

**DR. JUAN R. PIMENTEL**  
**Professor, Computer Engineering**  
**Kettering University**

## **1. Biographical Data**

### **1.A. Name and Address**

Juan Ricardo Pimentel  
3184 Hidden Trail  
Waterford, MI 48328  
Cell Number: (586) 222-2651  
Email: jpimente@kettering.edu

### **1.B. Place of birth**

Peru. U.S. citizen by nationalization.

### **1.C. Education**

Ph.D., Electrical Engineering University of Virginia, January 1980.  
M.sc., Electrical Engineering University of Virginia, January 1978.  
B.S., Electrical Engineering Universidad Nacional de Ingenieria, Lima, Peru, February 1975.

### **1.D. Experience and Former Positions**

1. **Professor**, Electrical and Computer Engineering Department, Kettering University (formerly General Motors Institute), Flint, Michigan, July 1991 - Present. Teaching courses in capstone design courses, distributed embedded systems, computer networks, data acquisition and database systems, digital communications, and digital systems. Supervising student thesis in related areas.
2. **Invited Research Professor**, TRIO group, INRIA-LORIA, Nancy, France, Spring 2006. Research on dependability evaluation of FlexCAN under transient communication failures.
3. **Visiting Professor**, Department of Automation and Informatics, Universidad Carlos III de Madrid, Spain, Spring 2005. Performed research on the application of FlexCAN to the RH-0 humanoid robot.
4. **Summer Intern Professor**, Summer of 2004 and 2005, Advanced Manufacturing Engineering, DaimlerChrysler, Auburn Hills, Michigan. Perform analysis and recommendations on the requirements, verification, and validation of real-time manufacturing production systems.
5. **Visiting Fulbright Scholar**, Department of Electrical and Computer Engineering,

- Universidad de los Andes, Bogota, Colombia, June – October 2001. Developed and taught a course on “distributed control systems” and conducted research on safety-critical aspects of fault tolerant distributed embedded systems. Co-advisor of doctoral candidates in the department.
6. **Visiting Research Professor**, Division of Systems Engineering and Automatic Controls of the Polytechnic University of Madrid, Spain, Sept. 1991-August 1993 (On leave from GMI). Directed the work of researchers within the mobile robots laboratory. Performed collaborative research in mobile robots and intelligent autonomous systems. Increased the visibility of the laboratory in the international engineering and research community on mobile robots through networking and conference participation. The mobile robots laboratory consisted of 3 Professors, 2 PhD students, and on average about 10 Master level and undergraduate students per semester.
  7. **Associate Professor**, Electrical and Computer Engineering Department, GMI Engineering & Management Institute, Flint, Michigan, July 1983 - June 1991. Taught courses in computer networks, robot dynamics and control, digital communications, digital systems, and communication systems. Supervised student thesis in the areas of robot controls, coordinate measurement machines, automated manufacturing, MAP communications, computer integrated manufacturing, network topology, cell controllers, distributed databases, local area networks, and network management.
  8. **Guest Professor**, Fraunhofer Institute fuer Informations und Datenverarbeitung, Karlsruhe, Germany, October 1987 - September 1988. (On sabbatical from GMI.) Research topics include requirements applications, and architectures of industrial local area networks. Project funding agency: Siemens A.G. Karlsruhe. Developed a presentation layer encoding for fieldbus networks.
  9. **Assistant Professor**, Electrical Engineering Department, General Motors Institute, Flint, Michigan, September 1979- June 1983. Taught courses in digital systems, signal processing, systems and signals, and circuit theory. Performed consulting for various GM divisions such as Delco Electronics, Pontiac, AC Spark Plug, GM of Canada. Supervised student thesis associated with important GM development projects such as engine control systems, knock sensor signal processing, diesel engine optimum control, fuel injection system remodeling, industrial computer networks, multi-processor systems for engine control, vision systems, robot controls, and distributed control systems.
  10. **Research Assistant**, National Radio Astronomy Observatory, Very Large Array (VLA) program, Socorro, New Mexico, Summer 1978.
  11. **Graduate Research Assistant**, Research laboratories for the Engineering Sciences, University of Virginia, June 1977 - August 1979.
  12. **Research Assistant**, National Radio Astronomy Observatory, Charlottesville,

Virginia, July 1976 - January 1977.

13. **Research Engineer**, Instituto Geofisico del Peru, Lima, Peru, June 1975 - July 1976.
14. **Instructor**, Universidad Nacional de Ingenieria, Lima, Peru (part-time), April 1975 - December 1975.

### **1.E. Patent and Testifying Experience**

1. Drafted and submitted a patent application in the area of control infrastructure for the Internet of Things (IoT), filed to INDECOPI, patent office, Peruvian Government, May 2014.
2. *Kirkland & Ellis LLP*, Chicago, Illinois, on-going cases. Expert Consultant. Two Patent Infringement cases involving over 15 patents in the area of peer-to-peer communication networks and the controller area network (CAN).
3. Drafted a patent application for FlexCAN on behalf of Kettering University, Aug. 2008. Did not file actual application due to prior publications on FlexCAN.
4. Drafted a patent application for Machine-to-Machine communications and applications on behalf of LeSoft LLC, June 2010. Did not file actual application due to possible infringements on existing patent claims.

### **1.F Consulting Engagements**

1. Teltech Resource Network, Eden Prairie, MN. Topic: Consulting on a variety of topics involving microprocessors, languages, operating systems, and networking. (1986-1990)
2. Siemens AG, Karlsruhe, W. Germany. Support on the development of the application layer of Profibus. 1987-1988.
3. Ship Star Associates, Wilmington, DE. Topic: Development and offering of short courses on networking for manufacturing applications. April 1986 – Dec. 1991
4. General Motors (MAP) committee, GM Technical Center, Warren, MI. Topic: Programmable devices for manufacturing. 1983-1987.
5. Industrial Technology Institute, Ann Arbor, MI. Topic: Research on the Token Bus Protocol for manufacturing applications. April 1983 - April 1986.
6. Infotron, Cherry Hill, New Jersey. Topic: Analysis and improvement of network routing algorithms. Jan 1990 – Feb. 1993.

7. Euromatech, Dubai, United Arab Emirates. Topic Areas: Distributed control systems, networking, information management, and communications for oil and gas industries. 2002 – Present.
8. Glomacs, Dubai, United Arab Emirates. Topic Areas: Sensors and Instrumentation, networking, and data communications for oil and gas industries. 2008 – Present.
9. Harley Davidson, Milwaukee, Wisconsin. Application of FlexCan to Motorcycles, 2006-2008, Contact: Frank Molinaro.
10. MBTech, Troy, Michigan. Design of a CANBus for a city bus. 2006. Contact: Mike Staszal.
11. Vector CANTech Inc., Novi, Michigan. Various studies on the real-time and dependable performance of CAN in a variety of applications, 2004 – 2009, Contact: Bruce Emaus.
12. Azentek, Grand Blanc, Michigan. Microcontroller, operating system, and networking aspects of an automobile head unit. Contact: John Cooper. 2007 – 2008.
13. Bay Engineering, Bay City, Michigan. Design of a GSM – GPS low cost phone, 2009 – 2010.
14. Kirkland & Ellis, Chicago, IL. Intellectual Property Legal Consulting. Topic area: peer-to-peer networking and the controller area network (CAN), 2012 – Present.

## **2. Teaching and Education**

### **2. A. Courses Taught at Kettering University**

1. Senior Capstone Design. Topics for this course vary from offering to offering but they are current, state of the art topics involving both computer and electrical engineering.
2. Distributed Energy Systems. Topics include power and energy calculations, distributed generation (PV, wind, and biogas), power electronics, energy measurement, hardware, software and communications (wireless, ZigBee).
3. Distributed Embedded Systems. Focus on the theory, analysis, design, simulation, and application of the controller area network (CAN).
4. Computer Networks. Focus on the Internet, industrial applications, wireless networking, and mobile Internet.

5. Wireless Industrial Networks (Graduate Course). Focus on IEEE 802.15.4 standards such as wirelessHART, ISA100, and ZigBee. Other topics: wireless sensor networks, Bluetooth, GSM/GPRS, LTE and industrial applications.
6. Microcomputers I and II. Hardware, software, communications, and architectures of selected microcontrollers from Freescale and Microchip.
7. Computer Architecture.
8. Digital Systems
9. Data Acquisition and Databases
10. Computer Monitoring and Control
11. Robot Dynamics and Control
12. Automotive Electronics

## **2.B. Senior Design Capstone Projects**

1. Spring 2015: Design and Implementation of a SCADA system for a water treatment process.
2. Winter 2014: A New Generation of SCADA System for the IoT (Internet of Things)
3. Spring 2013: Innovations Using Wireless Communications, Software Define Radio (SDR), Implementation of various wireless protocols using GNU Radio Companion (GRC).
4. Spring 2012: Innovations in Smart Energy Metering (SEM) to support the Smart Grid (SG): *Analog Front End (AFE) and Wireless communications (ZigBee)*.
5. Winter 2012: Innovations in Smart Energy Metering (SEM) to support the Smart Grid (SG): *Power and energy signal processing using the FFT (Fast Fourier Transform)*.
6. Spring 2011: *Solar Energy Global Monitoring and Control Using Advanced Metering*. This project used the Solar PV test bed developed in the Winter 2011 project. Two energy meters prototypes were demonstrated for dc and ac energy meters involving assorted microcontrollers from Microchip (dsPIC33F and Pic24 families).
7. Winter 2011: *Design and Implementation of a modular and scalable Solar PV test bed and an energy meter architecture*. Solar PV test bed components included:

- Solar panels, charge controllers, batteries, power inverters, and associated protection devices (e.g., circuit breakers).
8. Spring 2010: Design, Implementation and Evaluation of Location Based Web Services based on GSM/GPRS + GPS Modules. Part II: Applications: Mobile Device Platform (MDP), Basic Phone, CAN based, Smart Phone.
  9. Winter 2010: Design, Implementation and Evaluation of Location Based Web Services based on GSM/GPRS + GPS Modules. *Part I: Basic Hardware, Software, Architecture Components, and Services.*
  10. Spring 2009: Emergency Response Services in Vehicular Networks Using Cellular Technology. The tool used was IMS (Internet Multimedia System) as implemented by Ericsson's tool "service developers studio" sds 4.1 FD1 featuring the SIP (Session Initiation Protocol).
  11. Spring 2008: Implementation and Evaluation of 3-Phase PMSM (Permanent Magnet Synchronous Motor) Motor Controllers. Part II: Final Design, Implementation, and testing. Two groups used an FPGA and Microcontroller respectively for the implementation and demonstration.
  12. Winter 2008: Implementation and Evaluation of 3-Phase PMSM (Permanent Magnet Synchronous Motor) Motor Controllers. Part I: Basic modeling, analysis, design, and simulation.
  13. Winter 2004: Design, Implementation, Testing and Verification of a Safety-Critical System. This project was based on an existing hardware, software architecture and a simulation (in CANoe) of a steer-by-wire system . The safety-critical system was verified using the standard DO-178B. This project was presented to an special interest group of SAE.
  14. Spring 2003: Software for Safety-Critical Systems. The objective of this project was to design and implement a highly dependable software architecture for a simulated "drive-by-wire" system operating in a network environment (CAN) and then to exercise the architecture to develop two dependable controllers: a simulated one (using CANoe) and an actual one (on the S12 microcontroller using C).
  15. Winter 2003: Electrical Drive for a Personal Mobility Vehicle. The objective of this project was to design, build, and demonstrate a prototype of a low cost, electrical-drive based high performance *personal mobility vehicle* similar to the commercial product Trikke.8. The prototype used ac motors for propulsion and the CAN bus for sensing, control, and communications.
  16. Fall 2002: Microcontroller Generation of 3-phase PWM Signals for Induction Motor Control. Three students groups tackled this project using different

methods: A) Manual approach, B) Semi-automatic approach, and C) fully automatic approach. The manual approach consisted in manually writing the C-code to generate the PWM control signals. The Semi-automatic approach consisted in using a Simulink model of the PWM signal generation and using the tool TargetLink from dSPACE to generate C-code. The fully automatic approach consisted in using a Simulink model and dSPACE tools to generate, link, and download the C-code to a dSPACE DS1103 board.

17. Fall 2001: Design and implementation of a web-based interface to monitor and control a mobile robot (a small tank from Hobbico Inc.) using wireless Internet communications. Two wireless links were used. One link for transmitting a video signal from a camera mounted on the robot (using a X-10 wireless video system @ 2.4 GHz) to the controller and another link for sending control commands from the controller to the robot. The monitoring and control platform was an iPAQ (Compaq).

## **2. C. New Academic Courses Developed at Kettering University**

1. Wireless Industrial Networks (2010)
2. Distributed Energy Systems (2010)
3. Distributed Embedded Systems (2002)
4. GUI Design and Programming (1999)
5. Web Security (2000)
6. Data Acquisition and Databases (1998).
7. Computer Monitoring and Control (1997)
8. Computer Networks (1984).
9. Robot Dynamics and Control (1983).
10. Automotive Electronics (1982).

## **2.D. Academic Laboratories Developed**

1. Senior Capstone Design Laboratory (2012).
2. Distributed Energy Systems Laboratory (2010). A featured component of this laboratory is a modular and scalable PV solar system consisting of solar panels, batteries, battery charger, and power inverter. This laboratory is intended to be used for special projects, thesis projects, and senior capstone design projects.

3. Logic Systems for Manufacturing Laboratory (2006). Equipment Donated by GE-Fanuc that includes: Cimplicity, Motion Drives, Motion Controller, PLC, HMI, RFID devices, Diagnostic and Alarm Modules, all interconnected by a Profibus fieldbus network. Lab. Developed in conjunction with Prof. David Foster.
4. Distributed Embedded Systems Laboratory (2002). Equipment Donated by Vector CANTech Inc., dSPACE, and Movimento Inc. that includes: CANoe, CANalyzer, TargetLink, DS1103, PUMA. In addition, it includes microcontrollers from Freescale and Microchip and associated IDEs (integrated development environments) such as Microchip's ICE.
5. Computer Networks Laboratory (1997)
6. Automotive Electronics Laboratory (1984)

### **2.E. Supervised Student Thesis Projects (Undergraduate).**

This required some consulting and travel to the sponsor's location and meetings with the sponsor's thesis advisors. Kettering University is a full cooperative (co-op) education institution and requires that all students have a sponsoring institution or company and that they complete a thesis before graduation.

1. Colin Gierzynski, "Using Matlab to Automate Crash Test Signal Processing". Sponsor: Bosch Corp., June 2012.
2. Jacob Howarth, "IMPLEMENTATION OF A SERIAL NETWORK FOR AIRBORNE PARTICLE COUNTERS IN A CLASSIFIED CLEAN ROOM ENVIRONMENT," Sponsor: Sandia National Labs, June 2012.
3. Michael Hoeft, "Leak Test Automation," Sponsor: Hutchinson FTS, June 2012.
4. Joshua Oberhaus, "Automating and Expanding ECU Software Testing," Sponsor: Bendix Inc., Feb. 2012.
5. Sean Nunley, "Improve Vault Program Governance Process Request," Sponsor: General Electric, Sept. 2011.
6. Chad Thelen, "The Process of Implementing Network Access Control into a Corporate Network," Sponsor: Auto-Owners Insurance, July 2011.
7. Gregory Girard, "Lab View DC Brushless Motor Simulation," Sponsor: Kettering University, Sept. 2010.
8. Joshua Heitsch, "DESIGN AND IMPLEMENTATION OF A UNIVERSAL HARDWARE PLATFORM FOR USE IN ADVANCED CONTROL SYSTEMS," Sponsor: Federal-Mogul, June 2010.



9. Kenneth Weimer, "Event Session and Survey Information Database," Sponsor: Rockwell Automation., Dec. 2009.
10. Anthony Lane, "Implementation of a Company-wide Database for Tracking Software License Information," Sponsor: Behr Industries Corp., Nov. 2009.
11. Brian Fedewa, "Troubleshooting Siemens Communication Function Blocks Between a Siemens PLC and an Ancillary Device," Sponsor: General Motors, May 2009.
12. Nathan Nephew, "IVR Upgrade/Replacement," Sponsor: Frankenmuth Mutual Insurance, May 2009.
13. Willy Joseph, "Automated Network Signal-Integrity Analysis," Sponsor: Mentor Graphics, April 2009.
14. Thomas Wilson, "Graphic User Interface Tool for Restrain Control Module Testing And Validation," Sponsor: Autoliv ASP Inc., April 2009.
15. Daniel Wilk, "COMPARING IPV6 TRANSITION MECHANISMS," Sponsor: U.S. Government., Feb. 2009.
16. Clark Knudsen, "Design, Implementation, and Validation of Manufacturing Production Line Scoreboard and Data Archive System for Company Network Drive," Sponsor: Becton Dickinson, Jan. 2009.
17. Shahnoor Amin, "Safety Application of Drives on Ethernet/IP," Sponsor: McNaughton-McKay Elec Co., Dec. 2008.
18. Walter Wrye, "Evaluating Distributed Embedded System Technologies," Sponsor: Sandia National Labs, Nov. 2008.
19. Anthony Neumann, "Improved Data Storage Procedure for Golf Course Related Information," Sponsor: Your Golf Game Inc., June 2008.
20. Jeremy Meyers, "Data Transmission Efficiency of Fieldbus Systems Across Various Data Transmission Lines," Sponsor: Fives Cinetic, April 2008.
21. Jerrie Fairbanks, "Wireless Error Proofing," Sponsor: Superior Controls, March 2008.
22. Lisa Phare, "Improvements to the Requirements Management Process for the Development of Safety Critical Electronics," Sponsor: United Technologies Corp, Dec. 2007.
23. James Heakins, "Vehicle CAN PLC/Multiplexer Module Simulation," Sponsor: Orion Bus Industries Inc., Sept. 2007.

24. Jeffrey Warnke, "Creating More Reliable and User Friendly Fault Messages," Sponsor: General Motors, Aug. 2007.
25. Robert Wood, "Designing an Automation System for a Wastewater Treatment Plant," Sponsor: McNaughton-McKay Elec Co., May 2007.
26. Brett Stryker, "An AUTOSAR Implementation of FlexCAN," Sponsor: Kettering University, April 2007.
27. Steven Murphy, "Unified Contact System for County Staff," Sponsor: Shiawassee County, March 2007.
28. Stephen McLean, "Time-Triggered Generation of CAN Messages on Microchip DSPIC30F6014 Microcontrollers," Sponsor: Kettering University, Nov. 2006.
29. Michael Magat, "Recommendations for the Network Design of Using Ethernet for Device Level Communications," Sponsor: General Motors, Sept. 2006.
30. Angus Tsai, "Investigating a Scalable Test Environment," Sponsor: Sun Microsystems, June 2006.
31. Shane Reinke, "Development and Implementation of a State Check Testing Program," Sponsor: Denso Mfg., June 2006.
32. Michael Kokosa, "Incorporating ISDN Dial-On Demand Backup into the WAN," Sponsor: U.S. Government, May 2006.
33. Olanrewaju Alli, "Implementation of an SAE J1939 Compliant GPS Data Acquisition System for Nevada Automotive Test Center," Sponsor: Nevada Automotive Testing Center, Jan. 2006.
34. Patience Burczycki, "By-Wire System Development Data Recorder," Sponsor: Confidential, Dec. 2005.
35. Tyler Clarke, "Simulating the Diagnostic Capabilities of an Automobile Controller Network," Sponsor: General Motors, Dec. 2005
36. Nicholas Sup, "Design of an Automated Testing Process for Software Quality Assurance," Sponsor: Cyberlogic Technologies Inc., July 2005.
37. Vinh Nguyen, "GMLAN Handler Automated Test Environment," Sponsor: Denso Mfg., June 2005.
38. Schaefer Arnould, "Automation of the Creation of Graphical Conveyor Layouts in Genesis 32 Software," Sponsor: Siemens, Jan. 2005.

39. Dung Lam, "An Intelligent Configurable Bridge Module for Automotive Multiplex Applications," Sponsor: Mahle, Jan. 2005.
40. Judson Serumgard, "Development of a Web-Based Order/Tracking System," Sponsor: Patti Engineering, Jan. 2005.
41. Glenn Scheibel, "The Design and Implementation of a Field Operational Test System for InfoScout," Sponsor: General Motors, Dec. 2004
42. Jason Taylor, "Compact Data Acquisition System," Sponsor: Genral Motors, Dec. 2004.
43. Jeremy Meyers, "Data transmission efficiency of fieldbus systems across various data transmission lines," Sponsor: Cinetic Automation Corp, Dec. 2004.
44. Jason Lechtenberg, "Software Implementation of a Java Based Graphical Use Interface to Support Synthesis of ASIC Designs," Sponsor: Sandia National Laboratories, Sept. 2004.
45. Michael Doherty, "Design and Implementation of a Steer-by-Wire System," Sponsor: Kettering University, July 2004.
46. Cesar Antequera, "Development of an Analysis Model to Assist the Architectural Design and Integration Solutions for X-By-Wire Systems," Sponsor: Delphi, Dec. 2003.
47. Ty Clark, "CAN Technology in Distributed Embedded Systems," Sponsor: Vector CANtech Incorporated, Dec. 2003.
48. Clark Smalley, "Steer-By-Wire Vehicle With CAN Networking," Sponsor: Kettering University, Dec. 2003.
49. Heather Hughes-Smith, "A process to implement an industrial IT standard for an automotive assembly line," Sponsor: ABB, Inc., Dec. 2003.
50. David Kinton, "Telecommunication database automation," Sponsor: Choice One Communications, Dec. 2003.
51. Alissa Vaughn, "GUI Based Components for Online Education," Sponsor: Kettering University, Dec. 2003.
52. David Kinton, "Telecommunication Database Automation," Sponsor: Choice One Communications, June 2003.
53. Heather Huges, "A Process to Implement an Industrial IT Standard for an

- Automotive Assembly Line,” Sponsor: ABB Inc., Jun. 2003.
54. Judson Meigs Serumgard, “Confidential,” Sponsor: Patti Engineering, Inc., Mar. 2003.
  55. Nicholas Sup, “Design of an automated testing process for software quality assurance,” Sponsor: Cyberlogic Technologies, Inc., Dec. 2002.
  56. Christopher Mozariwskyj, “Wireless network and internet design for baked goods services,” Sponsor: Mozar Computer Services, LLC., Dec . 2002,
  57. Schaefer Arnould, “Automation of the creation of graphical conveyor layouts in Genesis 32 software,” Sponsor: Siemens Dematic, Rapistan Material Handling Automation Division, Dec. 2002.
  58. Chris Trottier, “Design, development and automation of an enterprise client operating system upgrade,” Sponsor: Pharmacia Corp., Dec. 2001.
  59. David, Claahsen, “An automation of the primary exception system,” Sponsor: United Parcel Service, Dec. 2001.
  60. Matthew Schrage, “Development of an electronic specifications guide,” Sponsor: McNaughton-McKay Electric Company, Dec. 2001.
  61. Joshua Hathaway, “The implementation of the Domino.Doc document management system,” Sponsor: Syntetics Corporation, Dec. 2001.
  62. Lisa Snyder, “ Product tracking and traceability at General Motors Powertrain Livonia,” Sponsor: General Motors Corporation, Dec. 2001.
  63. Christopher Michalak, “Symbology development and integration into a real-time simulation,” Sponsor: Unites States Army Tank-Automotive and Armaments Command, Dec. 2001.
  64. Daniel Palmer, “Implementation of a computer system to track and monitor,” Sponsor: New England Electric Wire Corporation, Dec. 2001.
  65. John Baas, “EDS Notes infrastructure upgrade,” Sponsor: EDS, Dec. 2001.
  66. Chris Brouwer, “Remote display of high resolution computer graphics,” Sponsor: United States Army, Dec. 2001.
  67. James Hendrickson, “Design and development of a resume and position tracking information system,” Sponsor: Mika Systems, Inc., Dec. 2001.
  68. Douglas Hornok, “C++/LabVIEW formula evaluator,” Sponsor: VI Engineering,

- Dec. 2001.
69. Craig Smith, "AutoCad automation using Active X and Visual Basic," Sponsor: Nu-Intellect, Inc., Dec. 2001.
  70. Eric Long, "IP telephony evaluation," Sponsor: Takata Restraint Systems, Dec. 2001.
  71. Benjamin Kauffman, "Plant wide machine/equipment integration and programmable logic controller standardization," Sponsor: Hayes Lemmerz International, Dec. 2001.
  72. Jeffrey Franklin, "Parallel processing using multicast," Sponsor: Rockwell Software, Inc., Dec. 2000.
  73. Teofilo Hernandez, "The integration of DeviceNet and ControlNet on the controllogix platform," Sponsor: McNaughton-McKay Electric Company, Dec. 2000.
  74. Richard Bundren, "Low-end manufacturing execution system," Sponsor: Matrix Technologies, Inc., Dec. 2000.
  75. John Lingl, "Design and development of an automatic control system," Sponsor: IMRA America, Inc., Dec. 2000.
  76. John Wyderko, "Redesign of an HL7 interface," Sponsor: Systems Engineering Consultants, Inc., Dec. 2000.
  77. Edwin Ulshafer, "The evaluation of desktop videoconferencing systems and its impact on networks," Sponsor: EDS, Dec. 1999.
  78. Dennis Klug, "Analyzing an innovative software paradigm, component systems, for use in a manufacturing corporation" Sponsor: Case Corporation Financial & Information Services Group, Dec. 1999.
  79. Rebecca Lindhagen, "Reporting tool design specification," Sponsor: Rockwell Software Inc., Dec. 1999.
  80. Marla Horton, "Evaluation of control system software and hardware for assembly," Sponsor: General Motors Corp., Dec. 1999.
  81. David Foster, "Establishing bi-directional communication between a Hewlett-Packard HP1000 and an Intellution Supervisory Control and Data Acquisition (SCADA) PC based," Sponsor: AK Steel Corp., Dec. 1999.
  82. Thuylinh Ngo, "Trends and network architectures," Sponsor: EDS, Dec. 1999.

83. Suzanne Thomson, "Design of the signatures directorate intranet," Sponsor: ManTech Advanced Technology Systems, Dec. 1998.
84. Jason Ward, "Design and implementation of a man machine interface." Sponsor: CMI-Precision Mold, Inc., Dec. 1998.
85. Matthew Lepkowski, "Design and implementation of the quality information management system," Sponsor: Irvin Automotive Products, Inc., Dec. 1998.
86. Jacob Dilk, "Frame load error proofing," Sponsor: General Motors Corp., Dec. 1998.
87. Vito Lomedico, "J 1939 high speed serial communications," Sponsor: Environmental Research Institute of Michigan,, Dec. 1997.
88. Clint Lupton, "Networked device control for material handling systems," Sponsor: Rapistan Demag,, Dec. 1997.
89. Neil Green, "PC based control," Sponsor: CIMTEC Automation & Control,, Dec. 1996.
90. Matthew Johnson, "Design of automatic tester data acquisition system for statistical analysis," Sponsor: MagneTek Inc., Dec. 1996.
91. Clark Rawlins, "Design of an object based, network oriented, database system specification," Sponsor: InfoCon Incorporated, Dec. 1996.
92. Jo LaFrain, "Real time shop floor data collection for metal stamping operations," Sponsor: A.O. Smith Automotive Products, Dec. 1996.
93. John McMullen, "Data acquisition & monitoring system for PVT test," Sponsor: Pilot Industries, Inc., Dec. 1995.
94. Kurt Evans, "The design of a token ring cable testing device," United Parcel Service, Dec. 1995.
95. Barbara Parker, "Development and implementation of a networking scheme for robotic workcells," Sponsor: General Motors Corp., Dec. 1995.
96. Steven Woodward, "Design and development of battery thickness gage," Sponsor: General Motors Corp., Dec. 1994.
97. Alfonzo Cutaia, "Design and implementation of Metropolitan-Area Network," Sponsor: General Motors Corp., Dec. 1994.

98. Christopher Tobey, "Implementation of a client-server based information retrieval system," Sponsor: Electronic Data Systems Corp., Dec. 1994.
99. Kevin Kernan, "Design and implementation of a predictive maintenance system using infrared thermography for pilot," Sponsor: General Motors Corp., Dec. 1994.
100. Michael Pfeiffer, "Development and enforcement of control standards for transfer machines," Sponsor: AEG Automotive Systems, Dec. 1991.
101. Michael Mozariwskyj, "An evaluation of alternatives for the facilities monitoring and control system," Sponsor: General Motors, Dec. 1991.
102. Michael Spaulding, "Automation of minivan seal line feasibility study," Sponsor: General Motors, Dec. 1991.
103. William Zimmerli, "Implementation of mobile scales for fabricated parts in screw machines department," Sponsor: General Motors, Dec. 1991.
104. Stephanie Usher, "Design of a foundry computerized casting tracking system," Sponsor: General Motors of Canada, St. Catharines, Dec. 1991.
105. Edward Sumpter, "Implementation of a multi-networked maintenance monitoring system," Sponsor: AC Rochester West, Dec 1991.
106. Paul Conlin, "An infrastructure for a factory floor information system focusing on continuous improvement," Sponsor: General Motors of Canada, St. Catharines, Dec. 1991.
107. Frank Steiert, "Analyze and design a robot support system for the GMF robots in the truck assembly center's body shop," Sponsor: General Motors of Canada, Oshawa, Dec. 1991.
108. Robert Okarski, "Conversion and distribution of CNC part programs in a flexible manufacturing system," Sponsor: Digital Equipment Corp., Dec. 1990.
109. Mark Temple, "Analysis and improvement of a LAN based information system," Sponsor: Guardian Fiberglass, Inc., Dec. 1990.
110. Michael Garritsen, "Computer monitoring and control of air handling systems at the axle plant," Sponsor: General Motors Corporation of Canada, St. Catharines, Dec. 1990.
111. Sharon Ellis, "The design of an ALDL durability instrument," Sponsor: General Motors Corp., Dec. 1990.

112. Todd Pepin, "Development of the coil spring production process monitoring system," Sponsor: General Motors Corp., Dec. 1990.
113. Sean Trainor, "Evaluation and recommendation of a new facilities monitoring and control system," Sponsor: General Motors Corp., Dec. 1990.
114. Maurice Knebel, "Worldwide packet switching via a common software package," Sponsor: Xerox Corp., Dec. 1990.
115. Craig Egan, "Fault diagnostics, controls specifications and buyoff procedures for automated machinery," Sponsor: General Motors Corporation, Dec. 1989.
116. Chung Rigby, "Networking applications in a factory environment," Sponsor: General Motors Corp., Dec. 1989.
117. Susan Cooley, "The cost and benefits of data communications networking for programmable device support," Sponsor: General Motors Corp., Dec. 1989.
118. Elizabeth Gornick, "A tactical plan for GMT 400 robot controller map communications implementation," Sponsor: General Motors Corp., Dec. 1988.
119. Laurie Macek, "Design and development of an automated manufacturing monitoring system," Sponsor: General Motors Corp., Dec. 1987.
120. Glen Deane, "Development of a robot mechanical unit emulator," Sponsor: General Motors Corp., Dec. 1987.
121. George Burke, "The design of a tool room management system," Sponsor: General Motors Corp., Dec. 1987.
122. Kevin Deane, "Tool monitoring feasibility study using vibration analysis," Sponsor General Motors Corp., Dec. 1987.
123. John Wadley, "Computer integrated manufacturing communications," Sponsor: General Motors Corp., Dec. 1987.
124. Robert Jones, "A distributed cell control architecture," Sponsor: General Motors Corp., Dec. 1986.
125. Jayne Hardy, "Receiving inspection local area network," Sponsor: General Motors Corp., Dec. 1986.
126. Scott France, "MAP subnetwork structures," Sponsor: General Motors Corporation, Dec. 1986.
127. Steven Tymczuk, "Systematic gauge control," Sponsor: General Motors



- Corporation, St. Catharines, Dec. 1986.
128. Tyrone Thompson, "Implementation of a plant floor process control communication network," Sponsor: General Motors Corp., Dec. 1986.
  129. William Stapel, "Distributed database design for manufacturing applications," Sponsor: General Motors Corp., Dec. 1986.
  130. Thomas Sabourin, "A communication strategy for coordinate measuring machine applications," Sponsor: General Motors Corp., Dec. 1986.
  131. Kimberly Kuhnle, "Design considerations for a portable network manager for a MAP network," Sponsor: General Motors Corp., Dec. 1986.
  132. Dan Karmazyn, "Simulation-based MAP network design," Sponsor: General Motors Corporation, Oshawa, Ontario, Canada, Dec. 1986.
  133. Mary Gustanski, "Machine visual inspection of 3-mode cruise control circuit boards," Sponsor: General Motors Corp., Dec. 1985.
  134. Edward Gundlach, "The development of Multibus compatible programmable controller," Sponsor: General Motors Corp., Dec. 1985.
  135. Donna Formanek, "Machine vision :application for oil cooler housing flexible manufacturing system," Dec. 1985.
  136. Julie Cunningham, "The programmable controller :a robotic application," Sponsor: General Motors Corp., Dec. 1985.
  137. Keith Dusina, "A MAP Communications Gateway to the Fisher Body standard gauging system," Sponsor: General Motors Corp., Dec. 1985.
  138. Gregory Campbell, "Topological aspects of local area networking," Sponsor: General Motors Corp., Dec. 1985.
  139. Thomas Obuchowski, "Data structures for distributed production control," Sponsor: General Motors Corp., Dec. 1985.
  140. Jeffery Richards, "Pierced hole alignment machine vision system," Sponsor: General Motors Corp., Dec. 1985.
  141. Glenn Kishiyama, "Automatic speech recognition in the assembly plant," Sponsor: General Motors Corp., Dec. 1984.
  142. Edward Hamel, "Troubleshooting transmission controls," Sponsor: General Motors Corp., Dec. 1984.

143. Manuel Bartling, "Industrial applications of computer vision systems," Sponsor: General Motors Corp., Dec. 1984.
144. Kelly Spitler, "Machine vision for line 5 flask pin and bushing inspection," Sponsor: General Motors Corp., Dec. 1984.
145. Brian Perry, "Management information system development precursory investigation," Sponsor: General Motors of Canada, Ltd., Dec. 1984.
146. James Kolhoff, "Development of control algorithm concepts for speed density and mass flow poer fuel injection enginesrt," Sponsor: General Motors Corp., Dec. 1984.
147. Michael Johnson, "Performance evaluation and optimization of an electronic unit injector system for pilot injection applications," Sponsor: General Motors Corp., Dec. 1984.
148. Leonard Isabelle, "An evaluation of voice recognition technology for automotive applications," Sponsor: General Motors Corp., Dec. 1984.
149. Brenda Topp, "Vibration analysis system development," Sponsor: General Motors Corp., Dec. 1983.
150. Steven Aldrich, "An automotive option control system using ferrite bead transformers," Sponsor: General Motors Corp., Dec. 1983.
151. Sandra Braun, "The selection of a high speed, multi-user data communication network for an industrial plant," Sponsor: General Motors Corp., Dec. 1983.
152. Janice Terrell, "Feasibility study of total charge dilution exhaust gas recirculation," Sponsor: General Motors Corp., Dec. 1982.
153. Gordon Woolslayer, "Computer verification of an energy management system," Sponsor: General Motors Corp., Dec. 1982.
154. Marc Center, "Diesel fuel injection timing control," Sponsor: General Motors Corp., Dec. 1982.
155. Susanne Gedeon, "Control systems for an automatic ribbon cable assembly process," Sponsor: General Motors Corp., Dec. 1982.
156. Anthony Mitchell, "Design of the diesel smoke sensor," Sponsor: General Motors Corp., Dec. 1982.
157. Kenneth Girardini, "Algorithms for optimum control of transient cycle diesel

- engines,” Sponsor: General Motors Corp., Dec. 1981.
158. Matthew Tsien, “Dot matrix displays in automotive information systems,” Sponsor: General Motors Corp., Dec. 1981.
  159. Robbie Banks, “Computer management system design for the plastic's maintenance department,” Sponsor: General Motors of Canada, Ltd., Dec. 1981.
  160. Kyle Brant, “Microcomputer data acquisition system,” Sponsor: General Motors Corp., Dec. 1980.
  161. Daniel Brennan, “Microcomputer engine controller aid,” Sponsor: General Motors Corp., Dec. 1980.
  162. Jerral Long, “DM-117 noise measurement and reduction,” Sponsor: General Motors Corp., Dec. 1980

## **2.F. Student Projects (Graduate)**

1. Nick Keehn, John Erhke, “Design of an IEEE 802.15.4 based wireless network for a city water treatment plant,” Graduate Project, Summer 2010.
2. Fariba Khosravian, “VPSP: Velocity-based Power Saving Protocols in Wireless Communication of Cooperative Mobile Robots,” Master’s Thesis, Kettering University, May 2012.

## **2.G. Member of Jury For Ph.D. Dissertation Defense**

1. University of Aveiro, Portugal. Dissertation Jury President: Dr. Luis Almeida, June 2005. Topic: FTT-CAN: Flexible Time Triggered Protocol for CAN.
2. University Carlos III of Madrid, Spain. Dissertation Jury President: Dr. Jose Luiz Perez-Diaz, March 2008. Topic: Design of Meissner Superconductors.
3. University of the Balearic Islands, Spain. Dissertation Jury President: Dr. Julian Proenza, May 2010. Topic: Star Implementation of CAN networks.
4. Phule Pune University, India, Dissertation examiner for Jayashri A. Bangali, May 2015. Topic: Study and Development of Sensors and Systems for Smart Space Automation.

### **3. Publications**

#### **3.A. Books**

1. Pimentel, J.R., *Real Innovation: The Case of Developing Countries*, to be published at the end of 2012.
2. Pimentel, J.R., *Mochica Gold*, Fiction Book, to be published at the end of 2012.
3. Pimentel, J.R., Safety-Critical Automotive Systems, *Society of Automotive Engineers*, PT-103, 2006.
4. Pimentel, J.R., Multimedia Para Todos (Multimedia for Everyone), *Editorial Ozlo*, Lima-Peru, March 1997.
5. Pimentel, J.R., Communication Networks for Manufacturing, *Prentice-Hall*, 1990.

#### **3.B. Book Chapters and Handbooks**

1. J.Pimentel, J.Proenza, L.Almeida, G.Rodríguez-Navas, M.Barranco, and J.Ferreira, Dependable Automotive CAN Networks, a chapter in the CRC Handbook, Automotive Embedded Systems, 2007.
2. Pimentel, J.R., Performance of a Fault Management Protocol for a CAN-based Safety-Critical Steer-by-Wire Controller, CAN Newsletter, September 2003 Issue, CAN in Automation, Erlangen, Germany.
3. Pimentel, J.R. Manufacturing Automation Protocol (MAP), Ch. 19, CRC Handbook on Industrial Electronics, CRC Press, Inc., 1997.
4. Pimentel, J.R., De la Escalera, A., Moreno, L., Salichs, M.A., Mobile Robots, Ch. 20, CRC Handbook on Industrial Electronics, CRC Press, Inc., 1997.
5. Moreno, L, Salichs, M.A., Gachet, D., Pimentel, J.R., Arroyo, F., and Gonzalo, A., Neural Networks for Mobile Robot Piloting Control, Chapter 6 in the book Neural Networks for Robotic Control, edited by A.M.S. Zalzalá and A.S. Morris, Ellis Horwood Limited, 1995.
6. Salichs, M.A., Puente, E.A., Moreno, L., and Pimentel, J.R.. A Software Development Environment for Autonomous Mobile Robots, a chapter in Advanced Mobile Robots-Theory and Applications: International Perspectives, World Scientific Publishing Company, 1993.
7. Pimentel, J.R., and Zgorzelski, M., Standardization in Design and Manufacturing, A chapter in "Intelligent Manufacturing Systems," John Wiley and Sons, New

York, NY, 1992.

8. Pimentel, J.R., Automated Manufacturing Networks, Chapter 2, pp. 37-77, in Progress in Robotic and Intelligent Systems, Ablex Publishing Corporation, Norwood, NJ, 1991.

### **3.C. Archival Journal Publications Critically Reviewed Before Publication**

1. Pimentel, J.R., and Rojas A., "A New Approach to Industrial Internet Education," In Preparation.
2. Pimentel, J.R., "Task and Message Scheduling for a FlexCAN-based Hybrid-Electric Vehicle Drivetrain Functional Unit", *SAE Int. J. Passeng. Cars – Electron. Electr. Syst.* **1**(1): 194-201, 2008.
3. Pimentel, J.R., Buja, G., and Bertoluzzo, M., "Design of a Safety-Critical Drive-by-Wire System Using FlexCAN," *SAE Transactions*, March 2007.
4. Buja, G., Zuccollo, A., and Pimentel, J.R., A Bus Guardian for the FlexCAN Architecture, *IEEE Transactions on Industrial Informatics*, Aug. 2007.
5. Pimentel, J.R., "Design of Ne-Learning Systems based on Experiential Learning," *On-Line Journal on Asynchronous Learning Networks*, Vol. 3, Issue 2, Nov. 1999. Available at: <http://www.aln.org/alnweb/journal/jaln-vol3issue2.htm>.
6. Pimentel, J.R., "Communication Architectures for Fieldbus Networks," *Control Engineering*, pp. 74-78, October 1989.
7. Pimentel, J.R., "Efficient Encoding of Application Layer PDUs for Fieldbus Networks," *Computer Communication Review*, Vol. 18, pp. 14-44, May/June 1988.
8. Daigle, J.N., Seidmann, A., and Pimentel, J.R., "Communications for Manufacturing: An Overview," *IEEE Network*, Vol. 2, pp. 6-13, May 1988.
9. Pimentel, J.R., and Loeffler, M.T., "A Real Time Engine Simulator Using Multiple Microcomputers," *IEEE Trans. On Industrial Electronics*, Vol. 30, pp. 117-126, May 1983.
10. Pimentel, J.R., "Real Time Simulation Using Multiple Microcomputers," *SIMULATION*, pp. 93-104, March 1983.
11. Pimentel, J.R., "Comments on a Simple Quadrature Oscillator for Generating Triangular Waves and Square Waves," *Proceedings IEEE*, Vol. 68, p. 7444, June 1980.

12. Pimentel, J.R., and McVey, E.S., "Digital Simulation Using Format Number Transform," SIMULATION, pp. 47-53, February 1979.
13. Pimentel, J.R., "Four Different Synchronized Waveforms from One Single Integrated Circuit," ELECTRONIC DESIGN, pp. 122-124, June 7, 1979.
14. Pimentel, J.R., "One-Chip Oscillator Generates In-Quadrature Waveforms," ELECTRONICS, p. 147, November 23, 1978.
15. Pimentel, J.R., "Analysis and Synthesis of Waveform Generators in the Phase Plane," IEEE Trans. on IECEI, Vol. 25, pp. 217-220, August 1978.

### **3. D. Refereed Conference Publications**

1. Pimentel, J. R., "Context Aware Systems for Unstructured Environments Based on WSNs", to be presented at the World Congress on Industrial Automation, San Francisco, CA, July 2015.
2. Pimentel, J.R., and Rojas A., "Industrial Internet Education: Issues and Opportunities," IEEE International Conference on Industrial Electronics, ISIE 2014, Istanbul, Turkey, June 2014.
3. Pimentel, J.R., "A New and Effective IoT Architecture," IEEE International Workshop on Factory Communication Systems, WFCS 2014, Toulouse, France, May 2014..
4. Pimentel, J.R., and Rojas A., "VHDL-AMS Modeling and Simulation Support for SoC Design and Implementation of AC Motor Drives", International Symposium on Power Electronics, Electrical Drives, Automation and Motion, 2008. SPEEDAM 2008, pp. 638-643, June 2008.
5. Pimentel, J.R., and Kanchi, S., "An Online Bandwidth Scheduling Algorithm for Distributed Control Systems with Multirate Control Loops," Accepted for publication, International Conference on Informatics in Control (ICINCO 2008), May 2008, Funchal, Madeira, Portugal.
6. Pimentel, J.R. , Task and Message Scheduling for a FlexCAN-based Hybrid-Electric Vehicle Drivetrain Functional Unit, Paper No. 2008-01-0480, SAE Congress 2008, Detroit, Michigan, April 2008.
7. Pimentel, J.R, and Paskvan, J., "Experimental Jitter Analysis in a FlexCAN Based Drive-by-Wire Automotive Application," 44<sup>th</sup> Design and Automation (DAC) Conference, San Diego, CA, June 2007.
8. Pimentel, J.R, "An Incremental Approach to Task and Message Scheduling for AUTOSAR Based Distributed Automotive Applications," 4<sup>th</sup> Workshop on

- Software Architectures for Automotive Systems, part of the Int. Conf. on Software Engineering, Minneapolis, MN, May 2007.
9. Pimentel, J.R., "Designing and Implementing Real-Time and Dependable Embedded Control Applications Using FlexCAN," IECON 2006, Paris, France, Nov. 2006.
  10. Pimentel, J.R. , "Verification and Validation of a Safety-Critical Steer-by-Wire System Using DO-178B," Paper No. , SAE Congress 2006, Detroit, Michigan, April 2006.
  11. Pimentel, J.R , Buja, G , and Bertoluzzo, M., "Design of a Safety-Critical Drive-by-Wire System Using FlexCAN," Paper No. 2006-01-1026, SAE Congress 2006, Detroit, Michigan, April 2006..
  12. Buja, G., Zuccollo, A. , and Pimentel, J.R., "Overcoming Babbling-Idiot Failures in the FlexCAN Architecture: A Simple Bus-Guardian," IEEE Int. conf. On Emerging Technologies for Factory Automation (ETF2005) 2005, Sept. 2005, Catania, Italy.
  13. Pimentel, J.R., and Fonseca J., "FlexCAN: A Flexible Architecture for Highly Dependable Embedded Applications," Real-Time Networkd (RTN) 2004, July 2004, Catania, Italy.
  14. Pimentel, J.R., and Kaniarz, J., "A CAN-Based Application Level Error Detection and Fault Containment Protocol," INCOM'04, April 2004, Brazil.
  15. Pimentel, J.R., An Architecture for a Safety-Critical Steer-by-Wire System, SAE Congress, March, 2004 Congress, Detroit, Michigan.
  16. Pimentel, J.R., Designing Safety-Critical Systems: A Convergence of Technologies, IEEE International Workshop on Dependable Embedded Systems, October, 2003, Florence, Italy.
  17. Pimentel, J.R., Modeling the Response of an Event-based Architecture : A Case Study, Society of Automotive Engineers (SAE) Congress, paper No. 03AE-185, March 2003, Detroit, Michigan.
  18. Pimentel, J.R., and Salazar, M., "Dependability of Distributed Control System Fault Tolerant Units," Proc. IECON'02, IEEE, pp. 3164-3169, IEEE Catalog Number: 02CH37363, Seville, Spain, Dec. 2002.
  19. Pimentel, J.R., and Sacristan, T., A Fault Management Protocol for TTP/C," Proc. IECON'01, IEEE, pp. 1800-1805, Denver, CO, Dec. 2001.
  20. J.R. Pimentel, An Experiential Learning-Based Delivery Environment for Power

- Electronics Education, NFS Workshop on Multimedia Delivery of Modern Power Electronics Curriculum,” Nov, 2000, Orlando, Florida.
21. M.A. Salichs, D. Gachet, L. Moreno, and J.R. Pimentel. Learning and Control in Autonomous Systems, Proc. AIRTC International Workshop on Artificial Intelligence in Real-Time Control, Valencia, Spain, October 1994.
  22. Gachet, D., Salichs, M.A., Moreno, L., and Pimentel, J.R., “Learning Emergent Tasks for an Autonomous Mobile Robot,” Proc. Of the International Conference on Intelligent Robots and Systems (IROS’94), pp. 290-297, Munich, Germany, Sept. 1994.
  23. Gachet, D., Pimentel, J.R., Puente, E.A., Salichs, M.A., and Valverde, R., Learning Behavioral Control by Reinforcement for an Autonomous Mobile Robot, Proceedings of IECON’93, pp. 1436-1441, Maui, Hawaii, November 1993.
  24. Moreno, L, Moraleda, E., Gachet, D., Pimentel, J.R., and Salichs, M.A., Fuzzy Supervision of Behavioral Primitives of Autonomous Systems, Proceedings of IECON’93, pp. 258-261, Maui, Hawaii, November 1993.
  25. Gachet, D., Pimentel, J.R., Moreno, L., Salichs, M.A., and Fernandez, V., Experiments with a Distributed Neural Controller for an Autonomous Mobile Robot, Workshop on Integration in Real-Time Intelligent Control Systems (IRTICS’93), October 1993, Madrid, Spain.
  26. Pimentel, J.R., Gachet, D., Moreno, L, and Salichs, M.A., Learning to Coordinate Behaviors for Real-Time Path Planning of Autonomous Systems, IEEE International Conference on Systems, Man and Cybernetics, Le Touquet, France, October 1993.
  27. Pimentel, J.R., Gachet, D., Moreno, L., and Salichs, M.A., On-Line Performance Enhancement of a Behavioral Neural Network Controller, to be presented, Workshop on Artificial Neural Networks (IWANN’93), Sigtes, Spain, June 1993.
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  29. Gachet, D., Pimentel, J.R., Moreno, L, Salichs, M.A. and Fernandez, V., Neural Network Control Approaches for Behavioral Control of Autonomous Systems, 1st IFAC International Workshop on Intelligent Autonomous Vehicles, pp. 330-334, Southampton, UK, April 1993.
  30. Gachet, D., Salichs, M.A., Pimentel, J.R., Moreno, L., and De la Escalera, A., A Software Architecture for Behavioral Control Strategies of Autonomous Systems,



- Proc. IECON'92, pp. 1002-1007, San Diego, CA, November 1992.
31. Moreno, L., Salichs, M.A., Peter, M., and Pimentel, J.R., A Motion Control Algorithm for Non-holonomic Robots in Dynamic Environments, Proc. IECON'92, pp. 844-848, San Diego, CA, November 1992.
  32. Puente, E.A., Gachet, D., Pimentel, J.R., Moreno, L., and Salichs, M.A., A Neural Network Supervisor for Behavioral Primitives of Autonomous Systems, Proc. IECON'92, pp. 1105-1110, San Diego, CA, November 1992.
  33. Pimentel, J.R., Puente, E.A., Gachet, D., and Pelaez, J.M., OPMOR: Optimization of Motion Control Algorithms for Mobile Robots, Proc. IECON'92, pp. 853-861, San Diego, CA, November 1992.
  34. Moreno, L., Pimentel, J.R., Puente, E.A., and Salichs, M.A., Mobile Robot Multitarget Tracking in Dynamic Environments, Proc. IROS'92, pp. 1464-1469, Raleigh, NC, July 1992.
  35. Trainor, S., and Pimentel, J.R., "A Distributed Facilities Monitoring and Information Management System," International Symposium on Automotive Technology and Automation (ISATA), Vienna, Austria, December 1990.
  36. Pimentel, J.R., "An Object-Oriented Environment for CIM Architectures," Proceedings IECON'90, Asilomar, CA, November 1990.
  37. Pimentel, J.R., "A Data Model for Intelligent Automation Systems," Proceedings IEEE International Workshop on Intelligent Robots and Systems '90, pp.509-516, Isuchiara, Japan, July 1990.
  38. Pimentel, J.R., "Architectures of Fieldbus Networks," 9th IFAC Workshop on Distributed Computer-Control Systems, Tokyo, Japan, September 1989.
  39. Pimentel, J.R., "Integrated Manufacturing Network Architectures," Proceedings INFOCOM'89, pp. 1128-1129, Ottawa, Canada, April 1989.
  40. Pimentel, J.R., "Industry-University Partnerships for Automated Manufacturing," Proceedings of the ASEE North Central Meeting, Lawrence Institute of Technology, pp. 14-21, April 6-8, 1989.
  41. Pimentel, J.R., "Fieldbus Network Management: Requirements and Architectures," Proceedings 1st IFIP International Conference on Network Management, pp. 467-477, Boston, MA, May 1989.
  42. Pimentel, J.R., "Fieldbus Application Layer: Functionality and Models," 8th IFAC Workshop on Distributed Computer-Control Systems, Vitznau, Switzerland, September 1988.

43. Chakravarthy, S., Pimentel, J.R., and Ravi, K.V., "A Flow and Error Control Model with Phase Type Timeout Periods," NBS Workshop on Factory Communications, Gaithersburg, MD, March 1987.
44. Muralidhar, K.H., and Pimentel, J.R., "Performability Analysis of the Token Bus Protocol," IEEE Infocom'87, pp. 55-63, San Francisco, CA, March 1987.
45. Campbell, G.G., and Pimentel, J.R., "Topological Aspects of MAP Network Design," 11th Conference on Local Computer Networks, Minneapolis, MN, pp. 34-43, October 1986.
46. Pimentel, J.R., "A MAP/TOP Compatible Distributed Database for Manufacturing Application," Proceedings of the 15th International Symposium on Automotive Technology and Automation, Paper NO. 86027, Flims, Switzerland, October 1986.
47. Lurtz, J., and Pimentel, J.R., "NC Machines Communications Using MAP," IEEE Industrial Electronics Society Conference, IECON'85, pp. 635-642, San Francisco, CA, November 19-21, 1985.
48. Pimentel, J.R., "Performance Evaluation of MAP Networks," IEEE Industrial Electronics Society Conference, IECON'85, pp. 629-630, San Francisco, CA, November 19-21, 1985.
49. Pimentel, J.R., "Performance Simulation of the IEEE Token Bus Protocol Using SIMAN," NBS Workshop on Analytical and Simulation Modeling of the IEEE 802.4 Protocol, Gaithersburg, MD, April 1985.
50. Pimentel, J.R., "Engine Model Parameter Estimation Using the RLS Algorithm," Proceedings of the International Association for Vehicle Design, Vol. 3, pp. A1-A22, Geneva, Switzerland, February 1984.
51. Pimentel, J.R., "Engine Modeling through Parameter Estimation Techniques," Proceedings of the Simulation and Modeling Conference, The University of Pittsburgh, April 1983.
52. Pimentel, J.R., "An Algorithm for the Decomposition of Difference Equations for Multiprocessor Implementation," Proceedings of the Artificial Intelligence Conference, Oakland University, April 1983.
53. Pimentel, J.R., and Loeffler, M.T., "A Multiple Microcomputer System for Real Time Engine Simulation," Workshop on Automotive Applications of Microprocessors, University of Michigan, Dearborn, MI, October 1982.
54. Pimentel, J.R., "Performance of a Multiple Microcomputer System of Distributed

- Processing in Control Applications,” 25th Midwest Symposium on Circuits and Systems, Michigan Technological University, August 1982.
55. Pimentel, J.R., “A New Implementation of the Two-Dimensional DFT Using CCD Programmable Transversal Filters,” Electro/81, Session 32, New York, April 1981.
  56. Pimentel, J.R., “Synthesis of Waveform Generators Using Phase Space Concepts,” 23rd Midwest Symposium on Circuits and Systems, University of Toledo, OH, August 1980.
  57. Pimentel, J.R., and McVey, E.S., “Image Bandwidth Compression Using One-Dimensional Techniques,” 23rd Midwest Symposium on Circuits and Systems, University of Toledo, Toledo, OH, August 1980.
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  59. Pimentel, J.R., “A Simple Solution to the Optimum Discrete Regulator Problem,” Proceedings IEEE Southeastcon’79, pp. 254-256, Roanoke, VA, April 1979
  60. Pimentel, J.R., and McVey, E.S., “On the Implementation of the Two-Dimensional Discrete Fourier Transform Using CCD Transversal Filters,” Proceedings IEEE Southeastern Symposium on System Theory, pp. 90-92, Clemson University, Clemson, SC, March 1979
  61. Pimentel, J.R., and McVey, E.S., “An Extension of Pole-Zero Concepts to the Design of Sampled-Data Systems,” Proceedings of the II Brazilian Congress on Automatic Control, pp. 601-609, Florianopolis, SC, Brazil, September 1978.

### **3. E. Invited Papers And Keynotes**

1. Pimentel, J.R., Modeling and analysis of CAN based systems, IESF Conference, Dearborn, Michigan. Mentor Graphics, June 2007.
2. “Automatic Generation of Inverter Control Signals for a Power Inverter” IEEE Regional Conference, Detroit, Michigan, April 2007.
3. Pimentel, J.R., “FlexCAN Applications,” *Vector Users Conference*, Detroit Michigan, August 2005.
4. Pimentel, J.R., Analysis, Design, Rapid Prototyping of Electric Vehicle Distributed Functions using dSPACE tools,” *dSPACE Users Conference*, Detroit, Michigan, June 2004.

5. Pimentel, J.R., Implications of Emerging Technologies on Factory Communication Systems, Plenary talk, IEEE International Workshop on Factory Communication Systems (WFCS97), pp. 3-7 of proceedings, Oct. 1997, Barcelona, Spain.
6. Pimentel, J.R., A Software Development Environment for Autonomous Mobile Robots, invited paper, pp. 1094-1099, Proc. IECON'94, Bologna, Italy, Sept. 1994.
7. Pimentel, J.R., Autonomous Learning for Mobiles Robots, in Prerational Intelligence in Robotics: From Sensorimotor Intelligence to Collective Behavior, a Conference organized by the Center for Interdisciplinary Studies (ZiF), May 16-20, 1994, University of Bielefeld, Germany.
8. Pimentel, J.R., "Automated Manufacturing Networks," invited paper, Proceedings International Conference on Robotics, CAD/CAM, FMS, and Artificial Intelligence, pp. 11-47, Vina del Mar, Chile, November 1989.

### **3.F. Reserach Reports**

1. Design of an Advanced Telemetry System, IPEN (Instituto Peruano de Energia Nuclear), Lima, Peru, May, 2015.
2. Pimentel, J.R., Remote Telemetry in Rural Areas Using TV White Spaces - State of the Art, IPEN (Instituto Peruano de Energia Nuclear), Lima, Peru, March, 2015.
3. Pimentel, J.R., Seguridad de Redes Industriales, Departamento de Ingenieria Industrial y de Automatizacion, Universidad de Ingenieria y Tecnologia (UTE), Lima – Peru, Dec. 2013.
4. Pimentel, J.R., Safety Analysis of FlexCAN for Automotive Applications, Institut National de Recherche en Informatique et Automatique (INRIA), Nancy, France, June 2006.
5. Pimentel, J.R., Verification, Validation, and Certification of Safety-Critical Communication Systems, Research Report No. ECE-2006-01, Department of Electrical an Computer Engineering, Kettering University, Flint, Michigan, March, 2006.
6. Pimentel, J.R., Metodos de Trabajo Experimental con Robots Moviles, Departamento de Automatica, Ingenieria Electronica e Informatica Industrial, Universidad Politecnica de Madrid, Madrid, Spain, May 1993
7. Pimentel, J.R., "Fieldbus Networks: Applications, Requirements and

- Architectures,” Fraunhofer Institute fuer Informations und Datenverarbeitung Report No. 10125, Karlsruhe, Germany, August 1988.
8. Pimentel, J.R., and Loeffler, M.T., “An Exorciser Based Multi-Microcomputer Configuration for Distributed Processing Applications,” General Motors Institute Research Report No. EE-02, Flint, Michigan, March 1982.
  9. Pimentel, J.R., and Rojas, A., “Application of Self Tuning Regulators to Processes with Non-Linear Disturbances,” General Motors Institute Research Report No. EE-01, Flint, Michigan, November 1981.

### **3.G. Software Environments Developed**

1. FlexCAN. An architecture for safety-critical systems based on the CAN protocol. It features a protocol for fault management (SafeCAN). Details of FlexCAN and SafeCAN is available at: [www.kettering.edu/~jpimente/flexcan/](http://www.kettering.edu/~jpimente/flexcan/)
2. VESOE (Vehicle Software Environment): An environment designed for the course Distributed Embedded Systems with emphasis on hybrid/electric vehicle software. The environment supports the specification, simulation, design, rapid prototype, verification, and testing of vehicle software particularly electric vehicles. The environment uses two tool chains. The first tool chain involves Matlab/Simulink -> Dspace -> target microcontroller. The second tool chain involves CANoe -> IAR -> target microcontroller. Dspace hardware and software include DS1103, Control Desk, and Target Link. The featured communication technology is CAN (controller area network) and the featured microcontroller is the Motorola S12.
3. LeProf (Le Professeur): An Internet-based teaching and learning environment used by Dr. Pimentel to develop courses for Universities and Industry. The implementation uses a variety of technologies including Java, HTML, Internet protocols, JMF (Java Media Framework), and databases. The environment is described in the paper, “Design of Net-Learning Systems based on Experiential Learning,” On-Line Journal on Asynchronous Learning Networks, Vol. 3, Issue 2, Nov. 1999. Available at: <http://www.aln.org/alnweb/journal/jaln-vol3issue2.htm>.
4. OPMOR: A software environment for the simulation, design, and test of motion control algorithms for mobile robots. This environment has been described in a number of papers. The environment was implemented using the C language and the Xwindows tool kit under UNIX. A comprehensive description appeared in a chapter in the book: Advanced Mobile Robots-Theory and Applications: International Perspectives, World Scientific Publishing Company, 1993.

### **3. H. Eeatured Work**

Dr. Pimentel’s work involving reinforcement learning methods of neural networks

applied to mobile robots has been featured in the book: Behavior-Based Robotics, Ronald C. Arkin, Editor, pp. 325-328, MIT Press, 1998.

### **3. I. Awards**

1. Distinguished Researcher Award, Kettering University, June 2007, for research in the areas of hardware, software, and communications Architectures of Automotive Systems, Distributed Embedded Systems, Safety-Critical Systems, Control of AC motors, and Hybrid Electric Vehicles.
2. M. Eugene Merchant Manufacturing Textbook Award, given by the Society of Manufacturing Engineers (SME), for the book “Communication Networks for Manufacturing,” Prentice-Hall, 1990, selected as best textbook of its kind in 1990.
3. Fulbright Scholar, June – October 2001, Universidad de los Andes, Bogota, Colombia. Developed a graduate course on “Distributed Control Systems,” and performed research on “Dependability evaluation of real-time distributed systems.”

### **3. J. Current Research**

1. Connectivity and Configuration Issues in the Internet of Things (IoT) and the Industrial Internet (II)
2. Modeling and simulation of renewable energy systems
3. Hardware, Software, and Communication Aspects of Solar PV systems
4. Innovations in Electrical Energy Meters
5. Innovation systems
6. Hardware, Software, and Communication Architectures for Embedded Systems
7. Hardware, Software, and network architectures for safety-critical Embedded Systems
8. Hardware, Software, and network architectures of process control and manufacturing systems.
9. Hardware and software platforms for wireless sensor networks (WSN)
10. Hardware and software platforms for wireless Internet of Things (IoT)

## **4. Grants and Contracts**

1. "Evaluation of CAN tools for Automotive Applications," 2008. Customer: Movimento Inc. Contact: Benjamin Hofman.
2. "Modeling and Design Using SystemVision," 2006-2007. Customer: Mentor Graphics. Contact: Darrell Teegarden.
3. "FlexCAN Characterization and Analysis," 2005-2006. Customer: Mentor Graphics. Contact: Jason Paskvan.
4. "Development of the CAN goes to College Program," 2002. Customer: Vector CANTech Inc., Novi, MI. Contact: Bruce Emaus.
5. "Evaluation of tools for rapid prototyping," 2001. Customer: dSPACE Inc., Detroit, Michigan.
6. Evaluation of CAN, Volcano, and FlexRay for Automotive Applications, 2001-2002, Customer: General Motors Research Laboratories, Warren, Michigan. Contact: Roger Fruechte.
7. Advanced city pollution monitoring system, Fyncit, Lima, Peru, 2013. Project being performed with IPEN (Peruvian Institute of Nuclear Energy).
8. Advanced telemetry system, Fyncit, Lima, Peru, 2014. Project being performed with IPEN (Peruvian Institute of Nuclear Energy).

## **5. Professional Activities**

### **5.A. Professional And Honorary Societies**

1. Senior Member of IEEE (The Institute of Electrical and Electronic Engineers)
2. SAE (Society of Automotive Engineers)
3. ISA (Instrument Society of America)
4. Eta Kappa Nu: Honorary society of Electrical Engineering
5. Tau Beta Pi: Honorary society of Engineering
6. Sigma XI: Honorary society of Research
7. Who's Who in Technology,
8. Who's Who in the Midwest.

### **5.B. Languages, Environments, Platforms, and Tools**

1. *Human*  
English, Spanish, German, French, Basic Ukrainian.
2. *Computer*  
Assembler for some processors, PHP, C, C++, Java, XML, JavaScript, VB.
3. *Environments*  
Internet protocols (TCP/IP, telnet, smtp, ftp, rtp, http, wap, etc.), Unix, Linux, MS Windows, Jini, Java 2 Platform.
4. *Tools*  
Matlab, Simulink, Real-Time Workshop, DSPACE (Control Desk, Target Link), MPLAB (microchip), IAR, microcontrollers (S12, TMS240), CANoe, Motohawk, SystemVision, IAR, Green Hills, IAR, NEC.
5. *FPGAs*  
Experience with several Xilinx and Altera FPGAs: Spartan, Virtex.

### **5.C. Workshop And Conference Organization**

1. Member of Program Committee, IEEE Int. Workshop for Factory Communication Systems (WFCS). Held bi-annually. Next conference: WFCS-2012, May 2012, Lego, Germany.
2. Member of Program Committee, IEEE Int. conference on Emerging Technologies for Factory Automation (ETFA). Held annually. Next conference: ETFA-2012, July 2012, Krakov, Poland.
3. Member of organizing committee for several annual conferences organized by the Industrial Electronics Society of IEEE.
4. Workshop chair, Industrial Distributed Computing Using Java, IECON'99 (International Conference on Industrial Electronics) held in San Jose, CA, Dec. 1999.
5. General Program Co-Chair, ISIE94 (International Symposium in Industrial Electronics, 1994) held during May 20-25, Santiago, Chile.
6. General Program Chairman, IECON'92 (International Conference on Industrial Electronics) held in San Diego, CA, Nov. 1992.
7. Program committee member, International Conference of the IEEE Industrial Electronics Society, IECON'87, Boston, MA, November 1987.
8. Program committee member and session organizer for the 1987 IEEE Workshop



- on “Languages for Automation,” Austria, Vienna, August 1987.
9. Program committee member, 12th Conference on Local Computer Networks, Minneapolis, MN, October 1987.
  10. Technical program chairman and organizer of the NBS Workshop on “Factory Communication,” National Bureau of Standards, Gaithersburg, MD, March 1987.
  11. Co-Chairman and organizer of a special session on MAP at the International Conference of the IEEE Industrial Electronics Society, IECON’86, Milwaukee, WI, October 1986.
  12. Organizer of a session on “Network Management” at the IEEE Workshop on Computer Communications, Warner Springs, CA, September 1986.
  13. Chairman and organizer of a special session on the “Manufacturing Automation Protocol,” MAP, sponsored by the IEEE Society on Industrial Electronics, IECON’85, San Francisco, CA, November 1985.

#### **5.D. Other Professional Activities**

1. Member of the IEEE-USA Energy Policy committee.
2. Past Associate Editor, Transactions on Mobile Computing, IEEE
3. Associate Editor, Transactions on Industrial Electronics, IE Society, IEEE
4. Associate Editor, Transactions on Industrial Informatics, IE Society, IEEE
5. Senior Member, Administration Committee, Industrial Electronics Society, IEEE
6. Founding Member of the Editorial Board, IEEE Network Magazine
7. Past chairman, Standards Committee, IEEE Industrial Electronics Society.
8. Representative to IEEE Standards Board, Industrial Electronics Society.
9. Guest Editor, Communications for Manufacturing, IEEE Network, May 1988.
10. Chairman and organizer of special sessions on the “Manufacturing Automation Protocol,” (MAP) sponsored by the IEEE society on industrial electronics, IECON’85, International Conference, San Francisco, CA, November 1985, and IECON’86, International Conference, Milwaukee, WI, October 1986.
11. Member, Manufacturing Automation Protocol (MAP) GM Task Force 1983 - 1987. Participated in the following MAP technical subcommittees:

Programmable Devices, Network Management, and Distributed Databases.  
Involved with the development of MMFS, MMS, MAP 2.0, MAP 2.1 and MAP 3.0.

12. Participated in the development of the IEEE 802.4 Token Passing Bus Standard (1984-1987).
13. Participated in the European MAP Users Group (EMUG) interest group on real-time network architectures (1987-1988).
14. Distinguished Speaker, area of manufacturing and industrial networks, Industrial Electronics Society (IES) of IEEE.

### **5.E. Continuing Education And Lifelong Learning**

Developed the following short courses and Continuing Engineering (CE) classes for industry:

1. *“Wireless Industrial Networks,”* Short course developed for TECSUP, Lima, Peru and delivered on April 2011.
2. *“Integration of Industrial Systems,”* Short graduate course developed for TECSUP, Lima, Peru and delivered on August 2011 and May 2012.
3. Participated in the Educator’s workshop for Educators from Xilinx, Spartan FPGA series. Implemented several modules involving digital communications, data encoders/decoders/, network protocols, and I/O. Albuquerque, New Mexico, August 2007
4. The following short courses were developed and delivered to Glomacs and Euromatech in Dubai, United Arab Emirates a few times each since 2002.
  - Synchronous Data Hierarchy (SDH)
  - Distributed Control Systems (DCS)
  - Sensor and Instrumentation Systems
  - Fundamentals of Process Control
  - Process Control and Instrumentation
  - Process Control Safeguarding
  - Safety in Process Design

- Quality Measuring Instruments for Process Operations
  - Foundation Fieldbus
  - Alarm Management
  - Information Management Compliance
5. Distributed Automotive Embedded Systems (SAE)
  6. Automotive Electronic Systems (GM- Technical Education Program)
  7. Wireless Communications: Automotive applications (GM- Technical Education Program)
  8. Testing, Verification, and Validation of Automotive Systems GM- Technical Education Program)
  9. Design of Safety-Critical Automotive Systems
  10. Steer-By-Wire Systems
  11. Automotive Communication Systems
  12. Digital communications
  13. Programming the 68000 microcomputer
  14. Computer networks
  15. Database systems: principles and applications
  16. Developed and taught the course “LAN Design and Performance” for Ship Star Associates, June 1986.
  17. Developed two courses: “Introduction to Data Communications” and “Design/Selection of Computer Networks” for the Saturn Corporation

#### **5.F. Web-Based Courses Developed**

1. Electrical Engineering I. Undergraduate course number ECE-300 at Kettering University, Fall 1998. Based on *LeProf*, an environment developed by Dr. Pimentel at Kettering University.
2. Circuits I. Undergraduate course number ECE-210 at Kettering University, Spring

1999. Based on *LeProf*, an environment developed by Dr. Pimentel at Kettering University.
3. Digital Communications Overview. Lifelong learning course developed for Delphi (In cooperation with other Kettering University faculty), Summer 1999. Based on *LeProf*, an environment developed by Dr. Pimentel at Kettering University.
  4. Design Engineering. Graduate course developed for General Motors Technical Education Program (in cooperation with the Universidad Carlos III de Madrid, Spain), Fall 1999.
  5. Environmental Management of Manufacturing Processes. Graduate course developed for General Motors Technical Education Program (in cooperation with the Universidad Carlos III de Madrid, Spain), Fall 1999.

### **5. G. Seminars Delivered**

Delivered several research seminars at various universities and companies in The United States, Europe, and South America.

1. “*Real Innovation: The Case of Developing Nations*,” Engineering Society of Peru (Colegio de Ingenieros del Peru), May 2012.
2. *The controller area network and other industrial communication networks*, TECSUP, Lima, Peru, August 2010.
3. “Dependability Features of FlexCAN,” SAE International Automotive Symposium on Distributed Embedded Systems, intex, Seoul, Korea, Sept. 2006.
4. “*Safety Analysis of the FlexCAN protocol*,” INRIA (Institut National de Recherche en Informatique et Automatique), Nancy, France, April 2006.
5. “*Design of a FlexCAN based network for a Humanoid Robot*,” Universidad Carlos III de Madrid, Spain, March 2005.
6. “*Characterization of Industrial Networks*,” Fulbright Scholar’s Conference, Universidad del Norte, Barranquilla, Colombia, August 2001
7. “Dependable Industrial Systems,” Department of Electronics and Automation, Universidad de los Andes, Bogota, Colombia, Feb. 2000.
8. “Automated Manufacturing Networks,” Within the IEEE International Conference, ISIE’94, Santiago, Chile Nov. 1994.

9. Developed a seminar on “MAP Network Management” delivered at the 1st IFIP Workshop on Network Management, Boston, MA, May 1989.
10. Developed a seminar on “Automated Manufacturing Networks” delivered at the Catholic University of Valparaiso, Chile for the Chilean Association of Automatic Controls, Feb. 1989..
11. Developed and delivered a seminar on “Network Management” for “Le FIP Club”, Paris, France, June 1988.
12. Developed and taught various seminars on Computer Networks and Network Management in The United States, Europe, and South America.

## **6. Business Activities**

### **6.A. Entrepreneurship Activities.**

Founder of the following business enterprises:

1. *Microcomputer Services LLC*  
Founded year: 1983. Business activities: Business Applications of microcomputers. Developed a comprehensive commercial accounting system. Current Status: Sold in 1989.
2. *Multimedia Services LLC*  
Founded year: 1996. Business activities: Business Applications of Multimedia and the Internet. Developed a comprehensive cybermall system for the city of Flint. Current Status: Sold in 1999.
3. *LeSoft LLC*  
Founded year: 1997. Business activities: Software, Hardware, and Communications Applications and Services for Embedded Systems. Current Status: Active.
4. *AltEnergy Inc.*  
Founded year: 2007. Business activities: Applications of Alternative and Renewable Energy with focus on Solar Energy (PV and Thermal). Current Status: Active.

### **6.B. Main Business Contracts**

1. (*LeSoft LLC.*) Harley Davidson, Milwaukee, Wisconsin. 2007-2008: Provision of FlexCAN Embedded Hardware and Software for a Motorcycle test-bed.
2. (*LeSoft LLC.*) Azentek, Grand Blanc, Michigan, 2007 – 2008: Deployment, testing, and diagnostics of CAN embedded software for an automobile Head Unit.

3. (*AltEnergy Inc.*) City of Flint, Michigan. 2010 – 1012: Development of an Energy Assurance Policy and an Energy Disruption Recovery Policy for the city of Flint.

### **6.C. Patents**

1. A Distributed Control System for the Industrial Internet (Pending)
2. A SCADA Broadcaster and Receiver for the Industrial Internet (In preparation)
3. Reliable and scalable hierarchical routing for wireless sensor networks (In preparation)

*Updated: May, 9, 2015.*