginia (Case No. 1:22-cv-01331-MSN-IDD). Retained 2/23 – 9/23, Deposed 8/17/23.

American Patents, LLC v. Texas Instruments, Inc., Realtek Semiconductor Corporation and Mediatak Inc.
Retained by Texas Instruments, Realtek, and Mediatek as an expert on defendants. Case before the United States District Court for the Eastern District of Texas – Sherman Division (Case Nos. 4:22-cv-478, 4:22-cv-479, and 4:22-cv-480). Declaration with respect to claim construction 2/10/23). Retained 1/23 – 4/23.

United Services Automobile Association v. Auto Telematics Ltd.
Retained by Fish & Richardson as an expert on behalf of petitioner United Services Automobile Association. Provided declarations in support of multiple IPR filings (IPR2023-00518, IPR2023-00519, IPR2023-00768, IPR2023-00769, IPR2023-00770, IPR2023-00857, IPR2023-00858, IPR2023-00859, IPR2023-00911, and IPR2023-00912). Retained 12/22.

Railware, Inc. v. National Railroad Passenger Corporation dba Amtrak
Retained by Venable, LLP as an expert on behalf of defendant Amtrak. Case before the United States District Court for the Southern District of New York (Case No. 1:22-cv-05013). Provided declarations in support of multiple IPR filings (IPR2023-1179, IPR2023-1180, and IPR2023-1181). Retained 12/22 – 6/24.

Volvo Penta of the Americas, LLC. v. Brunswick Corporation

Retained by Kilpatrick Townsend & Stockton, LLP as an expert on behalf of petitioner Volvo Penta. Provided declarations in support of multiple IPR filings (IPR2022-01366, IPR2022-01367, IPR2022-01368, IPR2022-01369, and IPR2022-01424). Retained 6/22 – 9/23.

Textron Innovations INC. v. SZ DJI Technology Co, LTD. and DJI Europe B.V.
Retained by Baker Botts, LLP as an expert on behalf of plaintiff Textron. Case before the United States District Court for the Western District of Texas (Case No. 6:21-cv-00740-ADA). Retained 2/22 – 4/23, Deposed 1/22/23 and 1/24/23, Testified 4/17-18.

Smartsky Networks, LLC, v. GOGO Business Aviation, LLC and GOGO INC.
Retained by Sidley Austin, LLP as an expert on behalf of defendant Gogo. Case before the United States District Court for the District of Delaware (Case No. 22-266 UNA). Deposed 5/19/22. Retained 3/22.

Via Transportation, Inc. v. RideCo Inc.
Retained by Erise, IP on behalf of defendant RideCo. Case before the United States District Court for the Western District of Texas, (Case No. No. 6:21-cv-00457). Retained 1/22.

BillJCo, LLC v. Cisco Systems, Inc., Apple Inc., Hewlett Packard Enterprise Co. and Aruba Networks, LLC
Retained by the law firms of Merchant & Gould, P.C., DLA Piper, and Greenberg Traurig, LLP Purpose on behalf of their clients Cisco Systems, Inc., Apple Inc., Hewlett Packard Enterprise Co. and Aruba Networks, LLC for the analysis of certain patents relating to methods and systems for location tracking of mobile devices. Submitted declaration related to IPR2022-420 and IPR2022-00427. Retained 12/21 – 6/23.

Mark Adams, Sr., v. Cataldo Ambulance Service, Inc,
Retained by Morrisson Mahoney, LLP on behalf of defendant Cataldo Ambulance Service. Case before Middlesex Superior Court, Commonwealth of Massachusetts, Civil Action No. 19-CV-1931. Retained 10/21.

Omnitracs, LLC et al. v. Platform Science, Inc.
Retained by Fish & Richardson on behalf of defendant Platform Science, Inc. Case before the Federal District Court Southern District of California. Case No. 3:20-cv-0958-JS-MDD. Retained 8/21 – 9/23, Deposed 8/23-24/23.

LoganTree, LP v. Garmin International, Inc. and Garmin USA, Inc.
Retained by EriseIP on behalf of defendant Garmin. Case before the District of Kansas, Case No. 17-cv-01217 2:16-cv-190 involving U.S. Patent No. 6,059,576. Submitted Expert Report on Non-Infringement; Deposed 12/1/21; Testified in Court 10/26/22; Retained 7/21 - 10/22.

Allstate Insurance Company V. Atos, LLC
Retained by Sidley Austin, LLP on behalf of petitioner Allstate Insurance Company challenging the validity of US Patent Nos. 8,527,140; 9,152,609; and 9,846,174 at the Patent Trial and Appeal Board of the U.S. Patent Office. Submitted declarations in IPR2021-01118, IPR2021-01209, and IPR2021-01449. Deposed 3/31/22 and 4/7/22; Retained 2/21 – 1/23.

R&R Packaging, Inc. D/B/A R&R Solutions v. Evenflo Company, Inc.

Retained by Polsinelli on behalf of Plaintiff R&R. Case before the Western District of Arkansas (Fayettevill Division), Case No. 5-20-cv-05095. Submitted Reports on Claim Construction; Deposed 7/21; Retained 11/20.

InfoGation Corporation v. Google LLC.
Retained by O'Melveny & Meyers, LLP as an expert on behalf of defendant Google Inc. Patents-in-suit are U.S. Patents 6,199,014. Case before the United States District Court for the Southern District of California, San Diego Division (Case No. 3:21-CV-00843-H-JLB). Deposed 2/27/23 - 2/28/23. Retained 8/20 to 6/22.

WSOU Investments LLC v. Dell Technologies Inc. et al.
Retained by Gibson-Dunn on behalf of defendant Dell. Case before the United States District Court for the Western District of Texas, (Case Nos. 20-cv-00473-ADA; 20-cv-00474-ADA; 20-cv-00475-ADA; 20-cv-00476-ADA; 20-cv-00477-ADA; 20-cv-00478-ADA; 20-cv-00479-ADA; 20-cv-00482-ADA). Deposed 5/11/23. Retained 7/20 – 6/22.

Apple v. LBS Innovations, LLC.
Retained by ěrīse ip on behalf of petitioner Apple, Inc., challenging the validity of U.S. Patent No. 6,091,956 at the Patent Trial and Appeal Board of the U.S. Patent Office, IPR2020-00696. Retained 02/20 – 8/20. Submitted declaration.

Makor Issues & Rights Ltd. v. Google LLC et al.
Retained by Arnold & Porter Kaye Scholer LLP on behalf of defendant Google. Case before the District of Delaware, Case No. 1:16-cv-00100. Retained 12/19.

Intellectual Ventures I, LLC and Intellectual Ventures II, LLC v. NetApp, Inc.
Retained by Gibson Dunn on behalf of defendant NetApp, Inc. Case before the District of Massachusetts, Case No. 1:16-cv-10868-PBS. Retained 09/19. Submitted Expert Reports on Invalidity and Non-Infringement.

Google, LLC v. Traxcell Technologies, LLC.
Retained by Finnegan, Henderson, Farabow, Garrett & Dunner, LLP on behalf of petitioner Google, Inc., challenging the validity of U.S. Patent Nos. 9,918,196 and 10,820,147 at the Patent Trial and Appeal Board of the U.S. Patent Office, IPR2021-01004 and IPR2022-00442. Retained 06/18 – 1/22. Submitted declarations.

Lipton, et al. v. Knight, et al.
Retained by Campbell Conroy & O'Neil, PC on behalf of defendant First Student. Case before the Superior Court of Massachusetts, Plymouth, Case No. PLCV 2014-00528. Retained 05/19-8/19. Submitted Expert Disclosure.

PPS Data, LLC., v. Jack Henry & Associates, Inc.
Retained by Polsinelli on behalf of defendant Jack Henry and Associates. Case before the Eastern District of Texas. Retained 11/18-9/19. Submitted Expert Reports on Invalidity and Non-Infringement; Deposed 5/29/19, testified in Court 9/11/19.

Cisco Systems, Inc. v. TracBeam, LLC.

Retained by Haynes Boone, LLP on behalf of petitioner Google, Inc., challenging the validity of U.S. Patent Nos. 7,525,484 9,277,525, and 7,298,327 at the Patent Trial and Appeal Board of the U.S. Patent Office, IPR2018-01722 - IPR2018-01728. Retained 06/18. Submitted declarations.

Burris Company, Inc. v. Garmin International, Inc.
Retained by Shook Hardy and Bacon on behalf of defendant Garmin. Case before the District of Oregon, Case No. 6:18-CV-00700. Submitted Declaration wrt Invalidity; Testified in Court (PI hearing) 07/11/18; Retained 04/18-08/18.

American GNC Corporation v. LG Electronics Inc., LG Electronics Mobilecomm U.S.A., Inc., and LG Electronics Mobile Research U.S.A., LLC.
Retained by White & Case on behalf of defendant LG. Case before the Southern District of California, Case No. 3:17-CV-01090-BAS-BLM. Retained 11/17. Submitted Declaration wrt Claim Construction; Deposed 1/18.

Qualcomm v. Apple
Retained by Quinn-Emanuel on behalf of plaintiff Qualcomm. Case before the Southern District of California, Case Nos. 3:17-cv-00108-GPC-MDD and 3:17-cv-01010-GPC-MDD. Retained 10/17-5/19; Submitted Expert Report; Deposed 10/18.

Samantha Ingram v. New England Beauty Academy, LLC a/k/a Toni&Guy Hairdressing Academy, Newell Rubbermaid INC. and Goody Products, INC. d/b/a Solano.
Retained on behalf of plaintiff Samantha Ingram. Case before the Worcester Superior Court, Commonwealth of Massachusetts, Civil Action 1385CV02129D. Retained 09/17-09/18; Submitted Expert Disclosure.

FISERV, INC., Jack Henry & Associates, Inc., Q2 Software, Inc., American National Bank of Texas and Hanmi Bank, Petitioners v. Mirror Imaging LLC., Patent Owner.
Retained by Polsinelli on behalf of petitioners to provide declarations for multiple petitions for covered business methods review. See CBM2018-00012, CBM2018-00014, and CBM2018-00015. Retained 1/18-03/18.

Acceleron v. Dell Inc.
Retained by Baker Botts on behalf of defendant Dell. Case before the Northern District of Georgia, Case No. 1:12-cv-04123-TCB. Submitted Expert Reports related to Claim Construction, Invalidity and Non-Infringement; Deposed 10/13/17 and 6/20/19; Trial 9/6/21 to 9/17/21; Retained 7/17 to 9/21.

Omega Patents, LLC v. CalAmp Corp.
Retained by Sidley Austin on behalf of defendant CalAmp. Case before the Middle District of Florida, Case No. 6:13-cv-1950 involving U.S. Patent Nos. 6,346,876; 6,756,885; 7,671,727 and 8,032,278. Retained 5/17 to 12/17.

Unified Patents, Inc.
Retained by Unified Patents to provide declarations for multiple petitions for *inter partes* review related to patents U.S. Patent No. 7,650,234 and 8,538,498. Retained 03/17-05/17.

Garmin Switzerland GmbH, and Garmin Corporation v. Navico Inc., C-MAP USA, Inc., and C-MAP/Commercial, Ltd.
Retained by Shook, Hardy & Bacon, L.L.P. on behalf of plaintiff Garmin. Case before the District of Kansas, Case No. 16-cv-2706 involving U.S. Patent Nos. 7,268,703 and 6,459,987. Submitted Declaration On Claim Construction; Deposed 12/21/17; Retained 10/16 to 02/18.

Navico Inc. and Navico Holdings AS, v. Garmin International, Inc. and Garmin USA, Inc.
Retained by Paul Weiss on behalf of defendant Garmin. Case before the Eastern District of Texas, Case No. 2:16-cv-190 involving U.S. Patent Nos. 9,223,922 and 9,244,168. Submitted Expert Report on Non-Infringement; Deposed 12/14/16, 5/25/17; Testified in Court 9/7/17; Retained 8/16 to 9/17.

Orbcomm, Inc. v. CalAmp Corp.
Retained by Sidley Austin on behalf of defendant CalAmp. Case before the Eastern District of Virginia, Case No. 3:16-cv-208 involving U.S. Patent Nos. 6,292,724, 6,611,686, 6,651,001, 6,735,150, and 8,855,626. Expert Declaration on Claim Construction, Reports on Invalidity and Non-Infringement; Retained 5/16 to 2/17.

Navico Inc. and Navico Holdings AS, v. Garmin International, Inc. and Garmin USA, Inc.
Retained by Paul Weiss on behalf of defendant Garmin. Case before the Northern District of Oklahoma, Case No. 14-cv-303 involving U.S. Patent Nos. 8,300,499, 8,305,840, and 8,605,550. Deposed 11/8/15; Retained 10/15 to 10/17.

Johnson Outdoors Inc. and Johnson Outdoors Marine Electronics, Inc., v. Garmin International, Inc. and Garmin USA.
Retained by Paul Weiss on behalf of defendant Garmin. Case before the Middle District of Alabama, Case No. 14-cv-683 involving U.S. Patent Nos. 7,652,952, 7,710,825, and 7,755,974. Retained 10/15 to 5/16. Case dismissed.

Google, Inc. v. Silver State Intellectual Technologies, Inc.
Retained by Paul Hastings on behalf of petitioner Google, Inc. to provide declarations for multiple petitions for *inter partes* review. See IPR2015-01737 and IPR2015-01738. Retained 10/15 to 12/15.

Vehicle IP LLC v. AT&T Mobility, LLC, et al.
Retained by Akin Gump and by Perkins-Coie on behalf of defendants AT&T Mobility LLC; Cellco Partnership; Networks In Motion, Inc.; TeleCommunications Systems, Inc.; and Telenav Inc. Case before the District of Delaware, Case No. 1:09-cv-01007-LPS involving U.S. Patent No. 5,987,377. Expert Report on Invalidity; Deposed 5/20/16; Retained 9/15 to 1/17. Matter settled.

TracBeam, L.L.C. v. T-Mobile US, Inc., et al.,
Retained by Baker Botts on behalf of defendant T-Mobile US, Inc., et al. Case before the Eastern District of Texas (6:14-cv-678-RWS). See also IPR2015-01681, IPR2015-01682, IPR2015-01684, IPR2015-01686, IPR2015-01687, IPR2015-01708, IPR2015-01709, IPR2015-01711, IPR2015-01712, and IPR2015-01713. Expert Report on Invalidity; Deposed 10/04/16; Retained 7/15 to 12/16. Matter settled.

Google, Inc. v. Porto Technology Co., Ltd.

Retained by Fish and Richardson on behalf of petitioner Google, Inc., patent owner Porto Technology Inc. IPR2016-00022 and IPR2016-00045. Expert Declarations; Deposed: 7/14/16 (IPR2016-00022); 7/14/16 (IPR2016-00045). Retained 7/15 to 7/20.

Bradium Technologies LLC v. Microsoft Corporation,
Retained by Perkins Coie on behalf of defendant Microsoft Corporation. Case before the District of Delaware (15-0031-RGA). See also IPR2015-01432, IPR2015-01434, IPR2015-01435, IPR2016-00448 and IPR2016-00449. Expert Declarations; Deposed 8/5/16, 02/21/17; (IPR2015-01432); Retained 3/15 to 10/17.

ACQIS LLC v. EMC Corp.,
Retained by Gibson Dunn on behalf of defendant EMC Corp. Case before the District of Massachusetts (1:14-cv-13560). Expert Report on Invalidity; Retained 2/15 to 2/21.

Locata LBS LLC v. YellowPages.com LLC,
Retained by Baker Botts on behalf of defendant YellowPages.com. Case before the Central District of California (2:13-cv-07664). See also IPR2015-00151. Submitted Declaration. Retained 9/14 to 4/15. Matter settled.

M/A-COM Technology Solutions Holdings, Inc. v. Laird Technologies, Inc.
Retained by Erise IP on behalf of Laird Technologies, Inc., for invalidity consulting regarding U.S. Patent No. 6,272,349. Retained 6/14 to 9/14.

Certusview Technologies, LLC v. S&N Locating Services, LLC and S&N Communications, Inc.,
Retained by Baker &McKenzie on behalf of defendant S&N. Patents-in-suit are U.S. Patents 8,265,344, 8,290,204, 8,340,359, 8,407,001, and 8,532,341. Case before the Eastern District of Virginia, (2:13-cv-346). Expert Report on Non-Infringement; Deposed 11/8/14; Retained 6/14 to 12/14.

adidas AG and adidas America, Inc. v. Under Armour, Inc. and MapMyFitness, Inc.
Retained by Kilpatrick Townsend on behalf of plaintiff adidas. Case before the District of Delaware, (1:14-cv-00130). See also IPR2015-00697, IPR2015-00698, and IPR2015-00700. Deposed: 10/21/16 and 10/22/16 relative to 1:14-cv-00130; 2/5/16 relative to IPR2015-00697; 2/5/16 relative to IPR2015-0068; 2/5/16 relative to IPR2015-0700. IPR Declarations, Expert Report on Validity; Deposed 02/05/16; Retained 5/14 to 7/16.

GeoTag, Inc., v. AT&T Mobility LLC and AT&T Services, Inc.,
Retained by Baker Botts as an expert on behalf of defendant AT&T. Patent-in-suit is U.S. Patent 5,930,474. Case before the Northern District of Texas, Dallas Division, (3:13-cv-00169). Expert Report on Invalidity; Deposed 5/29/14; Retained 1/14 to 9/14. Matter settled.

Nokia Corp v. HTC Corp.
Retained by Quinn Emanuel as an expert on behalf of defendant HTC. Case being litigated in Germany. Patent number EP0766811B1. Retained 12/13 to 2/14. Matter settled.

Porto Technology, Co., Ltd. et al. v. Cellco Partnership d/b/a Verizon Wireless
Retained by Wiley-Rein as an expert on behalf of defendant Verizon. Case before the United States District Court for the Eastern District of Virginia (Case No. 3:13-cv-00265). Declaration ISO Claim Construction and Summary Judgement of Invalidity; Expert Report on Invalidity; Retained 10/13 to 2/14. Matter dismissed.

Nokia Corp v. HTC Corp.
Retained by McDermott Will and Emery and White & Case as an expert on behalf of defendant HTC. Case before the United States District Court for the District of Delaware (Case No. Case No. 1:12-cv-00550-UNA and Case No. 1:12-cv-551-UNA. Retained 6/13 to 2/14. Matter settled.

NXP B.V. v. Research In Motion, Ltd., et al.
Retained by Fish and Richardson as an expert on behalf of defendant Research In Motion. Patent-in-suit is U.S. Patent 6,501,420. Case before the United States District Court for the Middle District of Florida (Case No. 6:12-cv-00498). Expert Report on Invalidity, Expert Report on Non-Infringement; Deposed 9/18/13; Testified in Court: 4/1/14 and 4/2/14; Retained 5/13 to 4/14.

Vehicle IP LLC v. Wal-Mart Stores Inc., et al.
Retained by Polsinelli-Shugart, as an expert on behalf of defendant Werner Enterprises. Patent-in-suit is U.S. Patent 5,694,322. Case before the United States District Court for the District of Delaware (Case No. 1:10-cv-00503). Expert Report on Invalidity, Expert Report on Non-Infringement; Deposed 7/15/13 and 9/20/13; Testified in Court: 9/27/13 and 9/30/13; Retained 4/13 to 9/13.

Commonwealth Scientific and Industrial Research Organisation v. Realtek Semiconductor Corporation
Retained by Sidley Austin, LLP as an expert on behalf of defendant Realtek Semiconductor Corporation. Patent-in-suit is U.S. Patent 5,487,069. Case before the United States District Court for the Eastern District of Texas (Tyler Division) (Case No. 6:12-cv-00578). Expert Report on Invalidity, Expert Report on Non-Infringement; Deposed 3/6/15; Retained 4/13 to 4/15. Matter settled.

TracBeam, LLC v. Google Inc.
Retained by Quinn-Emanuel as an expert on behalf of defendant Google. Patents-in-suit are U.S. Patents 7,764,231 and 7,525,484. Case before the United States District Court for the Eastern District of Texas (6:11-cv-00093). Deposed 2/5/14; Retained 3/13 to 6/14.

Microsoft Corporation and Google Inc., v. GeoTag, Inc.
Retained by Perkins-Coie as an expert on behalf of plaintiff Microsoft Corporation. Patent-in-suit is U.S. Patents 5,930,474. Case before the United States District Court for the District of Delaware (1:11-cv-00175). Retained 1/13 to 9/14.

GeoTag, Inc., v. Frontier Communications Corp., et al.,

Retained by multiple firms as an expert on behalf of defendants. Patent-in-suit is U.S. Patents 5,930,474. Case before the Eastern District of Texas, Marshall Division, (2:10-cv-00265; other defendants are listed in case numbers 2:10-cv-00265, 2:10-cv-00272, 2:10-cv-00437, 2:10-cv-00569, 2:10-cv-00570, 2:10-cv-00571, 2:10-cv-00572, 2:10-cv-00573, 2:10-cv-00574, 2:10-cv-00575, 2:10-cv-00587, 2:11-cv-00175, 2:11-cv-00404, 2:11-cv-00421, 2:11-cv-00424, 2:11-cv-00425, 2:11-cv-00570, 2:12-cv-00043, 2:12-cv-00051, 2:12-cv-00436, 2:12-cv-00438, 2:12-cv-00439, 2:12-cv-00441, 2:12-cv-00442, 2:12-cv-00444, 2:12-cv-00445, 2:12-cv-00446, 2:12-cv-00447, 2:12-cv-00448, 2:12-cv-00449, 2:12-cv-00450, 2:12-cv-00452, 2:12-cv-00454, 2:12-cv-00456, 2:12-cv-00459, 2:12-cv-00460, 2:12-cv-00462, 2:12-cv-00464, 2:12-cv-00466, 2:12-cv-00468, 2:12-cv-00469, 2:12-cv-00470, 2:12-cv-00471, 2:12-cv-00473, 2:12-cv-00474, 2:12-cv-00475, 2:12-cv-00476, 2:12-cv-00476, 2:12-cv-00477, 2:12-cv-00480, 2:12-cv-00481, 2:12-cv-00482, 2:12-cv-00482, 2:12-cv-00483, 2:12-cv-00486, 2:12-cv-00487, 2:12-cv-00520, 2:12-cv-00521, 2:12-cv-00523, 2:12-cv-00524, 2:12-cv-00525, 2:12-cv-00527, 2:12-cv-00528, 2:12-cv-00530, 2:12-cv-00532, 2:12-cv-00534, 2:12-cv-00535, 2:12-cv-00536, 2:12-cv-00537, 2:12-cv-00542, 2:12-cv-00543, 2:12-cv-00545, 2:12-cv-00547, 2:12-cv-00548, 2:12-cv-00549, 2:12-cv-00550, 2:12-cv-00551, 2:12-cv-00552, 2:12-cv-00555, 2:12-cv-00556, 2:12-cv-00570, 2:12-cv-00572, 2:12-cv-00573, 2:12-cv-00575, 2:12-cv-00587, 3:13-cv-00217). Deposed 5/29/14; Retained 1/13 to 9/14.

MOSAID Technologies Inc., v. Realtek Semiconductor Corporation
Retained by Sidley Austin, LLP as an expert on behalf of defendant Realtek Semiconductor Corporation. Patents-in-suit are U.S. Patents 5,131,006; 5,151,920; 5,422,887; 5,706,428; 6,563,786; and 6,992,972. Case before the United States District Court for the Eastern District of Texas (Tyler Division) (Case No. 2:11-cv-00179). Retained 12/12 to 12/12. Matter settled.

Hoyt A. Flemming v. Cobra Electronics Corporation
Retained by Sidley Austin, LLP as an expert on behalf of defendant Cobra Electronics Corporation. Patents-in-suit are U.S. Patents RE39038, RE40653 and RE41905. Case before the United States District Court for the District of Idaho (Case No. 1:12-cv-00392). Retained 11/12 to 06/13. Matter settled.

LBS Innovations LLC v. Aaron Bros., Inc., et al.
Retained as an expert on behalf of defendants Whole Foods Marketplace, Comerica, Hotels.com, Academy, Ltd., and Homestyle Dining. Patent-in-suit is U.S. Patent 6,091,956. Case before the Eastern District of Texas, Marshall Division, (Case No. 2:11-cv-00142-MHS-CMC. Deposed 10/5/12; Retained 7/12 to 12/12. Plaintiff moved to dismiss.

Advanced Media Networks, L.L.C. v. Gogo LLC et al.
Retained by Sidley Austin, LLP as an expert on behalf of defendant Gogo. Patent-in-suit is U.S. Patent 5,960,074. Case before the United States District Court for the Central District of California (Case No. 11-cv-10474). Deposed 2/6/13. Retained 7/12 to 8/13.

Walker Digital, LLC v. Google Inc.
Retained by O'Melveny & Meyers, LLP as an expert on behalf of defendant Google Inc. Patents-in-suit are U.S. Patents 6,199,014. Case before the United States District Court for the

District of Delaware (Case No. 1:11-cv-00309-SLR). Deposed 2/27/13 - 2/28/13. Retained 6/12 to 8/13.

Silver State Intellectual Technologies, Inc. v. Garmin International, Inc., et al.
Retained by Erise IP, P.A. as an expert on behalf of defendants Garmin International, Inc. and Garmin USA, Inc. Patents-in-suit are U.S. Patents 6,525,768; 6,529,824; 6,542,812; 7,343,165; 7,522,992; 7,593,812; 7,650,234; 7,702,455 and 7,739,039. Case before the United States District Court for the District of Nevada (Case No. 2:11-cv-1578). Deposed 2/19/14; Testified in Court: 5/21/15; Retained 4/12 to 5/15.

Beacon Navigation GmbH v. Toyota Motor Corporation, et al.
Retained by Kirkland & Ellis, LLP on behalf of defendants Toyota Motor Corporation; Toyota Motor North America, Inc.; Toyota Motor Sales, U.S.A. Inc.; Toyota Motor Engineering & Manufacturing North America, Inc.; Toyota Motor Manufacturing, Indiana, Inc.; Toyota Motor Manufacturing, Kentucky, Inc.; Toyota Motor Manufacturing Mississippi, Inc.; Mazda Motor Corporation; Mazda Motor of America, Inc.; Fuji Heavy Industries, Ltd.; Fuji Heavy Industries U.S.A. Inc.; Subaru of America, Inc.; Jaguar Land Rover North America, LLC; Jaguar Cars Limited; Land Rover; Volvo Car Corporation; and Volvo Cars of North America, LLC; Adduci Mastriani & Schaumberg, LLP on behalf of defendants Suzuki and Garmin; Crowell-Moring on behalf of General Motors; Dickstein Shapiro on behalf og Chrysler Group, LLC; Finnegan, Henderson, Farabow, Garrett & Dunner on behalf of Bayerische Motoren Werke AG, BMW of North America, LLC, and BMW Manufacturing Co. LLC; Fish & Richardson on behalf of Honda Motor Co., Ltd., Honda North America, Inc., American Honda Motor Co., Inc., Honda Manufacturing of Alabama, LLC, Honda Manufacturing of Indiana, LLC, and Honda of America, Mfg., Inc.; Frommer Lawrence and Haug, LLP on behalf of Dr. Ing. h.c.F. Porsche AG and Porsche Cars North America, Inc.; Hogan Lovells on behalf of Daimler AG, Mercedes-Benz USA, LLC, or Mercedes-Benz U.S. International, Inc.; Quinn-Emanuel on behalf of Nissan and Ford. Case before the US International Trade Commission, Washington D.C., in the matter of: "Certain Automotive Navigation Systems, Components Thereof, and Products Containing Same, Inv. No. 337-TA-814. Case withdrawn by Plaintiff. Retained 1/12 – 4/12.

Beacon Navigation GmbH v. Toyota Motor Corporation, et al.
Retained by Kirkland & Ellis, LLP on behalf of defendants Toyota Motor Corporation; Toyota Motor North America, Inc.; Toyota Motor Sales, U.S.A. Inc.; Toyota Motor Engineering & Manufacturing North America, Inc.; Toyota Motor Manufacturing, Indiana, Inc.; Toyota Motor Manufacturing, Kentucky, Inc.; Toyota Motor Manufacturing Mississippi, Inc.; Mazda Motor Corporation; Mazda Motor of America, Inc.; Fuji Heavy Industries, Ltd.; Fuji Heavy Industries U.S.A. Inc.; Subaru of America, Inc.; Jaguar Land Rover North America, LLC; Jaguar Cars Limited; Land Rover; Volvo Car Corporation; and Volvo Cars of North America, LLC. Multiple cases before the United States District Court for the District of Delaware. Case numbers 1:11-cv-00942-UNA, 1:11-cv-00941-UNA, 1:11-cv-00951-UNA, 1:11-cv-00952-UNA, 1:11-cv-00936-UNA, 1:11-cv-00937-UNA, 1:11-cv-00955-UNA, 1:11-cv-00959-UNA, and 1:11-cv-00960-UNA. Currently stayed. Retained 1/12.

Beacon Wireless Solutions, Inc., et al., v. Garmin International, Inc., et al.

Retained by Shook, Hardy and Bacon, LLP as an expert on behalf of defendant Garmin. Matter involves alleged trade secret misappropriation. Case before the United States District Court for the Western District of Virginia, Harrisonburg Division (Case No. 5:11-cv-00025). Testified in Court: 5/25/12. Retained 12/11 to 5/25/12.

Tramontane IP, LLC v. Garmin Int'l, Inc., et al.
Retained by Shook, Hardy and Bacon, LLP as an expert on behalf of defendant Garmin. Patents-in-suit are U.S. Patents 6,526,268 and 7,133,775. Case before the United States District Court for the Eastern District of Virginia (Case No. 1:2011-cv-00918). Case Settled. Retained 11/11 to 12/11.

Sourceprose, Inc. v. AT&T, Inc., MetroPCS Communications, Inc., *et al.*
Retained by Kilpatrick Townsend as an expert on behalf of defendant AT&T. Patents-in-suit are US Patent Nos. 7,142,217 and 7,161,604. Case before the United States District Court for the Western District of Texas, Austin Division. Case number 1:11-cv-00117. Retained 11/11 to 3/16.

Furuno Electric Co., Ltd. and Furuno U.S.A., Inc. v. Honeywell International, Inc.
Retained by Quinn-Emanuel as an expert on behalf of complainant Furuno. Case before the US International Trade Commission, Washington D.C., in the matter of: "Certain GPS Navigation Products, Components Thereof, and Related Software," Investigation number 337-TA-810. Patents-in-suit are U.S. Patent Nos. 6,084,565; 7,095,367; 7,089,094; and 7,161,561. Case settled. Retained 8/11 – 12/11.

Honeywell International, Inc. v. Furuno Electric Co., Ltd. and Furuno U.S.A., Inc.
Retained by Quinn-Emanuel as an expert on behalf of respondent Furuno. Case before the US International Trade Commission, Washington D.C., in the matter of: "Certain GPS Navigation Products, Components Thereof, and Related Software," Investigation number 337-TA-783. Patents-in-suit are U.S. Patent Nos. 7,209,070; 6,865,452; 5,461,388; and 6,088,653. Case Settled. Retained 8/11 – 12/11.

Triangle Software, Inc. v. Garmin International, Inc.
Retained by Weil, Gotshal & Manges, LLP., as an expert on behalf of defendant Garmin. Patents-in-suit are US Patents 7,557,730, 7,221,287, 7,375,649, 7,508,321 and 7,702,452. Case before the United States District Court, Eastern District of Virginia, Case No. 1:10-cv-1457 CMH/TCB. Deposed 7/28/11; Testified in Court: 11/3/11 (jury trial). Retained 4/11 to 11/11.

Garmin International, Inc. v. Pioneer Corporation and Pioneer Electronics (USA), Inc.
Retained by Shook, Hardy and Bacon, LLP as an expert on behalf of plaintiff Garmin. Patents-in-suit are U.S. Patents 5,365,448; 5,424,951; and 6,122,592. Case before the United States District Court for the District of Kansas. Case No. 10-CV-2080 JWL/GLR. Declarative Judgment action stayed. Retained 3/11 to 11/11.

Visteon Global Technologies, Inc. And Visteon Technologies, LLC v. Garmin International, Inc.
Retained by Shook, Hardy and Bacon as an expert on behalf of defendant Garmin. Patents-in-suit are US Patents 5,544,060, 5,654,892, 5,832,408, 5,987,375 and 6,097,316. Case before the

United States District Court, Eastern District of Michigan, Case No. 2:10-cv-10578--PDB-MAR. Deposed 10/9/12; Retained 12/10 to 10/17.

Thomson Licensing SAS and Thomson Licensing, LLC. v. Realtek Semiconductor Corporation
Retained by Sidley-Austin as an expert on behalf of respondent Realtek Semiconductor. Case before the US International Trade Commission, Washington D.C., in the matter of: "Certain Liquid Crystal Display Devices, Including Monitors, Televisions, Modules, And Components Thereof," Investigation number 337-TA-741. Patent-in-suit is US Patent 6,121,941. Deposed 6/29/11; Testified in Court: 9/15/11 and 9/16/11. Retained 11/10 – 9/11.

Ambato Media, LLC. v. Clarion Co., LTD., *et al.*
Retained by Traurig-Greenberg as an expert on behalf of defendant Garmin. Patent-in-suit is US Patent 5,432,542. Case before the United States District Court for the Eastern District Of Texas, Marshall Division. Case number 2:09-CV-242. Deposed 4/26/12 and 5/10/12; Testified in Court: 7/11/12. Retained 10/10 to 7/12.

Gabriel Technologies Corporation and Trace Technologies, LLC, v. Qualcomm Incorporated, Snaptrack, Inc. and Norman Krasner
Retained by Cooley-Godward as an expert on behalf of defendants Qualcomm, Snaptrack, and Krasner. Trade secret misappropriation case related to US Patents 6,377,209, 6,583,757, 6,661,372, 6,799,050, 6,861,980, 6,895,249, 7,254,402, 7,289,786, 7,319,876, 7,421,277, 7,446,655, 7,570,958, 7,574,195, and 7,660,588. Case before the Southern District of California San Diego Division, Case No. 08-cv-1992 MMA POR. Retained 6/10 to 7/12.

SiRF/CSR v. Global Locate/Broadcom Corporation
Retained by Wilmer-Hale as an expert on behalf of defendant Global Locate / Broadcom. Patents-in-suit are US Patents 5,663,735, 6,480,150, 6,519,466, 6,650,879, 6,882,827, 6,934,322, 7,412,157, 7,236,883, and 7,573,422. Case before the Central District of California, Case No. 8:06-cv-01216 and Case No. 8:10-cv-01281. Retained 9/10 to 1/11.

Pioneer Electronics v. Garmin Corporation
Retained by Shook, Hardy and Bacon, LLP as an expert on behalf of respondent Garmin In the matter of Certain Multimedia Display and Navigation Devices and Systems, Components Thereof, and Products Containing Same; Inv. No. 337-TA-694. Patents-in-suit are U.S. Patents 5,365,448; 5,424,951; and 6,122,592. Case before the U.S. International Trade Commission. Deposed on 7/29/10; Testified at technology tutorial (8/27/10) and in the evidentiary hearing (9/20/10). Retained 4/10 to 9/10.

EMSAT Advanced Geo-Location Technology, LLC and Location Based Services LLC, v. AT&T Mobility, LLC
Retained by Baker-Botts as an expert on behalf of defendant AT&T Mobility, LLC. Patents-in-suit are U.S. Patents 7,289,763; 5,946,611; 6,324,404; and 6,847,822. Case before the U.S. District Court for the Northern District of Ohio, Eastern Division, Civil Action No. 4:08 CV 822. Deposed 5/4/10; Testified in Court: 5/10/10 (Markman hearing). Retained 12/09 to 3/11.

Tendler Cellular of Texas, LLC v. AT&T Mobility, LLC, et al.
Retained by Baker-Botts as an expert on behalf of defendants AT&T Mobility, LLC, et al. Patents-in-suit are U.S. Patents 7,447,508; 7,305,243; 7,050,818; and 6,519,463. Case before the U.S. District Court for the Eastern District of Texas (Tyler), Civil Action No. 6:09-CV-00115. Retained 8/09 to 7/10.

Ambit Corporation v. Delta Air Lines, Inc., and Aircell LLC.
Retained by Sidley Austin, LLP., as an expert on behalf of defendants Delta Airlines, Inc., and Aircell, LLC. Patent-in-suit is US patent 7,400,858. Case before the US District Court, District of Massachusetts, Boston, Civil Action No. 1:09-CV-10217-WGY. Deposed 12/4/09; Testified in Court: 12/7/09 (evidentiary hearing), 7/10 (jury trial). Retained 8/09 to 7/10.

GPS Industries, Inc. and Optimal I.P. Holdings, L.P. v. Altex Corporation, et. al.
Retained by Hitchcock-Evert as an expert on behalf of defendants Altex Corporation, Deca International Corporation, Golflogix, Inc. and L1 Technologies. Patent-in-suit is US patent 5,364,093. Case before the US District Court, Northern District of Texas, Dallas Division, Civil Action No. 3-07-CV0831-K. Deposed 6/30/09. Retained 5/08 through 7/09.

Satellite Tracking of People, LLC v. Omnilink Systems, Inc.
Retained by DLA Piper as an expert on behalf of defendant Omnilink Systems, Inc.. Patent-in-suit is US patent RE39,909. Case before the US District Court, Eastern District of Texas, Marshall Division, Civil Action No. 2-08CV-116. 12/08 – 1/11.

SiRF Technology, Inc. v. Global Locate, Inc.
Retained by DLA Piper/WilmerHale as an expert on behalf of Global Locate. Patents-in-suit include US patents 6,304,216; 6,417,801; 6,606,346; 6,651,000; 6,704,651; 6,937,187; 7,043,363; 7,091,904; 7,132,980 and 7,158,080. Case before the US International Trade Commission, Washington D.C., in the matters of: "Certain GPS Devices and Products Containing Same," Investigation number 337-TA-602 (Global Locate, plaintiff) and "Certain GPS Chips, Associated Software and Systems, and Products Containing Same," Investigation number 337-TA-596 (SiRF Technologies, plaintiff). My work focused on the 7,043,363 and 7,091,904 patents in defense of Global Locate/Broadcom from June 2007 through March 2008. Deposed 1/18-1/19/08; testified at trial 3/18-3/19/08.

Intellectual Science and Technology
Retained Dykema Gossett, PLCC as a technical expert on patent infringement issues related to "suspend-to-RAM" technologies in personal computers. Pre-litigation work.

Intellectual Science and Technology, Inc., v. Sony, JVC and Panasonic
Retained Dykema Gossett, PLCC as a technical expert on patent infringement issues related to US Patent 5,748,575, US Patent 6,222,799, US Patent 6,785,198, US Patent 6,662,239 and US Patent 6,717,890. Sony Electronics Inc., case number 2:06-CV-10406, JVC Americas Corp., case number 2:06-CV-10409 and Panasonic Corporation of North America case number 2:06-CV-10412. Cases heard in United States District Court, Eastern District of Michigan, Southern Division. Expert for Intellectual Science and Technology, Inc. Dec 2006 – 2008..

Kirsch Technologies v. Xerox, Canon
Retained Dykema Gossett, PLCC as an Expert Witness on patent infringement issues related to US Patent 4,816,911, Canon case number CA 00-72775, Xerox case number CA 00-72778, cases heard in United States District Court, Eastern District of Michigan, Southern Division. Expert for Kirsch Technologies. Nov 2006 – 2008..

American Video Graphics v. ATI Technologies
Retained by Sidley, Austin, Brown & Wood, Dallas, TX as a technical expert on patent infringement issues related to US Patents 5,132,670, 5,109,520, 5,084,830, 4,761,642, 4,742,474, 4,734,690, 4,730,185 and 4,694,286. Hewlett-Packard Co., et al., defendants, case number CA 6:04-CV-379-LED and Sony Corporation of America et al., defendants, case number CA 6:04-CV-399-LED. Cases heard in United States District Court, Eastern District of Texas, Tyler Division. Expert for ATI Technologies, intervener. Jan 2005 – Sep 2005.

Microsoft v. EMC
Dewey Ballantine, LLP, Washington, D.C., as a technical expert on patent infringement issues related to US Patents 5,588,147; 5,689,700; 6,393,466; 6,424,151; 6,490,594; and 6,632,248. Wrote a declaration on behalf of Microsoft. Oct 2004 – Jan 2005.

Optimum Return v. Meier Brothers
Retained by Sidley, Austin, Brown & Wood, Dallas, TX as a technical expert on Copyright infringement allegations related to software owned by Optimum Return, LLC. Cyberkatz Consulting, Inc., Handsquare, LLC, Meier Brothers, et al., defendants, case number CA 3-03CV1064-D. Case heard in United States District Court, Northern District of Texas, Dallas Division. Expert for Meier Brothers. July 2004.

Parental Guide of Texas, Inc. v. Funai Corp., et. al.
Technical expert for defendants JVC and Panasonic in their dispute over non-infringement of US Patent number 4,605,964.

Elonex I.P. Holdings, LTD. and Elonex PLC, Phase II
Expert witness for defendants Chuntex, Acer, Tatung, Lite-On, Daewoo and Envision in their dispute with Elonex non-infringement and validity for US Patent numbers 5,389,952; 5,648,799; and 5,880,719.

Storage Computer Corporation vs. Veritas Software
Technical expert for the plaintiff in matters involving Patents US 5,257,367; US 5,893,919; and US 6,098,128.

Storage Computer Corporation vs. Seagate Technology LLC
Technical expert for the defendant in matters involving US Patent RE 34,100.

Elonex I.P. Holdings, LTD. and Elonex PLC, vs. Packard Bell et. al., CA 98-689-GMS
Expert witness for defendants ViewSonic Corp., Dell Computer Corporation, MAG Technology USA, Princeton Graphic Systems, Inc., Micron Electronics, Sony Electronics and Capetronic

Computer USA in their dispute with Elonex non-infringement and validity for US Patent numbers 5,389,952; 5,648,799; and 5,880,719.

1.4.2 Engineering Consulting

Offspring Media Inc.
Technical consultant for the development of real-time auralization algorithms for integration into a consumer electronics product. Sep 2004.

Raytheon Company, Sudbury, MA
Development of techniques and requirements for implementing a fault tolerant computer system using software implemented fault tolerance (SIFT) techniques on commercial off-the-shelf processing hardware. The resultant system is to be used for highly reliable radar data and signal processing.

TVM Techno Venture Management
Provided consulting services to assist in assessing the technical claims of a company pursuing venture capital investment for a hardware implemented RAID 5 system .

Keyhold Engineering Inc., Northboro, MA.
Development of a prototype system for automatically calibrating multiple channel audio systems.

American Navigation Systems Inc., Milbury, MA.
Consulting on the development of the hand-held personal navigation and mapping system.

Lincoln Laboratory, Bedford, MA.
Simulated, tested and evaluated a GPS integrity monitoring algorithm developed at Lincoln Laboratories.

1.5 Licenses and Certifications

1.5.1 Commercial Radio Operator

General Radiotelephone Operator License
Ship RADAR endorsement

1.5.2 Amateur Radio Operator

Amateur Extra class radio operator license.

1.5.3 Diving Certifications

PADI Open Water Diver (ISO 24801-2 Diver Level 2 – Autonomous Diver)

1.5.4 Other Certifications

Remote Pilot Certificate (FAA Part 107 Small UAs)

2. Courses Taught at WPI

2.1 Course Descriptions

Short descriptions of the courses taught are as follows:

EE572N Advanced System Architecture

This course focuses on the architectural techniques used to achieve high-performance in SISD and SIMD computer systems. In this course the interaction between the software application and hardware architecture and the effect of this interaction on achievable performance is stressed. The course begins by covering the basic architectural tricks used to enhance system performance and ends with a series of case studies that analyze specific architectures such as the CRAY and CDC vector supercomputers, the MasPar, the Connection Machine, the ICL DAP, and others.

ECE505 Computer Architecture

This course is an introductory graduate course in computer architecture. Most aspects of CPU architecture are covered using a combined hardware/software approach. Specific topics include datapath design, memory systems, microprogramming, memory management, operating systems, and instruction set design.

ECE579M Real-Time System Design

This course focuses on the design of computer systems for which the timeliness of producing results is a critical factor for establishing the correctness of the system design. Topics covered include hardware specification, real-time operating systems and programming, scheduling, communications, and validation/verification. Issues and choices arising for single processor and distributed systems are also covered. Both hard and soft real-time system issues and the interactions between real applications and real systems is stressed.

ECE2010 Introduction to Electrical and Computer Engineering.

The objective of this course is to introduce students to the broad field of electrical and computer engineering within the context of real world applications. This course is designed for first-year students who are considering ECE as a possible major or for non-ECE students fulfilling an out-of-major degree requirement. The course will introduce basic electrical circuit theory as well as analog and digital signal processing methods currently used to solve a variety of engineering design problems in areas such as entertainment and networking media, robotics, renewable energy and biomedical applications. Laboratory experiments based on these applications are used to reinforce basic concepts and develop laboratory skills, as well as to provide system-level understanding. Circuit and system simulation analysis tools are also introduced and emphasized.

ECE2019 Sensors, Circuits, and Systems.

This course investigates commonly used sensors such as resistive temperature sensors, capacitive touch sensors, and inductive motion sensors and actuators. Numerous applications are presented to motivate coverage of fundamental operating principles of circuit elements such as resistors, capacitors, and inductors; model the signals produced by these sensors; and analyze the circuits and systems used to amplify and process these signals. After a review of Kirchhoff 's current and voltage laws, fundamental analysis techniques such as Thevenin and Norton's theorems and the superposition principle are used to model and analyze sensors, circuits, and systems. Concepts from analysis of linear, time-invariant continuous-time signals and systems are introduced as necessary, including Fourier series and characterization of systems such as filters in both the frequency domain (bandwidth, transfer function) and time domain (rise time, step response). Capacitance, inductance and mutual inductance are explored as energy storage elements, including consideration of resonance and energy losses in power systems. Concepts will be reinforced with the use of laboratory exercises and computer simulation. Recommended background: ECE 2010, MA 1024 (or equivalent), PH 1120/21 and MA 2051 (concurrent) Note: Students who have received credit for ECE 2111 may not receive credit for ECE 2019.

ECE2022 Introduction to Digital Circuits and Computer Engineering.

The objective of this course is to expose students (including first year students) to basic electrical and mathematical concepts that underlie computer engineering while continuing an introduction to basic concepts of circuits and systems in a hands-on environment. Experiments representing practical devices introduce basic electrical engineering concepts and skills which typify the study and practice of electrical and computer engineering. In the laboratory, the students construct, troubleshoot, and test analog and digital circuits that they have designed. They will also be introduced to the nature of the interface between hardware and software in a typical microprocessor based computer.

ECE2801 Foundations of Embedded Systems

This course teaches the principles of programming microprocessors and microcontrollers for real-time applications. Students are introduced to software engineering principles and are taught how to translate product specifications into engineering solutions.

ECE2799 ECE Design

This is a new course added to the curriculum that teaches sophomore Electrical Engineering students the basic principles of design. Topics are covered which range from project planning and management through manufacturing and implementation. Students are exposed to external factors influencing design such as safety, liability, cost, and other constraints.

ECE3801 Logic Circuits

This is an introductory course in logic circuit design. Topics covered include Boolean Logic, Algebraic minimization of logic equations, Karnaugh Maps, sequential machine design and timing analysis.

ECE3803 Introduction to Microprocessor Systems

This is an undergraduate-level first-course in microprocessor design. Topics covered include timing analysis, address decoding, memory system design, assembly language programming, programmed I/O, and digital/analog interfacing. Experiments are run using ISA-bus interfaces to standard PCs.

ECE3810 Advanced Digital System Design

This course addresses the design of advanced digital logic systems using VHDL to design, synthesize and model digital circuits, and to implement these circuits using Xilinx FPGA devices. The course emphasizes understanding functional design, designing for speed and power objectives, and testing. The course ends with students designing moderately complicated "system on a chip" (SOC) based systems

ECE4815 Computer Architecture (crosslisted as CS4515)

A first course in computer architecture. Essential aspects of CPU architecture are covered using a combined hardware/software approach. Students learn how a CPU interprets and processes instructions. Issues associated with interfacing hardware with software are covered in detail as are the hardware/software tradeoffs associated with performance optimization.

ECE4801 Microprocessor System Design

Microprocessor System Design is the second course in the microprocessor sequence. In this course, students learn the advanced concepts used in modern microprocessor systems. Topics such as system organization, dynamic and cache memory systems, communications, mixed language programming, and device driver design are covered.

ECE430X Fundamentals of Navigation Systems

This course introduces students to the fundamentals of navigation using electronic systems. The course covers types of navigation systems, how to interpret sensor data and sources of navigation system error. Topics include: types of navigation systems (dead reckoning, inertial, radio based systems), sensors and error sources, coordinate frames and transformations, system dynamics and measurement processing. Case studies explore the use of accelerometers, gyroscopes, GPS (including, differential and assisted GPS) as well as other types of navigation systems.

RBE 3001 Unified Robotics III

Third of a four-course sequence introducing foundational theory and practice of robotics engineering from the fields of computer science, electrical engineering and mechanical engineering. The focus of this course is actuator design, embedded computing and complex response processes. Concepts of dynamic response as relates to vibration and motion planning

will be presented. The principles of operation and interface methods various actuators will be discussed, including pneumatic, magnetic, piezoelectric, linear, stepper, etc. Complex feedback mechanisms will be implemented using software executing in an embedded system. The necessary concepts for real-time processor programming, re-entrant code and interrupt signaling will be introduced. Laboratory sessions will culminate in the construction of a multi-module robotic system that exemplifies methods introduced during this course.

RBE 3002 Unified Robotics IV

Fourth of a four-course sequence introducing foundational theory and practice of robotics engineering from the fields of computer science, electrical engineering and mechanical engineering. The focus of this course is navigation, position estimation and communications. Concepts of dead reckoning, landmark updates, inertial sensors, vision and radio location will be explored. Control systems as applied to navigation will be presented. Communication, remote control and remote sensing for mobile robots and tele-robotic systems will be introduced. Wireless communications including wireless networks and typical local and wide area networking protocols will be discussed. Considerations will be discussed regarding operation in difficult environments such as underwater, aerospace, hazardous, etc. Laboratory sessions will be directed towards the solution of an open-ended problem over the course of the entire term.

RBE 400x Robot System Engineering and Design

The designers of robotic systems start with a system requirement to define the mechanical, electrical and software systems which must work together to achieve the system goals. Typically, parallel teams of engineers will work concurrently to create the requirements document as well as model various aspects of the system to verify operational capabilities and the ability to meet time and budget constraints. For complex systems, the development of such teams can itself be a complex problem since the project has to be organized in such a way that parallel teams can work independently, yet have excellent communication channels and information passing to insure project success.

This course explores the tools and techniques used to develop complex systems. The topics covered include: requirements development; system architecture and partitioning; requirements flowdown; functional and interface specifications; trade studies; system modeling and simulation; system integration; as well as design verification and validation.

RBE500 Foundations of Robotics

Foundations and principles of processing sensor information in robotic systems. Topics include an introduction to probabilistic concepts related to sensors, sensor signal processing, multi-sensor control systems and optimal estimation. The material presented will focus on the types of control problems encountered when a robot must operate in an environment where sensor noise and/or tracking errors are significant. Techniques for assessing the stability, controllability and expected accuracy of multi-sensor control and tracking systems will be presented. Lab projects will involve processing live and synthetic data, robot simulation and projects involving the control of robot platforms.

RBE502 Robot Control

This course reviews the interplay between control and robotics through introducing theory and demonstrating applications. It aims to provide an in-depth coverage of control design for robotic manipulators and mobile robots. We focus primarily on fundamental theory, control design methods, and their application on practical robotic systems. Topics may include modeling of robotic systems, linear/nonlinear control of robotic systems, control of under-actuated robotic systems, optimal control, adaptive control, behavior-based robots. Course projects will emphasize modeling, simulation and practical implementation of control systems for robot applications.

RBE594 Capstone Project Experience In Robotics Engineering

This project-based course integrates robotics engineering theory and practice, and provides the opportunity to apply the skills and knowledge acquired in the Robotics Engineering curriculum. The project is normally conducted in teams of two to four students. Students are encouraged to select projects with practical significance to their current and future professional responsibilities. The projects are administered, advised, and evaluated by WPI faculty as part of the learning experience, but students are also encouraged to seek mentorship from experienced colleagues in the Robotics Engineering profession.

3. List of Publications:

3.1 Journal Papers

[1] DiLuoffo, Vincenzo, and William R. Michalson. "A Survey on Trust Metrics for Autonomous Robotic Systems." arXiv preprint arXiv:2106.15015 (2021).

[2] V. Diluoffo, W. R. Michalson and B. Sunar, "Robot Operating System 2: The need for a holistic security approach to robotic architectures," International Journal of Advanced Robotic Systems, 15.3, 2018.

[3] T. Padir, W.R. Michalson, et. al., "Implementation of an Undergraduate Robotics Engineering Curriculum," Computers in Education Journal, vol. I, no. 3, pp. 92-101, 2010.

[4] W. R. Michalson, A. Navalekar and H. Parikh, "Error mechanisms in indoor positioning systems without support from GNSS," The Journal of Navigation, Cambridge University Press, vol. 62, no. 2, pp. 239-49, 2009.

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3.3 Book Chapters

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3.4 Patents

Assurance Model for an Autonomous Robotic System feedback user interface
United States Patent Application, October, 2023

Haptic glove as a wearable force feedback user interface
United States Patent 10,551,923, Issued February 4, 2020

A toroidal actuator is responsive to a teleoperator for providing haptic feedback responsive to a curvature or articulated movement applied to a gripped object. The toroidal actuator surrounds an operator member such as a finger, and is responsive to pneumatic pressure for increasing telepresence force defined by resistance encounter against a teleoperated robotic claw. As the teleoperated claw grips an object, increased pneumatic pressure in the toroidal actuator tends to elongate the toroidal shape in a linear manner and oppose a curvature force applied by an inserted operator finger. Resistive force is based on soft sensing of the gripped object, thus the toroidal actuator applies an increasing resistive force to curvature as the robotic claw closes around a gripped object by solenoid regulated air pressure.

Precision location methods and systems
United States Patent 8,928,459, Issued January 6, 2015

The invention describes systems and methods for determining the location of a transmitter by jointly and collectively processing the full sampled signal data from a plurality of receivers to form a single solution.

Tracking device and remote monitoring system
United States Patent Application US20140274115A1

A system includes a remote monitoring device configured to detect and measure one or more signals and to convey detected and measured signal information to a central location. The central location is configured to determine the location of the remote monitoring device based on the received signal information and is also configured to determine at least one hypothetical path of the remote monitoring device. Abandoned.

Apparatus and methods for addressable communication using voice-grade radios
United States Patent 8,284,711, Issued 9 October 2012
The invention relates to methods and apparatus for conducting directed communication using voice-grade radios. The methods and apparatus can be used to form a packet-switched wireless network using legacy analog transceivers, providing, e.g., both data and voice-over-Internet Protocol communication.

Multi-channel electrophysiologic signal data acquisition system on an integrated circuit.
United States Patent 7,896,807, issued 3 March 2011.
A physiologic data acquisition system includes an analog input, a sigma-delta front end signal conditioning circuit adapted to subtract out DC and low frequency interfering signals from and amplify the analog input before analog to digital conversion. The system can be programmed to acquire a selected physiologic signal, e.g., a physiologic signal characteristic of or originating from a particular biological tissue. The physiologic data acquisition system may include a network interface modulating a plurality of subcarriers with respective portions of an acquired physiologic signal. A receiver coupled to the network interface can receive physiologic data from, and send control signals and provide power to the physiologic data acquisition system over a single pair of wires. The network interface can modulate an RF carrier with the plurality of modulated subcarriers and transmit the resulting signal to the receiver across a wireless network. An integrated circuit may include the physiologic data acquisition system. Also included are methods for acquiring physiologic data comprising the step of selectively controlling an acquisition circuit to acquire the physiologic signal.

Methods and apparatus for high resolution positioning. United States Patent 7,292,189. The invention relates to a method of signal analysis that determines the location of a transmitter and to devices that implement the method. The method includes receiving by at least three receivers, from a transmitter, a first continuous-time signal having a first channel. The first channel includes a first plurality of signal carriers having known relative initial phases and having known frequencies which are periodically spaced and which are orthogonal to one another within a first frequency range. The signal analysis method also includes determining the phase shifts of the carriers of the first channel resulting from the distance the carriers traveled in reaching the first

receiver. Analysis of the phase shifts yields time difference of arrival information amongst the receivers, which is further processed to determine the location of the transmitter. 6 Nov 2007.

A Reconfigurable Indoor Geolocation System, US Patent Number 7,079,025. A portable reconfigurable geolocation system is provided. The system includes a portable user node and one or more portable pseudolite nodes in communication one another and with the user node. Each of the user nodes and pseudolite nodes includes a transmitter that generates a signal on one or more carrier frequencies. Each signal is modulated with digital signals necessary to establish distances between the nodes and to convey data between the nodes. Each node also includes a receiver for receiving and demodulating the signals transmitted between the nodes, and a processor for receiving the demodulated signals, extracting data values and derived values from the demodulated signals and determining a three-dimensional position of each node in the system. Issued 18 Jul 2006.

Auto-Calibrating Surround System, United States Patent 7,158,643. A multi-channel surround sound system and method is described that allows automatic and independent calibration and adjustment of the frequency, amplitude and time response of each channel of the surround sound system. The disclosed auto-calibrating surround sound (ACSS) system includes a processor that generates a test signal represented by a temporal maximum length sequence (MLS) and supplies the test signal as part of an electric input signal to a loudspeaker. A microphone coupled to the processor receives the signal in a listening environment. The processor correlates the received sound signal with the test signal in the time domain and determines from the correlated signals a whitened response of the audio channel in the listening environment. Issued 2 Jan 2007.

Hand-held GPS-mapping device, US. Patent Number 5,987,380. A hand-held navigation, mapping and positioning device contains a GPS receiver, a database capable of storing vector or bit mapped graphics, a viewing port, an embedded processor, a simplified user interface, a data compression algorithm, and other supporting electronics, The viewport is configured such that the data presented in the viewport if clearly visible in any ambient light condition. The database stores compressed image data which might include topographical map data, user annotations, building plans, or any other image. The system includes an interface to a personal computer which may be used to annotate or edit graphic information externally to the device for later upload. In addition, the device contains a simple menu-driven user interface which allows panning and zooming the image data, marking locations of interest, and other such functions. The device may be operated from an internal rechargeable battery, or powered externally. Issued 16 Nov 1999.

Hand-held GPS-mapping device, US. Patent Number 5,902,347. A hand-held navigation, mapping and positioning device contains a GPS receiver, a database capable of storing vector or bit mapped graphics, a viewing port, an embedded processor, a simplified user interface, a data compression algorithm, and other supporting electronics. The viewpoint is configured such that the data presented in the viewport is clearly visible in any ambient light condition. The database stores compressed image data which might include topographical map data, user annotations, building plans, or any other image. The system includes an interface to a personal computer which may be used to annotate or edit graphic information externally to the device for later

upload. In addition, the device contains a simple menu-driven user interface which allows panning and zooming the image data, marking locations of interest, and other such functions. The device may be operated from an internal rechargeable battery, or powered externally. Issued 11 May 19/99.

3.5 Professional Presentations

American Ambulance Association Annual Meeting: Low-cost VHF/UHF Interoperability for digital telemetry, Las Vegas, NV, Dec. 2005.

California Ambulance Association, Keynote address: Alternatives to solving interoperability problems in Land Mobile Radios, Lake Tahoe, NV, July 2005.

Museum of Science Lecture Series: The Next Generation of Information and Communications Technologies-What does the Future Hold?, William R. Michalson and Brian King, January 14, 2004.

Agilent Wireless Technology Summit: Dynamic Node Location in an Ad Hoc Indoor Communications and Positioning Network, William R. Michalson, January 27, 2004

Security & Technology Online (SATO) Security Leadership Council. Panel discussion on Smart Surveillance, Command and Control, Oct 28-29, 2004.

"*Worcester Polytechnic Institute Barcelona Summit: The Future of Information Technology*," delivered presentation entitled "Personal Navigation in the Information Age," Apr 2001.

4. Projects advised (undergraduate).

4.1 Major Qualifying Projects (current)

[1] *Formula SAE Electric*, S. V. Boyd, T.A., T.A. Ninesling, E.R. Robert, J.M. Duffield, B.P.Steeves, J.B. Chase, N.S. Bajakian, N.R. Alescio, R.D. Johnson, C.L. Besch, T.R. Schaeffer, MQP-DCP-AB82/MQP-WZM-EV21, 2021.

[2] *SailBot 2021*, C.J. Burri, M.J. Laks, L.C. Zebrowski, N.H. Jackson, C.J. Scholler, N.J. Eusman, A.V. Thammana, MQP-WZM-SB21, 2021.

[3] *Ship Recycling Robot*, N.M. Kalsih, S.I. Morales, J. Cybul, J.D. Hoy, T.H. Reiser, MQP-BC2-SRR1, 2021.

[4] *Tethered Submersible Surveyor*, B.L. Ward, L.C. Reid, J.A. Conklin, J.Y. Huang,MQP-YGB-SUB2/MQP-WZM-SUB1, 2021.

[5] *Underwater Communications*, L. Spalding, MQP-WZM, 2021.

[6] *Lionfish IIII*, MQP-CBP, 2021.

4.2 Major Qualifying Projects (completed)

[7] **Remote Water Monitoring*, Daniel Shrives, T. Vose, and B. Rolfes, MQP-WZM-AB0R, 2020. [* Winner – Provost's MQP Award in Robotics Engineering]

[8] *SailBot 2019-2020 MQP*, I. Lavryonova, T. Andrews, M. Guzman, and K. Reese, MQP-WZM-ABWT, 2020.

[9] *Firefighting Remote Exploration Device II*, J. Cheng, D. Karavoussianis, A. Moseley, and L. Sahyun, CP4-MQP-FIRE, co-advised, 2020.

[10] *Mohamed Bin Zayed International Robotics Challenge at Takemura Lab, Osaka University*, N. Greig and D. McHorney, WZM-MQP-ABVE, 2020

[11] *Lionfish Harvesting Robot – Phase III*, M. Abadjiev, Q. Chen, C. Ewen, N. Johnson, N. Olgado, H. Saperstein, O. Strickland, and C. Whimpenny, WZM-MQP-ABVF, 2020.

[12] *Underwater 3D Data Collection*, D. Pelaez, T. LaCroce, and N. Budris, WZM-MQP-ABVK, 2020.

[13] *Efficient Multi Robot Mapping: Quick and Sustained Environmental Surveying with Limited Communication*, D. Abraham, T. Bergeron, and C. Dembski, WZM-MQP-AB0P

[14] *Leveraging NVMe Management Interface to Provide SES Support for Enterprise Server Diagnostics*. T. P. Mackintosh, WZM-MQP-ABQ3, 2019.

[15] *Sailbot 2018-19*. S. T. Palmer, K.B. Randall and S. A. Fisher, MQP-KZS-SBOT/MQP-WZM-SAIL, 2019.

[16] *Firefighting Remote Exploration Device*, E. M. Barinelli, J. L. Berman-Jolton, G. K. MacNeal, K. R. Naras, M. Tasellari, and Y. A. Verdeja. MQP-CP4-ABQE, 2019.

[17] *Vertical Take-Off and Landing Autonomous Aircraft Design*, Q. C. Barker, T. P. Bergeron, J. A. Goldsberry, J. Romelle, B. H. Pasculano, B. M. Waterman, T. M. Weiss, and Z. J. Zolotarevsky, MQP-RVC-1901, 2019.

[18] *Mobile Manipulation Testbed*, N. S. Dennler, M. LeMay, and T. J. Macaluso, MQP-WZM-AD19, 2019.

[19] *K.O.L.T.: Known Object Localization and Mapping,* N. A. Rosenberg, MQP-WZM-DRMP, 2019.

[20] *Walking Quadrupedal Platform*, N. C. Franco, N. M. Liedtke, and D. Lu, MQP-WZM-QUAD, 2019.

[21] *Wolfgang: An Autonomous Mobile Robot for Outdoor Navigation*, A. U. Cookson, M.E. Landergan, and S. T. O'Neil, MQP-XIH-AD19, 2019.

[22] *MGH Biomedical Imaging Tools*, I. Alexiou, MQP-SNM-SNMA, 2019.*Automated Sandwich Assembly*, Derek W. Feehrer, Carter C. Reynolds, Jaime R. Stephen, Taylor A. Stephen, MQP WZM 17A1, 2018.

[23] *Localization for FRC*, Hu, J., Mitrano, P., Puczydlowski, K. and Vere, N., 2017.

[24] **Sailbot 2017-2018 Final Report*, Burklund, J., Johnson, H., Norris, T. and Shanahan, L. 2018. [* Winner – Provost's MQP Award in Robotics Engineering, Winner – Professional Writing Award].

[25] *QRP – Quadrupedal Robotics Platform*, Armsby, Z., Cole, R., Coll, B., Martin, J., and Nagal, A., 2018.

[26] *Embedded GPU-Based Image & Signal Processing Prototype*, Baker, L and Song, D. Lincoln Laboratories, 2018.

[27] *Music and Wearable Technology*, Perry, L.M., Ferguson, E.E., Barreiro, M.P., 2017.

[28] *Collaborative Robotics Heads-Up Display*, Christopher Bove and Alexander Wald, MQP-WZM-16A1, Lincoln Laboratories, 2017.

[29] *Low Cost Quadrupeds*, Joshua Graff, Kevin Maynard, and Alonzo Martinz, MQP-WZM-16A2, 2017.

[30] *Fire Response Drone*, John Lomi, Zachary Hood, Kyle Young, Chase St. Laurent, and William Boyd, MQP-WZM-16A3, 2017.

[31] *Smart Transradial Prosthesis*, Yesugey Sipka, ID-CDO-1603, 2017

[32] **Sailbot 2016*, Nicholas Gigliotti, James Kuszmaul, Tucker Martin, and Ryan Wall, 2016. [* nominated for the Provost's MQP Award in Computer Science].

[33] *Autonomous Snowblower*, Nicholas Rowles, Daniel Pongratz, Harrison Vaporciyan, , 2017.

[34] **Body Armor Impact Map System*, Carolyn S. Keyes, ME; Nicholas B. Potvin, ECE; and Zachary R. Richards, CS, MQP-WZM-15A1, 2016. [* winner of the Mechanical Engineering Department's MQP Award].

[35] *Highway Safety Merge System*, Dante A. Pace, ECE; and Sunghoon Yoon, CS, MQP-MYE-AAS5, 2016.

[36] *Highway Safety Merge System*, Christopher M. Ellen, RBE; MQP-MYE-AATK, 2016.

[37] *Collaborative Robotics Heads-Up Display*, Bove, C.P. and Wald, A., WPI Lincoln Laboratories Project Center, 2016.

[38]De-Mining with UAVs, Gregory G Tighe

[39] *Arc-Liberation of Intermolecular Bond Energy for Marine Propulsion*, Rohan Jhunjhunwala, ME; James Deane Jackman, CS; Tyler Jon Ewing, ME; Christopher Michael Byrne, ECE; Christopher William Egan, ECE, 2015.

[40] *Glovesense Data Glove*, Nathan William Joseph Wiegman, ECE,; Nathan Harrison Wells, ECE; Russell Hagan Hedlund, ECE,; and Mert Can Erad, ECE, 2015.

[41] *Mobile Motion Capture*, Robert Patrick Dabrowski, ID; and Matthew Stephen Costi, ID, 2014.

[42] *Intelligent LED Display*, Harrison Chabot Williams, ECE; Rayce Colemen Stipanovich, ECE; and Alexander Joseph Ryan, ECE, 2014.

[43] **Design and Optimization of a FSAE Vehicle*, Justin Shane Paprota, ECE; and Camden Ryan Mallette, ECE, 2014. [* winner of the Provost's MQP Award in Mechanical Engineering].

[44] *Sailboat Stabilization System*, Steven Mize Rutledge, ECE; Pedro John Miguel, ECE; Dominic Student author Gonzalez, ECE; and Michael Eric Brendlinger, RBE, 2014.

[45] *Real Time Person Tracking and Identification using the Kinect sensor*, Nikolaos Matthiopoulos and Matthew Francis Fitzpatrick, 2013.

[46] *H.E.A.T. – Home Energy Automation Technology*, John Thomas Manero, ECE; Scott James Cloutier, ECE; Michael Dominick Audi, ECE-RBE, 2012.

[47] *Automated Refueling for Hovering Robots*, Raymond P. Short, RBE; Janine S. Pizzimenti, RBE; and Nigel Bowers Cochran, RBE, 2012.

[48] *Improved Intelligence and Systems Integration for WPI's UGV – Prometheus*, Gregory Duncan McConnell, RBE; Samson Michael King, RBE; Craig Alan DeMello, RBE; Michael A. Rodriguez, RBE; and Eric J. Fitting, ID, 2012.

[49] *Aeacus – development of a bio-inspired robotic platform for swarm-based multi-object transport over uneven terrain*, N. Anderson, D. Praetorius and C. Roddy, co-advised with S. Nestinger, 2011.

[50] *Realization of Performance Advancements for WPI's UGV-Prometheus*, M. Akmanalp, R. Doherty, J. Gorges, P. Kalauskas, E. Peterson and F. Polido, co-advised with T. Padir, S. Nestinger, M. Ciraldi, K. Stafford, 2011.

[51] *Optimization of an Autonomous Underwater Vehicle*, J. Baker, C. Frumento, J. Grzyb and T. North, co-advised w/I. Hussein, 2011.

[14] *Intelligent Tactical Vest*, V. Brisian, J. Fernando, A. Khandaker and J. Zorrilla DeLos Santos, 2011.

[15] *Quadrotor UAV Interface and Localization Design*, N. Smith, B. Berard and C. Pietre, Lincoln Laboratory Project Center, co-advised with G. Heineman, 2011.

[16] *Voice Release System,* J. Low, WZM-MQP-1M10, 2010.

[17] *Design and Realization of an Intelligent Unmanned Ground Vehicle*, J. Barrett, B. Roy and D. Sacco, Co-Advised w/T. Padir, 2010.

[18] *Real-time Digital Modeling of analog circuitry for audio applications*, B. Gleason, WZM-MB09, 2010.

[19] *Optimization and Control Design of an Autonomous Underwater Vehicle*, D. Moussette, A. Palooparambil, and J. Raymond, AE- IIH-0003, co-advised w/I. Hussein, 2010.

[20] *Design of Autonomous Underwater Vehicle and Optimization of Hydrodynamic Properties and Control*, R. David, WZM-3A08, 2009.

[21] Autonomous Vehicle Control, Breznak, R. S., Cunningham, A. G and Kleinfeld, Z., 2008.

[22] *Roof Robot Phase 2*, Zachary James Strowe, ECE; and Xu Lin, ECE, 2008.

[23] *The Thumper Robotic Bass*, *B. Kosherick*, M. Brown, and A. Teti, WZM-RB08, 2008.

[24] *Public Safety Integration Center*, P. Lucia, I. Levin and M. Barone, WZM-1A08, 2008.

[25] *Aircraft Lasercom Terminal Compact Optical Module*, B. Scoville and S. Rose, Lincoln Laboratory Project Center, WZM-2A08, 2008.

[26] *PANSAT Triple Modular Redundant (TMR) Satellite Flight Computer v3*, Kevin Zhang, ECE; and Karim G. Makram, ECE, 2006.

[27] *GPS Attitude Determination System*, J.P. Salmon, Michael LaBossiere and Mark Minotaur, 2005.

[28] *FPGA Implementation of an OFDM Modem*, Andrew Dupont and Jack Coyne, 2005.

[29] *TREMOR – A Triple Modular Redundant Flight Computer for WPI's PANSAT – Revision 2,* Maulin Patel, Omar Moussa and Matthew Kwiatkowski, 2005.

[30] *Construction of a GPS Pseudolite*, Tim Coffey, 2005.

[31] *Dipole Antenna Placement in a Falcon-20 Aircraft*, Emily Anesta and David Plourde, Lincoln Laboratories Project Center, A-Term, 2004.

[32] *GPS Attitude Determination System*, Joshua Holwell, Himanshu Agrawal and Andrew Coonradt, 2004.

[33] *TMR Computer System*, Ryan Angilly, Mitch Lauer and Dan Debiasio, 2004.

[34] *Personal Inertial Navigation System*, Jason DeChiaro and Christopher Strus, 2003.

[35] WZM-MQP-4A02: *PC I/O in High Stress Environments*, John Niesz and James Kent, 2003.

[36] WZM-MQP-2A02: *Vacuum Tube Amplifier*, Joseph Kambourakis and Gregory Molnar, 2003.

[37] *Container Tracking System*, Victoria Chaplick, 2003.

[38] WZM-MQP-2A03: *Heat Management System for PCs*, Ernest Cardin, Kevin Candiloro and Stephen Leavey, 2002.

[39] WZM-MQP-1313: *Digital Image Enhancement*, Julie Bolduc, Joeseph Perry, Wei Fu, 2002.

[40] WZM-MQP-2A01: *Synchronized Audio Sample Looper*, Joel Gottshalk, Robert Conrad and Sanford Freedman, 2002.

[41] WZM-MQP-1A01: *Springboard Digital Multimeter*, Pavel Loven and Andrew Young, 2002.

[42] *Ballistic Missile Defense Analysis Toolkit*, Winfield Peterson, Doug Tilkin and Benjamin Wilson, Lincoln Laboratories Project Center, 2002.

[43] HU-FB-CS01, *C Sound Synthesizer*, Peter W. DeBonte (co-advised).

[44] WZM-MQP-1A00: *StrongArm-Based Computer System*, Bradford Snow, 2001.

[45] WZM-MQP-1C01: *PC Controlled Laser Light Show Device*, Joel Smith, 2001.

[46] WZM-MQP-1E00: *PIC-based MIDI Sequencer* Malcolm Beaulieu, 2001.

[47] WZM-MQP-2A00: *Automotive PC Development Platform* Travis Pouliot and David Philips, 2001.

[48] *The RoadCom Automotive Computing System*, Benjamin Kennedy and John Pong, 2000.

[49] WZM-MQP-1A99: *Compressed Sample Wavetable Synthesizer*, Justin Brzozoski, 2000.

[50] WZM-MQP-3499, *Automatically Equalizing Monitor*, Fernando Braghin, Tenzin Lama, Rahul Bhan and Dion Soetadi, 2000.

[51] 99D163M: *Railroad Communication*, Benjamin Richards, 2000.

[52] CS-MXC-IE00: *PIC Real-Time Sequencer*, Alexander Goodrich, 2000.

[53] 99D514M: *Design of a Microphone Preamplifier*, Eric Reuter, 2000.

[54] WZM-MQP-1A99, *MPEG Audio Deck*, Justin Brzozoski, 2000.

[55] *Digital Image Enhancement*, Julie Bolduc, Wei Fu and Joseph Perry, 2000.

[56] WZM-MQP-4A98, *Railroad Communications System*, Matthew Lug, 1999.

[57] 99D078M: *Modular Effects Processor II*, Erik Neyland, 1999.

[58] 99D176M: *Portable Digital Audio Recorder* Eric Toledo and Duc Truong, 1999.

[59] EE-WZM-1A97, *C Sound Synthesizer*, Ross E. Borgeson, Michael W. Hamel and Matthew S. Walsh, 1998.

[60] EE-WZM-4A97, *Firewire Audio Device*, Daniel R. Stutzbach, 1998.

[61] EE-WZM-2A97, *Modular Effects Processor*, Michael J. Dellisanti, 1998.

[62] EE-WZM-3A97, *GPS Personal Navigation*, Jeffery A. Alderson and Helder Machado, 1998.

[63] HU-FB-CS01, *C Sound Synthesizer*, Peter W. DeBonte (co-advised).

[64] EE-WZM-1E97, *PM Measurement System*, Yevgeniy Bogdanov.

[65] EE-REL-C008, *Design and Development of a Microprocessor-Based Gaussmeter*, David M. Burnham.

[66] EE-WZM-RC01, *Acoustic Guitar Amplifier*, Christopher Thomas.

[67] EE-WZM-GSD1, *Guitar Sustaining Device*, Paul D'Ambra.

[68] EE-RXV-5260, *Audio Feedback Elimination System*, Ross D. Pease and John R. Pelliccio.

[69] EE-RJD-M963, *Embedded Systems Design*, Christopher A. Briggs and Anthony J. Viapiano.

[70] EE-WHE-9601, *GPS Hazard Detector*, Michael Roberts, William Cidela, and Chris Mangiarelli.

[71] EE-WZM-2C96, *Flexible Synthesis*, Noah T. Vawter and Luke Demoracski.

[72] EE-WZM-1A96, *Tap Dancer MIDI Interface*, Thomas Trela and William Dowell.

[73] EE-WZM-2A96, *GPS Hazard Detector II*, Will Brothers, Jon Day, and John Zaghi.

[74] EE-WZM-3A96, *Loudspeaker Data Acquisition System*, Adam Gross.

[75] EE-WZM-4A96, *Audio Morphing Processor*, William Butterfield and Ted Phipps.

[76] EE-WZM-5A96, *Acoustic Modeling*, Peter DeBonte.

[77] EE-WZM-1B96, *Distributed Audio Controller*, Stephen S. Richardson.

[78] EE-WZM-1A95, *Acoustic Hazard Meter*, Ronald D. Slack.

[79] EE-WZM-2A95, *Forest Service DGPS*, Joshua J. Single and Michael T. Spadazzi.

[80] EE-WZM-1C95, *Audio to MIDI Converter*, Jennifer R. Principe.

[81] EE-WZM-1D95, *Low Cost Auralizer*, Jason R. Hills and Mark R. Paulson.

[82] EE-WZM-3A95, *Passive Radiator Design*, Kevin R. Weldon.

[83] EE-WZM-1C94, *Char Model Generation*, Colin J. Florendo.

[84] EE-WZM-1D94, *Wide Area DGPS Simulator*, Daniel Cohen and Robert Schroter.

[85] EE-WZM-2D94, *Digital Soundcard*, Timothy Alsberg (Russian Project Center).

[86] EE-WZM-3D94, *Digital Univibe*, Andrew Willis and Daniel Toohey.

[87] EE-WZM-1A94, *DSP Based Real-Time Audio Feedback Eliminator*, Kevin M. Eddy.

[88] EE-WZM-2A94, *Digital LCD Oscilloscope*, William F. Brown and John F. Ebersole.

[89] 93D236M, *MIDI Mapper*, Jonathan Kemble and Brian Candiloro.

[90] EE-WZM-1C93, *Fault-Tolerant Computer*, Frederick N. Parmenter.

[91] EE-WZM-1A93, *Wireless MIDI Controller*, Sanjay Raja, Charles Cimalore, Ty Panagoplos.

[92] EE-WZM-2A93, *Multiple Pitch Detector*, Jeanne A. Sawtelle.

[93] EE-WZM-3A93, *Multiprocessor Cache Coherence*, Lauren C. Lind and Norman E. Rhodes.

[94] EE-WZM-1C92, *A Simulation of the DLX Architecture*, Lisa Harlow.

[95] EE-WZM-2C92, *A New Microprocessor Development System*, Gregory B. Burlingame, David J. Fortin, Kevin S. Pearson.

[96] EE-WZM-1A92, *Digital Audio Sampler*, Roger D. Gagnon and James M. Lach.

[97] EE-WZM-2A92, *Intelligent Harmonizer*, Prabhjot S. Anand and Aftab M. Yusuf.

[98] EE-WZM-3A92, *Computerized Audio Mixer*, Richard J. Wood.

[99] EE-WZM-1B92, *Real-Time Harmonizer*, Mohiuddin M. Kahn.

[100] EE-WZM-1A91, *Residue Number System Processor*, Ravdeep S. Anand and Christine A. Easton.

[101] EE-WZM-2A91, *SCSI Bus Analyzer*, Brian Costello, George Delouriero, Matthew Maguire, and Keith Nevins.

4.3 Interactive Qualifying Projects (completed)

[1] *Bell Towers*, Bowman, I.H., Casciola, I.O., Adiletta, M.J., Bruneau, C.D., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2019.

[2] *Creating a Circular Economy with Urban Farming*, Ward, B.L., Cyran, B., Premo, J., Soens, N., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2019.

[3] *Plastic-Free Venice*, S.L. Bonanno, V.C.Nguyen, A.H. Hagedorn, T.S. Howlett, WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2019.

[4] *30th Anniversary Exhibit*, N. Bajakian, J. Wong, J. DeDonato, and N. Stallings, WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2019.

[5] *Venice Crowdfunding*, T. Ferrara, F de Leo, M. Bernardo and S. O'Connell, WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2019.

[6] *Visitor Experiences in Venice*, T. King, C. Anderson, M. Laks, and C. Hoey, WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2019.

[7] *Venice From Above: Preserving Venetian Bell Towers*, Iuliano, C.T., Kavassalis, F.I., Colucci, N.D., Lessard, P., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.

[8] *Celebrating 30 Years of the Venice Project Center*, Ellis, E.J., Morton, K.J., Carpini, N.A.D., Hale, S.A., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.

[9] *PreserVenice Launch: A Crowdfunding Solution to Preserving Venetian Heritage*, Hetherington, B.F., Berardi, D., Thompson, K.R., Joy, S.P., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.

[10] *Tech Mecca in Giudecca*, McMahon, A.J., Hiscox, C.A., Maida, P.J., Lee, R.T., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.

[11] *Exploring Urban Permaculture: Initializing a Path to a Greener Venice*, Jordan, A.S., O'Driscoll, K.J., Manca, R. A., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.

[12] *Open For Business: Analyzing Venetian Storefronts,* Bartone, J.R., Scales, K.J., Racca, S.R., Chen, Y., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.

[13] *Venice Without Obstacles*, DeRusha, A.C., Abenante, E.R., DiStefano, M.S., Jones, S.A., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.

[14] *Documenting and Promoting the Impacts of the Melbourne Project Center*, Seely, C.A., Day, J.L., Cochran, I.L., and Carlson, K.A.M., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.

[15] *Students' Mental Wellbeing in Universities Located in Melbourne*, Isaro, A., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.

[16] *I See a Psychologist -- Reducing Stigma through Normalizing Mental Health Care in Australia*, Vayas, NN., Daci, E.G., and Bianco, C.E., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.

[17] *Improving Web Presence and Stakeholder Interaction for the Emergency Services Foundation*, Savage, H.A, Sanchy, M.T., Capozzi, R. and Babel, B.M., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.

[18] *Understanding Visitor Experiences at the Pauline Gandel Children's Gallery*, Nigro, J.T., France, G.T., Coppolino, J.R. and Blakslee, B.S., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.

[19] *A Citizen Science Platform for Long-Term Monitoring of Microplastic Pollution in Port Phillip Bay*, Bayas, A.C., Buckley, M.J., Ford, C.K. and Lawes, J.A., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.

[20] *A Comprehensive Methodology for Assessing the Quality of Solar Photovoltaic Systems*, Arthur, D.P., Hoey, C.J., Laffer, T. and Westgate, B., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.

[21] *High Efficiency Power Inverter*, Grzegorz J. Klos and Robert Hall, 2015.

[22] *An Analysis and comparison of affordable and ecological short-term transportation energy solutions*, Bryan Thomas Gleason, 2009.

[23] *Lens and Lights Operational Overview*, Andrew Thomas Wilkins, ECE; Matthew Houstle, ECE; and Anthony R. Azersky, CS, 2009.

4.4 Graduate Theses Advised and Co-Advised

4.4.1 MS Theses (current)

[1] Pratik Jawahar, "High-Level Exogenous Fault Detection in Multi Robot Systems with Variational Autoencoders and Normalizing Flows," MS Thesis, co-advisor, 2022.

[2] Rohan Walia, "Formation-Centric Software Interface," MS Thesis, co-advisor, 2022.

4.4.2 MS Theses (completed)

[1] Nathaniel Michaels, "A Modular Robotic AFO for detecting phase changes during Walking Gait," MS Thesis, co-advisor, 2020.

[2] Hernandez, A. C., "Implementing and Comparing Image Convolution Methods on an FPGA at the Register-Transfer Level," MS Thesis, co-advisor, 2019.

[3] Katie Gandomi, "Implementation of a Modular Software Architecture on a Real-Time Operating System for Generic Control over MRI Compatible Surgical Robots," MS Thesis, co-advisor, 2018.

[4] Adhavan Jayabalan, "Decentralized Persistent Connectivity Deployment in Robot Swarm," MS Thesis, co-advisor, 2018.

[5] Janani Mohan, "Dynamic Task Allocation in Robot Swarms with Limited Buffer and Energy Constraints," MS Thesis, co-advisor, 2018.

[6] Rogers, J.P., GNSS and Inertial Fused Navigation Filter Simulation, MS Thesis, co-advisor, 2018.

[7] Christopher Bove, "Constrained Motion Planning System for MRI-Guided, Needle-Based, Robotic Interventions," MS Thesis, co-advisor, 2018.

[8] Vyas, Shivang, "Feature detection in an indoor environment using Hardware Accelerators for time-efficient Monocular SLAM," MS Thesis, primary advisor, Worcester Polytechnic Institute, 2015.

[9] Morin, Russell, "A Novel Localization System For Experimental Autonomous Underwater Vehicles," MS Thesis, co-advisor, Worcester Polytechnic Institute, 2010.

[10] Navalekar, Abhijit, "Design of an OFDM-Based VHF Modem," MS Thesis, primary advisor, Worcester Polytechnic Institute.

[11] Ahlehagh, Hasti, "Techniques for Communications and Geolocation Using Wireless Ad Hoc Networks," MS Thesis, primary advisor, Worcester Polytechnic Institute, 2004.

[12] Sebastian, Dalys, "Development of a Field-Deployable Ultrasound Scanner System," MS Thesis, co-advisor, Worcester Polytechnic Institute, 2004.

[13] Tobgay, Sonam, "Novel Concepts for RF Surface Coils with Integrated Receivers," MS Thesis, co-advisor, Worcester Polytechnic Institute, 2004.

[14] Breen, Daniel, "Characterization of Multi-Carrier Locator Performance," MS Thesis, co-advisor, 2004.

[15] Aghogho, Obi, "A Novel Radio Frequency Coil Design for Breast Cancer Screening in a Magnetic Resonance Imaging System," MS Thesis, co-advisor, Worcester Polytechnic Institute, 2003.

[16] Fei, Ming, "Electromagnetic Detection, Infrared Visualization and Image Processing Techniques for Non-Metallic Inclusions in Molten Aluminum," MS Thesis, co-advisor, 2002.

[17] Lavoie, Bruce, "Design and Implementation of an N-Channel Self Calibrating Audio System," MS Thesis, primary advisor, Worcester Polytechnic Institute, 2000.

[18] Bogdonov, Gene, "Theoretical and Practical Implementation of Electrical Impedance Material Inspection of Powder Metallurgy Compacts," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1999.

[19] Messier, Andrew, "Modeling the Effects of Terrain Masking on GPS Accuracy and Integrity," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1998.

[20] Antonescu, Bogdan, "Elliptic Curve Cryptosystems on Embedded Microprocessors," Bogdan Antonescu, MS Thesis, co-advisor, Worcester Polytechnic Institute, 1998.

[21] Lai, Qiang, "Ground-Penetrating Radar Data Processing System," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1998.

[22] Soria-Rodríguez, Pedro, "Multicast-Based Interactive-Group Object-Replication For Fault Tolerance," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1998.

[23] Hoy, William, "Audio Signal Denoising Using Wavelets," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1997.

[24] Progri, Ilir, "Harmonic Flow Monitoring by means of Global Positioning System," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1997.

[25] Bretchko, Pavel, "Pulsed Hysteresis Graph System," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1997.

[26] Repkin, Dmitry V., "A Hierarchical Neural Network Based Data Processing System for Ground Penetrating Radar," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1997.

[27] Metsis, Sophocles, "Design of a Real-Time Capable, Fault-Tolerant, Distributed System," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1996.

[28] Hill, Jonathan, "Efficient Implementation of Mesh Generation and FDTD Simulation of Electromagnetic Fields," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1996.

[29] Dunkelberg, John, "FEM Mesh Mapping to a SIMD Machine Using Genetic Algorithms," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1996.

[30] Leuenberger, Georg, "Design and Development of a Microprocessor Based Gauss Meter," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1995.

[31] Valentino, Ralph, "DISC: A Dynamic Instruction Set Coprocessor," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1995.

[32] Muley, Aalok, "A Fault Tolerant Network for a Real-Time Environment," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1994.

[33] Mohan, Surrender, "Automatic Surface Mesh Generation for 3D Solid Models Using Delaunay Algorithm," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1994.

[34] Petrangelo, John, "Experimental Preconditioners for Large Dense Systems," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1994.

[35] Schneider, Eric, "Design, Simulation, and Analysis of a 3D Integrated Optical Computer," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1993.

[36] Palmer, Bradley, "A Comparison of Three Protocols Supporting Time-Dependent and Time-Independent Communications," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1992.

[37] Clayton, Shawn, "An Analysis of the Real-Time Behavior of Galactica Net," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1992.

[38] Levergood, Thomas, "An Experimental Evaluation of Split User/Supervisor Cache Memories," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1992.

[39] Lavalee, James, "The Design and Development of Real-Time Systems Using Ada and the Activation Framework," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1992.

[40] Velazques, Javier, "The Development of a Real-Time Environment Using the Activation Framework," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1992.

4.4.3 Ph. D. Dissertations (current)

[1] Vincenzo Diluoffo, "Security in the Robot Operating System Version 2 (ROS 2) Environment," primary advisor.

[2] Jitesh, "Ad-Hoc Networking for Bandwith Limited LMR Systems," primary advisor.

4.4.4 Ph. D. Dissertations (completed)

[1] Carvalho, P. A., "Advancing Technologies for Interventional MRI Robotics with Clinical Applications," 2019.

[2] Ferreira, PVR "SRML: Space Radio Machine Learning," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2017.

[3] Iyer, Vishwanath, "Broadband Impedance Matching of Antenna Radiators," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2010.

[4] Navalekar, Abhijit, "Distributed Digital Radios For Land Mobile Radio Applications," Ph.D. Dissertation, primary advisor, Worcester Polytechnic Institute, 2009.

[5] Parikh, Hemish, "Design of an OFDM Transmitter and Receiver for Precision Personnel Location," primary advisor.

[6] Progri, Ilir, "An Assessment of Indoor Geolocation Systems," Ph.D. Dissertation, primary advisor, Worcester Polytechnic Institute, 2003.

[7] Li, Xinrong, "Super-Resolution TOA Estimation with Diversity Techniques for Indoor Applications," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2003.

[8] Leuenberger, Gerog H. W., "Electrostatic Density Measurements in Green-State PM Parts," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2003.

[9] Bogdanov, Gene, "Radio-Frequency Coil Design for High Field Magnetic Resonance Imaging," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2002.

[10] Elbirt, Adam J., "Reconfigurable Computing for Symmetric-Key Algorithms," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2002.

[11] Bretchko, Pavel, "Design and Development of Ultra-wideband DC-Coupled Amplifier," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2001.

[12] Hill, Jonathan, "Development of an Experimental Global Positioning System (GPS) Receiver Platform for Navigation Algorithm Evaluation," Ph.D. Dissertation, primary advisor, 2001.

[13] Spasojević, Mirko, "Creation of Sparse Boundary Element Matricies for 2-D and Axi-symmetric Electrostatic Problems Using a Bi-orthogonal Wavelet," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 1997.

[14] Shi, Funan, "Optimal Designs of Gradient and RF Coils for Magnetic Resonance Imaging (MRI) Instrument," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 1996.

5. Proposals and Funding:

5.1 Funding Received

$300,000	MRI: Development of an autonomous, Connected and Data-Driven Vehicle for Multi-Disciplinary Research, Co-PI, 09/13/16.
$200,000	Advanced Bayesian Methods for Autonomous Navigation, Co-PI, 07/25/11.
$50,524	PCOG Broadband Modem, PI, $50,524, 05/15/09.
$839,000	Real-Time Troop Physiological Status Monitoring System, Co-PI, 09/06/07.
$83,726	State Communications Interoperability, PI, 07/18/07.
$224,822	MANET Protocols for Capacity-Limited Channels, PI, 03/08/07.
$44,366	TATRC: Wireless Sensor Communications, Co-PI, 12/20/06.
$95,000	Real-Time Troop Physiological Status Monitoring System, Co-PI, 02/13/06.
$3,225,000	Real-Time Troop Physiological Status Monitoring System, Co-PI, 12/19/05.
$1,973,286	Precision Indoor/Outdoor Personnel Locator, Co-PI, 09/23/05.
$25,000	Sensor-on-a-Chip for Electrophysiological Monitoring, Co-PI, 08/08/05.
$1,245,000	Real-Time Troop Physiological Status Monitoring System, Co-PI, 12/23/04.
$1,370	WPI-NanoSAT Program, Co-PI, 11/03/04.
$37,408	Precision Indoor/Outdoor Personnel Locator, Co-PI, 10/05/04.
$74,048	Real-Time Troop Physiological Status Monitoring System, PI, 09/15/04.
$813,141	Real-Time Troop Physiological Status Monitoring System, PI, 12/08/03.
$255,496	Precision Indoor/Outdoor Personnel Locator, Co-PI, 10/31/03.
$3,246	WPI-NanoSAT Program, Co-PI, 10/20/03.
$2,789	WPI-NanoSAT Program, Co-PI, 03/06/03.
$827,000	Real-Time Troop Physiological Status Monitoring System, PI, 11/22/02.
$14,866	Norfolk County Sheriff's Office Data Mining, Co-PI, 02/01/02.
$54,483	Auto-calibrating surround sound system, PI, 2001.
$11,252	Auto-calibrating surround sound system, PI, 2000.
$18,977	GPS-Based Attitude Determination System, PI, 07/1998.
$70,000	Development of an Electric Resistivity Instrument for the Testing of Green-State P/M Compacts, Co-PI, 01/1997.
$10,550	GPS Hazard Detection, Co-PI, 1996.
$200,000	Integrity for the Global Positioning System - Supplemental Funding I, Co-PI, 1995.
$3,000	GPS-Based Tracking of Forest Vehicles, PI, 1995.

$7,200	Acoustic Identification of Mosquito Species, Co-PI, 1995.
$9,978	Acoustic Identification of Mosquito Species, Co-PI, 1995.
$11,527	Laboratory Equipment for Microkernel Based Embedded Systems, Co-PI, 1995.
$74,388	RF Circuit and Antenna Modeling on High Performance Computers, Co- PI, 1994.
$199,075	Integrity for the Global Positioning system, PI, 1994.
$326,336	3D Modeling of Microwave Antennas on High-Performance Parallel Computers, Co-PI, 1993.
$338, 687	Integrity for the Global Positioning system, Co-PI, 1993.

6. Honors, Awards, and Recognitions:

Elected Senior Member of the IEEE.

Joseph Samuel Satin Distinguished Fellowship awarded for the 1994-1995 academic year.

Aldo Miccioli Fellowship recipient from Raytheon Equipment Division.

ION Best Paper Award - GPS-96 for W. R. Michalson, W. Cidela, et. al., "A GPS-Based Hazard Detection and Warning System," in review, " *ION GPS-96, 9th International Meeting of the Satellite Division of the Institute of Navigation*, pp. 167-175, Kansas City, MO, Sep 17-20, 1996

2nd Place - 2004 ECE Department MQP Award / Provost's MQP Award for *GPS-Based Orbit and Attitude Determination System for PANSAT*, Joshua Holwell, Andrew Coonradt and Himanshu Agrawal.

1st Place - 2003 ECE Department MQP Award / Provost's MQP Award for *Personal Inertial Navigation System*, Jason DeChiaro and Chris Struus.

1st Place - 2002 ECE Department MQP Award / Provost's MQP Award for *Handspring Digital Voltmeter*, Andrew Young and Pavel Loven.

3rd Place - 1998 ECE Department MQP Award / Provost's MQP Award for *Design of a Personal Handheld GPS Receiver*, Jeffery Alderson and Helder Machado.

2nd Place - 1997 ECE Department MQP Award / Provost's MQP Award for *Distributed Audio Controller*, EE-WZM-1B96, Stephen S. Richardson.

3rd Place - 1997 ECE Department MQP Award / Provost's MQP Award for *GPS Hazard Detector II*, EE-WZM-2A96, Will Brothers, Jon Day, and John Zaghi.

1st Place - 1996 ECE Department MQP Award / Provost's MQP Award for *GPS Hazard Detector*, EE-WHE-9601, Michael Roberts, William Cidela, and Chris Mangiarelli.

6.1 Memberships and offices held in professional society

- Institute of Electrical and Electronic Engineers, Senior Member
- Institute of Navigation
- Royal Institute of Navigation
- American Society of Engineering Educators
- National Academy of Inventors
- Society of Automotive Engineers

6.2 Professional Service

Massachusetts Board of Bar Overseers Hearing Committee Member, 2010-Present.

Steering Committee – 2009 First Annual Robotics Innovations Competition and Conference (RICC '09), Nov 7-8, Worcester, MA, 2009.

Conference Technical Co-Chair – 2009 IEEE International Conference on Technologies of Practical Robot Applications (TePRA 2009), Nov. 9-11, Woburn, MA, 2009.

Reviewer – Proposal number CRDPJ 379622-08, Natural Sciences and Engineering Research Council of Canada (NSERC), Mar. 2009

Co-Chair – Urban and Indoor Geolocation, Institute of Navigation International Technical Meeting (ITM2009), Anaheim CA, Jan. 2009.

Reviewer – Proposal number CRDPJ 379622-08, Natural Sciences and Engineering Research Council of Canada (NSERC), Mar. 2009