

Abhiman A. Hande, Ph.D.

Research Associate, Electrical Engineering Department
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Education:

- Ph.D. in Electrical Engineering (GPA 4.0/4.0), University of Toledo, December 2002.
- M.S. in Electrical Engineering (GPA 3.68/4.0), University of Toledo, May 2000.
- B.S. in Electrical Engineering, University of Mumbai, India, December 1996.

Appointments and Experience:

- **Research Associate**, Electrical Engineering Department, University of Texas at Dallas (UTD) Aug.2005-present
Designing switch mode power supplies (buck, boost, and buck-boost) that use a new feedback linearization technique. Also, investigating various energy harvesting and power management techniques to power ultra low power wireless sensor nodes. I am part of a team of researchers at the Center of Integrated Circuits and Systems (www.cics.utdallas.edu) in UTD.
- **Assistant Professor**, Electrical Engineering Department, Lake Superior State University (LSSU) Jan.2003-Aug.2005
Courses taught: Electronic Design, Digital Fundamentals, Microcontroller Fundamentals, Microcomputer Systems, Digital Design, C Programming, Introduction to Engineering, Senior Design Projects I and II.
- **Teaching Assistant**, Electrical Engineering Department, University of Toledo Aug.2002-Dec.2002
Assisted faculty in teaching the EECS-5260 Control Systems Design and EECS-3400 Electronics I courses.
- **Research Assistant**, Power Electronics Laboratory (PEL), University of Toledo Aug.1998-Jul.2002
Worked on various EV/HEV battery management projects that involved design of battery equalizers and chargers, battery testing, and DC/DC, AC/DC converter and DC/AC inverter design. These projects were funded by DaimlerChrysler and Department of Energy's National Renewable Energy Laboratory (NREL).
- **Electrical Engineer**, Electrical Engineering Department, RPG Cables Ltd., Mumbai, India Jul.1996-Jun.1998
Designed and implemented an Automatic Power Factor Correction Panel and optimally distributed generator loads for improving plant energy efficiency.
- **Engineering Intern**, Electrical Engineering Department, Godrej Soaps Ltd., Mumbai, India Jul.1995-Jun.1996
Installed a 1000 kVA distribution substation as part of a team under a chief engineer. Designed the substation layout along with appropriate switchgear, transformer, capacitor banks, and cables.

Skills:

- **Platforms:** Windows XP/NT/9x, Macintosh, Solaris, UNIX, TinyOS.
- **Software:** C/C++, Assembly, FORTRAN, Visual Basic, Visual C++, MATLAB/Simulink, Mathcad, VHDL, Verilog, PSpice, HTML.
- **Software packages:** Cadence, OrCAD, Accel 13, ModelSim VHDL, Mentor Graphics Led, LogicWorks, MAX+Plus II Baseline, Quartus II, Borland C++Builder, Lattice ispDesign Expert, BlueSoft.
- **Microcontrollers:** TI MSP430, Atmel Atmega128L, Infineon C505C, C166, Motorola 68376, 68HC11, 68HC12, 68HS12, 68HS08, Renesas M16C/26, Intel 8051.
- **Development Tools:** Keil μ Vision IDE and Debugger for C505C and C166 microcontrollers, Tasking 8051 and C166 software development tools, Infineon DAVe v2.1, Metrowerks CodeWarrior IDE for Motorola microcontrollers, MGTEK MiniIDE v1.17, Renesas High-Performance Embedded Workshop, TI IAR Embedded Workbench, Silicon labs and PHYTEC emulation boards.
- **Communication protocols:** CAN2.0B, SAE-J1850, RS-232, USB v2.0, SPI, I2C, Bluetooth v2.0, ZigBee, IEEE 802.15.4.

Relevant Projects:

Implementation of Fixed Frequency PWM Converters with Feedback Linearization Aug.2005-present
We are in the process of designing 50-75W buck, boost and buck-boost DC/DC converters using a new feedback linearization control technique (with leading edge modulation) rather than using traditional PID controllers (with trailing edge modulation). The algorithm has been simulated using Simulink and will be implemented on a Xilinx Spartan-II FPGA. This project is internally funded and assisted by Dr. Robert Taylor (Technical Manager, Tyco Electronics Power Systems).

Energy Scavenging Methodologies for Wireless Sensor Nodes

Aug.2005-present

Presently, in the process of studying energy harvesting methods for wireless sensor nodes and implementing a smart power management scheme. TI MSP430 based motes are being designed along with an energy efficient wireless protocol similar to Zigbee. This undertaking also involves design of a low power linear regulator and is funded in part by UTD and TI.

A Low Voltage Regulator for Dual Voltage Automotive Electrical Systems

Jan.2003-Jan.2004

Programmed the Infineon C505C-L microcontroller and built necessary hardware to implement a scheme where the 14V bus is provided by a 14V tap on a 42V battery instead of using a conventional DC/DC converter for providing the 14V bus.

AC Battery Heating for Cold Climates (Ph.D. Dissertation)

Mar.2000-Dec.2002

Developed methods to internally heat EV/HEV batteries at cold temperatures using high frequency AC currents. A 10-20 kHz half bridge inverter was designed to circulate about 70-80 Arms current for warming 150-200V lead acid and nickel metal hydride (NiMH) battery packs. This project was conducted at PEL and funded by NREL.

A Selective Boost Equalizer for NiMH Batteries (M.S. Thesis)

Aug.1998-Mar.2000

Designed a relay matrix for charging weak EV/HEV batteries in a "round robin" manner. Programmed a Motorola M68376 microcontroller for sensing battery health and controlling the switching of relays in the relay matrix. Energy was routed from the pack to the detected weak battery via a DC/DC converter. This project was conducted at PEL and funded by NREL.

A Modular Battery Management System (MBMS) for HEVs

Aug.1998-Mar.2001

Worked in a team of engineers to design an MBMS for a 128V Li-ion battery pack. The system consisted of four local modules (LMs) that managed four sections (32V) of the pack and were controlled by a central module (CM) via CAN. Each LM used the above equalizer to boost weak batteries from a DC/DC converter. This project was funded by DaimlerChrysler.

Selected Professional Publications (in reverse chronological order):

1. **A. Hande**, T. Polk, W. Walker, and D. Bhatia, "Indoor Solar Energy Harvesting for Sensor Network Router Nodes", article in press, *Journal of Microprocessors and Microsystems*, December 2006.
2. **A. Hande** and S. Kamalasadán, "An Electromechanical Transfer Circuit to Measure Individual Battery Voltages in Series Packs", *Journal of Power Sources*, Vol.162, Issue.1, pp. 719-726, November 2006.
3. **A. Hande**, T. Polk, W. Walker, and D. Bhatia, "Self-powered Wireless Sensor Networks for Remote Patient Monitoring in Hospitals", *Sensors Journal*, Vol.6, Issue.9, pp. 1102-1117, 2006.
4. **A. Hande**, "Internal Battery Temperature Estimation using Series Battery Resistance Measurements during Cold Temperatures", *Journal of Power Sources*, Vol.158, Issue.1-2, pp. 1039-1046, August 2006.
5. A. Srivastava, S. Kamalasadán, and **A. Hande**, "Comparative Performance of Improved Shrinking Span Fuzzy Logic Controller", *IEEE Southeastern Conference*, pp. 16-21, Memphis, TN, April 2006.
6. **A. Hande**, S. Kamalasadán, and A. Srivastava, "A Selective Voltage Measurement System for Series Connected Battery Packs", *IEEE Southeastern Conference*, pp. 22-27, Memphis, TN, April 2006.
7. **A. Hande** and T. Stuart, "Effects of High Frequency AC Currents on Cold Temperature Battery Performance", *2nd IEEE India International Congress on Power Electronics (IICPE 2004)*, Mumbai, India, December 20-21, 2004.
8. **A. Hande** and T. Stuart, "A Selective Equalizer for NiMH Batteries", *Journal of Power Sources*, Vol.138, Issue.1-2, pp. 327-339, November 2004.
9. S. Kamalasadán and **A. Hande**, "A PID Controller for Real-Time DC Motor Speed Control using the C505C Microcontroller", *17th International Conference on Computer Applications in Industry and Engineering (CAINE)*, pp.34-39, Orlando, FL, November 17-19, 2004.
10. **A. Hande** and T. Stuart, "A Selective Boost Equalizer for Series Connected NiMH Battery Packs", *8th IEEE Workshop on Power Electronics in Transportation (WPET 2004) Conference*, Detroit, MI, October 21-22, 2004.
11. **A. Hande** and T. Stuart, "A Round Robin Algorithm for an Embedded Electronic Battery Equalizer", *IEEE Region 4 Electro/Information Technology (EIT 2004) Conference*, Milwaukee, WI, August 26-27, 2004.
12. **A. Hande**, "A High Frequency Inverter for Cold Temperature Battery Heating", *9th IEEE Workshop on Computers in Power Electronics (COMPEL '04) Conference*, University of Illinois, Urbana-Champaign, IL, August 15-18 2004.
13. T. Stuart and **A. Hande**, "HEV Battery Heating using AC currents", *Journal of Power Sources*, Vol.129, Issue.2, pp. 368-378, April 2004.
14. T. Stuart and **A. Hande**, "AC Heating for EV/HEV Batteries", *7th IEEE Workshop on Power Electronics in Transportation (WPET 2002) Conference*, pp.119-124, Detroit, MI, October 24-25, 2002.
15. T. Stuart and **A. Hande**, "AC Battery Heating for Cold Climates", *Environmental Vehicle (EnV 2001) Conference*, Engineering Society of Detroit, Southfield, MI, June 10-13, 2001.

Professional Memberships, Awards, and Distinctions:

Professional Memberships:

- Associate Member, Society of Automotive Engineers (SAE), 2001 - present.
- Member, Institute of Electrical and Electronics Engineers (IEEE), 1999 - present.
- Member, IEEE Power Electronics Society (PELS), 1999 - present.
- Member, IEEE PELS Dallas chapter, 2006 - present.

Professional Organization and Association Offices:

- Faculty Advisor/Counselor, LSSU IEEE and SAE student chapters, Aug.2004 – Aug.2005.
- Reviewer, Journal of Power Sources, Journal of Microprocessors and Microsystems, IEEE Power Electronics Letters Journal, and Thomson Delmar Learning, Jan.2004 - present.
- Consultant, Destiny Automation Inc., Detroit, MI, May2004 - Aug.2004

Awards and Recognition:

- First Place Best Paper Award, IEEE Region 4 Electro/Information Technology (EIT 2004) Conference, Milwaukee, WI, August 26-27, 2004.
- Outstanding Research Award, University of Toledo Graduate Student Assembly Awards 2001-02, April 2002.
- Guest speaker, University of Toledo EECS Fall Graduate Seminar Series, Aug.2001-Aug.2003.
- Graduate Assistantship for M.S. and Ph.D., Electrical Engineering Department, University of Toledo, Aug.1998-Dec.2002.

Supervised Research at UTD (with Dr. Dinesh Bhatia as primary advisor):

- Dhaval Shah, M.S. student, “Implementation of Fixed Frequency PWM Converters with Feedback Linearization”, expected to graduate in December 2007, UTD.
- Todd Polk, Ph.D. student, “Self-Powered Wireless Sensor Networks for Telemedicine Applications”, expected to graduate in December 2007, UTD.
- Joel Votaw, M.S. student, “An Asynchronous Microprocessor for Low-Power Wireless Sensor Nodes”, expected to graduate in May 2007, UTD.

Personal Information: US Permanent Resident, Married with one daughter.

References: Available upon request.