

Habiballah Rahimi-Eichi

EDUCATION

Ph.D. in Electrical Engineering, 2014

- North Carolina State University, NC, USA
- Thesis title: Online adaptive battery parameters identification and State-of-Charge (SOC) and State-of-Health (SOH) co-estimation.

M.Sc. in Electrical Engineering, 2004

- Khajeh Nasireddin Toosi University of Technology, Tehran, Iran
- Thesis title: Composite QFT Controller Design for a Nonlinear Flexible Joint Robot

B.Sc. in Electrical Engineering, 2001

- Isfahan University of Technology, Isfahan, Iran
- Research: Study on fiber optic fieldbuses and intrinsically safety conditions for foundation fieldbus in hazardous area

RESEARCH EXPERIENCE AND POSITIONS

Post-doctoral Research Associate at North Carolina State University, ECE Department, May 2014 – May 2016

- Design and develop an adaptive predictive algorithm in a big data-based framework to estimate the driving range of electric vehicles by collecting traffic, weather, route, etc. data from online APIs, and applying data analysis techniques in MATLAB and Python.
- Design and develop a big data-based framework to collect and analyze data for home energy management algorithm accessing public database using SQL and JMP Pro.
- Design and implement algorithm to predict the remaining useful life (RUL) and end of life (EOL) of batteries in grid-connected applications using Bayesian inference techniques.

North Carolina State University, ECE Department, August 2009 - May 2014

- Design an Intelligent Battery Management System (iBMS) for Electric Vehicles and Smart Grid implemented in MATLAB and microcontroller-based embedded system by developing a patented online adaptive battery parameters identification and State-of-Charge (SOC) and State-of-Health (SOH) co-estimation algorithm
- Test, model and analyze different Lithium-Ion batteries using data obtained from Arbin test system considering temperature, hysteresis and ageing effect
- Develop optimization algorithm for power management in large-scale PHEV municipal parking deck using auction theory and game theory.

University of Miami, ECE Department, 2008 - 2009

- Implement a GUI platform using JAVA to demonstrate modeling, simulation, and energy management in Micro-grid and electric vehicles

Isfahan University, Biomedical Engineering Department, 2003 - 2008

- Adaptive identification of the robot arm model and design and implementation of QFT controller using Real-time MATLAB toolbox
- Implementing a laboratorial robot set to present a control and automation lab

Khajeh Nasireddin Toosi University of Technology, ECE Department, 2002 - 2005

- Design H-inf and μ -synthesis robust controller for a flexible link arm
- Implement ELS, MSLS and Kalman Filter adaptive algorithms to identify the variable parameters of different systems and design robust controllers

PUBLICATIONS

Book Chapter

- H. Rahimi-Eichi and M.-Y. Chow, "Energy Management in Electric Vehicles," in *Electric Vehicles: Technology, System and Implementation*, C. Ma, Ed., ed: John Wiley & Sons, 2014 (submitted).
- H. Rahimi-Eichi and M.-Y. Chow, "Batteries," in *Handbook of Energy*, G. M. Crawley, Ed., ed USA, *World Scientific Publishing Company and Imperial College Press*, 2012.

Journal Papers

- F. Baronti, M.-Y. Chow, C. Ma, H. Rahimi-Eichi, R. Saletti, "E-Transportation: The Role of Embedded Systems in Electric Energy Transfer from Grid to Vehicle", Accepted to be published in *EURASIP Journal on Embedded Systems*, 2016.
- H. Rahimi-Eichi, F. Baronti, and M. Y. Chow, "Online Adaptive Parameter Identification and State-of-Charge Coestimation for Lithium-Polymer Battery Cells," *Industrial Electronics, IEEE Transactions on*, vol. 61, pp. 2053-2061, 2014.
- H. Rahimi-Eichi, U. Ojha, F. Baronti, and M. Chow, "Battery Management System: An Overview of Its Application in the Smart Grid and Electric Vehicles," *Industrial Electronics Magazine, IEEE*, vol. 7, pp. 4-16, 2013 (**Best Paper Award**).
- W. Su, H. Rahimi Eichi, W. Zeng, and M.-Y. Chow, "A Survey on the Electrification of Transportation in a Smart Grid Environment," *Industrial Informatics, IEEE Transactions on*, vol. 8, pp. 1-10, 2012 (**IES student best paper award**).

Conference Papers

- H. Rahimi-Eichi, P. B. Jeon, M.-Y. Chow, and T.-J. Yeo, " Incorporating big data analysis in speed profile classification for range estimation," presented at *Industrial Informatics (INDIN), 2015 IEEE 13th International Conference on*, IEEE, Cambridge, UK, 2015.
- H. Rahimi-Eichi, P. B. Jeon, M.-Y. Chow, and T.-J. Yeo, "Big-Data Framework for Electric Vehicle Range Estimation," presented at the *40th Annual Conference of the IEEE Industrial Electronics Society (IECON2014)*, IEEE, Dallas, TX , 2014.
- N. Otero, H. Rahimi-Eichi, J. J. Rodriguez-Andina, M. Y. Chow, "FPGA Implementation of an Observer for State-of-Charge Estimation in Lithium-Polymer Batteries", presented at the *IEEE International Conference on Mechatronics and Control (ICMC)*, Jinchou, China, 2014 (Best paper award).
- H. Rahimi-Eichi, B. Balagopal, M.-Y. Chow, and T.-J. Yeo, "Sensitivity Analysis of Lithium-Ion Battery Model to Battery Parameters," presented at the *39th Annual*

Conference of the IEEE Industrial Electronics Society (IECON2013), IEEE, Vienna, Austria, 2013.

- F. Baronti, W. Zamboni, N. Femia, H. Rahimi-Eichi, R. Roncella, S. Rosi, et al., "Parameter identification of Li-Po batteries in electric vehicles: A comparative study," presented at the *IEEE International Symposium on Industrial Electronics (ISIE2013)*, pp. 1-7, Taipei, Taiwan, 2013.
- H. Rahimi-Eichi and M.-Y. Chow, "Adaptive online battery parameters/SOC/capacity co-estimation," presented at the *Transportation Electrification Conference and Expo (ITEC2013)*, IEEE, pp. 1 – 6, Metro Detroit, Michigan, USA, 2013.
- H. Rahimi-Eichi and M.-Y. Chow, "Adaptive parameter identification and State-of-Charge estimation of lithium-ion batteries," presented at the *38th Annual Conference on IEEE Industrial Electronics Society (IECON 2012)*, IEEE, pp. 4012 – 4017, Montreal, QC, Canada, 2012.
- H. Rahimi Eichi and M.-Y. Chow, "Modeling and analysis of battery hysteresis effects," presented at the *Energy Conversion Congress and Exposition (ECCE2012)*, IEEE, pp. 4479-4486, Raleigh, NC, USA, 2012.
- H. Rahimi-Eichi and Mo-Yuen Chow, "Auction-based Energy Management System of a large-scale PHEV municipal parking deck," presented at the *Energy Conversion Congress and Exposition (ECCE2012)*, IEEE, pp. 1811-1818, Raleigh, NC, USA, 2012.
- H. Rahimi-Eichi, F. Baronti, and M. Y. Chow, "Modeling and online parameter identification of Li-Polymer battery cells for SOC estimation," presented at the *International Symposium on Industrial Electronics (ISIE2012)*, IEEE, pp. 1336-1341, Hangzhou, Zhejiang, China, 2012 (**Top-ten scored paper presented at the conference**).
- J. Zhenhua and H. Rahimi-Eichi, "Design, modeling and simulation of a green building energy system," presented at the *Power & Energy Society General Meeting (PES2009)*, IEEE, pp. 1-7, Calgary, AB, Canada, 2009.
- A. Khodabakhshian, H. Rahimi, and N. Golbon, "QFT design for load frequency control of non-minimum phase hydro power plant," presented at the *Computer Aided Control System Design, IEEE International Conference on Control Applications and IEEE International Symposium on Intelligent Control*, IEEE, pp. 1380-1385, Munich, Germany, 2006.
- H. D. Taghirad and H. Rahimi, "Composite QFT controller design for flexible joint robots," presented at the *IEEE Conference on Control Applications (CCA 2005)*, pp. 583-588, Toronto, ON, Canada, 2005.

Filed Patents

- Chow Mo-Yuen, Rahimi-Eichi Habiballah, 2015 "Method And Apparatus For Analyzing Data Related To Vehicle Range Estimation", Filed: October, 2015.
- Chow Mo-Yuen, Rahimi-Eichi Habiballah, 2013 "Battery Parameters, State of Charge (SOC), and State of Health (SOH) Co-estimation", Issued: November 27, 2014.

Invention Disclosures

- M.-Y. Chow, H. Rahimi-Eichi, Daebong Jung, P. B. Jeon, Jywjw Jeon, "Adaptive Range Estimation Algorithm for Electric Vehicles Using Fuzzy Inference System", case# 16255, April 2016.

- M.-Y. Chow, H. Rahimi-Eichi, P. B. Jeon, T.-J. Yeo, “Incorporating Big Data Analysis in Speed Profile Classification for Range Estimation”, case# 15185, February 2015.
- M.-Y. Chow, H. Rahimi-Eichi, P. B. Jeon, T.-J. Yeo, “Battery Remaining Useful Life (RUL) and End of Life (EOL) Estimation Algorithm”, case# 14126, February 2014.
- M.-Y. Chow, H. Rahimi-Eichi, P. B. Jeon, T.-J. Yeo, “Online Battery Remaining Charge Estimation Algorithm in Electric Vehicles”, case# 14115, January 2014.
- M.-Y. Chow, H. Rahimi-Eichi, W. Zeng, “Big Data Based Smart Battery Gauge Technology for Electric Vehicles”, case# 14081, November 2013.
- M.-Y. Chow, H. Rahimi-Eichi, “Battery Parameters/SOC/SOH Co-Estimation Algorithm”, case# 13099, November 2012.

AWARDS / HONORS:

- IEEE, International Conference on Mechatronics and Control, **Best Paper Award**, 2014
- IEEE, Industrial Electronics Magazine, **Best Paper Award**, 2013.
- IEEE, IES **Student Best Paper Award**, 2013.
- **Best presentation award** of FREEDM center industrial review student Forum, NCSU, 2012.
- **Among best 10 paper award** in 21st IEEE International Symposium of Industrial Electronics, Hangzhou, China, 2012
- Tau Beta Pi Engineering honor society, 2011
- Phi Kappa Phi National Honor Society, 2011
- Top student award in control engineering, Isfahan University of Technology, 2004

TEACHING/WORK EXPERIENCE

North Carolina State University, ECE department,

- Supervising undergraduate student to implement the range estimation algorithm in Freescale evaluation board, spring 2015.
- Supervising senior and M.Sc. students during Advanced Mechatronics course to implement battery state of charge estimation algorithm in an electric vehicle emulator, fall 2014.
- Mentoring 12 senior students as summer interns from Zhejiang University and Tsinghua University to Advanced Diagnosis, Automation and Control (ADAC) Lab at NCSU, summers 2011-2013
- Mentoring one REU senior student and two RET high school teachers at the FREEDM center, summer 2011
- Teaching Assistant for Senior Design course, helping students with their projects and for Power System Analysis, designing the course project on power flow and Cap compensation, August 2010-May 2011

University of Miami, ECE Department, 2008 - 2009

- Teaching Assistant for Power Electronics course, helping students to analyze and design power circuits.

Isfahan Engineering Research Center, Control and Precise Instrumentation group, 2004 - 2008

- Installing sensors and actuators (MFCs, humidifiers, thermos-controllers, pressure gauges, heaters and level switches) to visually display and control parameters via MATLAB.

Professional Affiliations:

- IEEE, IES East Carolina Chapter Chair, 2014-2015
- IEEE, IES Energy Storage Technical Committee Secretary, 2012-2016.
- IEEE Member since 2008.

SKILLS

Computer Skills

- MATLAB and SIMULINK programming and using identification, real-time, control, GUI, data acquisition, robust and QFT toolboxes.
- Real-time data extraction from online resources (Google map, MapQuest, Weather forecasting websites) to be imported to MATLAB and Python for data analysis.
- Working knowledge of Python, SQL, JMP Pro, Tableau, statistical analysis with R, Octave, JAVA, FORTRAN, C programming and Hadoop structure.