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| Scott J. Moura  Ph.D. Candidate  Department of Mechanical Engineering  University of Michigan, Ann Arbor  <http://www.umich.edu/~sjmoura> | G029 W. E. Lay Automotive Lab  Control Optimization Laboratory  Automated Modeling Laboratory  Ann Arbor, Michigan 48109-2133, USA  Tel: (734) 763-7388  [sjmoura@umich.edu](mailto:sjmoura@umich.edu) |

## Education

**Ph.D., Mechanical Engineering** (expected April 2011) **University of Michigan, Ann Arbor**

Dissertation: *Optimal Control of Energy Systems for Lithium-ion Battery Health*

Advisors: Professor Jeffrey L. Stein (Michigan) and Professor Hosam K. Fathy (Penn State)

Committee: Prof. Jeffrey Stein (Michigan-ME), Prof. Hosam Fathy (Penn State-MNE), Prof. Huei Peng (Michigan-ME), Prof. Jessy Grizzle (Michigan-EECS:Systems)

Major Field: Systems and Controls

**M.S.E, Mechanical Engineering** (2008) **University of Michigan, Ann Arbor**

Thesis: *Plug-in Hybrid Electric Vehicle Power Management: Optimal Control & Battery Sizing*

Advisors: Professor Jeffrey L. Stein (Michigan), Professor Hosam K. Fathy (Penn State), and Professor Duncan S. Callaway (UC Berkeley)

Major Field: Systems and Controls

**B.S., Mechanical Engineering** (2006) **University of California, Berkeley**

Graduated with Honors

## Research Interests

## Optimal control, dynamic system modeling, sustainable & alternative energy storage/conversion systems, advanced battery systems, vehicle electrification and vehicle-to-grid applications.

## Publications & Presentations

**Peer-Reviewed Journals**

1. S. J. Moura, J. L. Stein, and H. K. Fathy, “Optimal Boundary Control and Estimation of Diffusion-Reaction PDEs,” (in preparation).
2. J. C. Forman, S. J. Moura, J. L. Stein, H. K. Fathy, “Parameter Identification of the Doyle-Fuller-Newman Model for a LiFePO4 Battery with Fisher Information-based Identifiability Analysis,” (in preparation).
3. S. J. Moura, J. L. Stein, and H. K. Fathy, “Battery Health Conscious Power Management for Plug-in Hybrid Electric Vehicles via Stochastic Control,” (in preparation).
4. S. J. Moura and Y. A. Chang, “Lyapunov-Based Switched Extremum Seeking for Maximum Power Point Tracking in Photovoltaic Systems,” (in preparation).
5. S. Bashash, S. J. Moura, and H. K. Fathy, “Battery Health-Conscious Plug-in Hybrid Electric Vehicle Grid Load Prediction,” (in preparation)*.*
6. S. J. Moura, J. C. Forman, S. Bashash, J. L. Stein, and H. K. Fathy, “Optimal Control of Film Growth in Lithium-Ion Battery Packs via Relay Switches,” *accepted to IEEE Transactions on Industrial Electronics,* Sept. 2010
7. S. Bashash, S. J. Moura, J. C. Forman, and H. K. Fathy, “Plug-in hybrid electric vehicle charge pattern optimization for energy cost and battery longevity,” *Journal of Power Sources*, v 196, n 1, p 541-549, January 2011.
8. S. J. Moura, D. S. Callaway, H. K. Fathy, and J. L. Stein, “Impact of Battery Sizing on Stochastic Optimal Power Management in Plug-in Hybrid Electric Vehicles,” *Journal of Power Sources*, v 195, n 9, p 2979-2988, May 2010.
9. S. J. Moura, H. K. Fathy, D. S. Callaway, and J. L. Stein, “A Stochastic Optimal Control Approach for Power Management in Plug-in Hybrid Electric Vehicles,” *IEEE Transactions on Control Systems Technology*, v PP, n 99, p 1-11, March 2010.

**Conferences Proceedings**

1. S. J. Moura, J. L. Stein, H. K. Fathy, “Optimal Boundary Control & Estimation of Diffusion-Reaction PDEs,” Submitted to the *2011 American Control Conf.*, San Francisco, CA, 2011.
2. J. C. Forman, S. J. Moura, J. L. Stein, H. K. Fathy, “Genetic Parameter Identification of the Doyle-Fuller-Newman Model From Experimental Cycling of a Li-ion LiFePO4 Battery,” Submitted to the *2011 American Control Conference*, San Francisco, CA, 2011.
3. S. Bashash, S. J. Moura, H. K. Fathy, “Battery Health-conscious Plug-in Hybrid Electric Vehicle Power Demand Prediction,” *Proceedings of the 2010 ASME Dynamic Systems and Control Conference*, Cambridge, MA, 2010.
4. S. J. Moura, J. L. Stein, H. K. Fathy, “Battery Health-Conscious Power Management for Plug-in Hybrid Electric Vehicles via Stochastic Control,” *Proceedings of the 2010 ASME Dynamic Systems and Control Conference*, Cambridge, MA, 2010.
5. S. J. Moura, J. B. Siegel, D. J. Siegel, H. K. Fathy, A. G. Stefanopoulou, “Education on Vehicle Electrification: Battery Systems, Fuel Cells and Hydrogen,” *Proceedings of the 2010 IEEE Vehicle Power and Propulsion Conference*, Lille, France, 2010.
6. S. Bashash, S. J. Moura, H. K. Fathy "Charge Trajectory Optimization of Plug-in Hybrid Electric Vehicles for Energy Cost Reduction and Battery Life Enhancement," *Proceedings of the 2010 American Control Conference*, Baltimore, MD, 2010.
7. S. J. Moura, Y. A. Chang "Asymptotic Convergence through Lyapunov-Based Switching in Extremum Seeking with Application to Photovoltaic Systems," *Proceedings of the 2010 American Control Conference*, Baltimore, MD, 2010.
8. S. J. Moura, J. C. Forman, J. L Stein, H. K. Fathy, "Control of Film Growth in Lithium Ion Battery Packs via Switches," *Proceedings of the 2009 ASME Dynamic Systems and Control Conference*, Hollywood, CA, 2009. **Best Student Paper Finalist**
9. Y. A. Chang, S. J. Moura, “Real-Time Air-Flow Control in Fuel Cell Systems: An Extremum Seeking Approach,” *Proceedings of the 2009 American Control Conf.*, St. Louis, MO, 2009.
10. S. J. Moura, D. S. Callaway, H. K. Fathy, and J. L. Stein, “Impact of Battery Sizing on Stochastic Optimal Power Management in Plug-in Hybrid Electric Vehicles,” *Proceedings of the 2008 IEEE International Conference on Vehicular Electronics and Safety*, pp. 96-102, Columbus, OH, 2008. (Invited Paper)
11. S. J. Moura, H. K. Fathy, D. S. Callaway, J. L. Stein, “A Stochastic Optimal Control Approach for Power Management in Plug-in Hybrid Electric Vehicles,” *Proceedings of the 2008 ASME Dynamic Systems and Control Conference*, Ann Arbor, MI, 2008.

**Technical Presentations**

1. S. J. Moura, H. K. Fathy, D. S. Callaway, and J. L. Stein, "Interaction of Battery Size and Optimal Power Management in Plug-in Hybrid Electric Vehicles," *Automotive Research Center Conference*, Ann Arbor, MI, 2009.
2. S. J. Moura, D. S. Callaway, H. K. Fathy, and J. L. Stein, "Plug-in Hybrid Electric Vehicle Power Management: Optimal Control and Battery Sizing," *Society of Hispanic Professional Engineers Conference*, Phoenix, AZ, 2008. **Technical Paper Competition Winner**
3. S. J. Moura, D. S. Callaway, H. K. Fathy, and J. L. Stein, "Plug-in Hybrid Electric Vehicle Power Management: Optimal Control and Battery Sizing," *Engineering Graduate Symposium*, Ann Arbor, MI, 2008. **2nd Place Poster, System Analysis and Control Session**
4. S. J. Moura, H. K. Fathy, D. S. Callaway, and J. L. Stein, "A Stochastic Optimal Control Approach for Power Management in Plug-in Hybrid Electric Vehicles," *Automotive Research Center Conference*, Ann Arbor, MI, 2008.
5. S. J. Moura, H. K. Fathy, D. S. Callaway, and J. L. Stein, "Plug-in Hybrid Powertrain Modeling," *Engineering Graduate Symposium*, Ann Arbor, MI, 2007. **2nd Place Oral Presentation**, System Analysis and Control Session
6. S. J. Moura, Dongsuk Kum, H. K. Fathy, and J. L. Stein, "Hybrid Powertrain Optimization for Plug-in Microgrid Power Generation," *Automotive Research Center Conference*, Ann Arbor, MI, 2007.

## Awards & Honors

**National Science Foundation (NSF) Graduate Research Fellowship**

National Science Foundation (2008 - 2011)

**Rackham Merit Fellowship (RMF)**

University of Michigan Rackham Graduate School (2006 - 2011)

**Distinguished Leadership Award**

College of Engineering, University of Michigan (2009)

**2009 ASME Dynamic Systems and Control Conference, Hollywood, CA USA**

Best Student Paper Finalist

Best Presentation in Session

**2009 American Control Conference, Baltimore, MD USA**

Best Presentation in Session

**2008 ASME Dynamic Systems and Control Conference, Ann Arbor, MI USA**

Best Presentation in Session

**2008 Society of Hispanic Professional Engineers Conference, Phoenix, AZ USA**

1st Place Technical Paper Competition

**2008 Engineering Graduate Symposium, University of Michigan**

2nd Place Poster, Control Systems Session

**2007 Engineering Graduate Symposium, University of Michigan**

2nd Place Oral Presentation, System Analysis and Control Session

**Michigan Memorial Phoenix Energy Institute (MMPEI)**

MMPEI-Rackham Energy Fellowship, Honorable Mention (2007-2008)

**SHPE Academic Achievement Award**

Society of Hispanic Engineers and Scientists, University of Michigan (2007)

**National Science Foundation (NSF)**

Graduate Research Fellowship Program (GRFP), Honorable Mention (2006 - 2007)

**Christopher A. Burrows Memorial Scholarship**

Community Scholarship Foundation (2002)

**Paul Rickershauser Memorial Award**

Community Scholarship Foundation (2002)

**The Governor’s Scholars Award**

Governor’s Scholarship Programs (2001)

## Teaching Experience

* ME 499/599 Battery Systems & Control, Winter 2010, 2011 (2010 Enrollment: 59 students)

Co-Instructor and co-developer for new course within DOE-ARRA education program

* 10th Preparatory Math, 2005, Campbell Academic Services, ACES Program, Detroit, MI
* Undergrad Research Assistant mentor, “Li-ion Battery Float Charger Design and Fabrication”, Summer 2010

## Society Memberships

**American Society of Mechanical Engineers (ASME)**

Student Member, Dynamic Systems and Control Division (2002 - present)

**IEEE**, Student Member, Control Systems Society (2008 – present)

**Society of Hispanic Professional Engineers (SHPE)**

University of Michigan, Student Chapter (2006 - present)

Community Service Committee (Sept 2007 - present)  
UC Berkeley Hispanic Engineers & Scientists, Student Chapter (2002 - 2006)

Administrative Vice-President (2004-2006)

## Academic Service

## Reviewer

**Journals:** ASME Journal of Dynamics Systems, Measurement, and Control, Energies, IEEE Trans. on Control Systems Technology, IEEE Trans. on Industrial Electronics, IEEE/ASME Trans. on Mechatronics, Simulation Modeling Practice and Theory.

**Conferences:** ASME Dynamics Systems and Control Conference, ASME International Mechanical Engineering Congress & Exposition, American Control Conference, Conference on Decision and Control, IEEE Vehicle Power and Propulsion Conference

*Session Chair*

2008 University of Michigan Graduate Symposium, Control Systems Session

2009 University of Michigan Graduate Symposium, Design & Control Systems Session

*Web Design*

Student Services Site for the 2009 American Control Conference, St. Louis, MO

2009 University of Michigan Graduate Symposium

2008 University of Michigan Graduate Symposium

International Union of Theoretical and Applied Mechanics (IUTAM) Symposium on Cellular, Molecular and Tissue Mechanics, Woods Hole, MA

## Appointments and Experience

**University of Michigan** – Ann Arbor, Michigan (August 2006 - present)

*Graduate Student Research Assistant*     
  
**DaimlerChrysler Corporation** - Detroit, Michigan (May 2006 - August 2006)

*Summer Intern, Electrical Engineering - Vehicle Engineering*

**Ford Motor Company** - Dearborn, Michigan (May 2005 - August 2005)

*Summer Intern, Manufacturing & Quality*

**Southern California Edison** - Rosemead, California (June 2004 - August 2004)

*Professional Aide, Staff Engineering*  

**BIS Computer Solutions, Inc.** - La Crescenta, California (June 2003 - July 2003)

*Sales Assistant, Computer Technician*

## Instrumental Music Experience

**Instruments**

Oboe, English horn, Alto/Tenor/Baritone Sax, Timpani, Cymbals, Bass Drum, Conducting

**Performance Groups**

University of Michigan Pops Orchestra (September 2010 – April 2011)

University of Michigan Campus Philharmonic Orchestra (September 2009 – March 2010)

University of Michigan Campus Band (January 2009 – April 2009)

UC Berkeley Symphony Orchestra (portions of 2003 - 2006)

UC Berkeley University Wind Ensemble (January 2003 – May 2006)

California Marching Band (September 2003 – May 2006)

Mystikal Drum & Bugle Corps (April 2003 – July 2003)

## Graduate Courses Completed at U-M

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| Linear Spaces & Matrix Theory (Math 419)  Control Systems Analysis & Design (EECS 460)  Design of Digital Control Systems (ME/EE 561)  Linear Systems Theory (EECS 560/ME 564)  Control of Adv. Powertrain Systems (ME 569)  Linear Feedback Control Systems (EECS 565)  Discrete Event Systems (EECS 661)  Nonlinear Systems and Control (EECS 562)  Advanced Nonlinear Control (EECS 662)\*  Trajectory and Flight Optimization (AERO 575)  Infrastructure for Veh. Electrification (EECS 598)\* | Analytical Methods in Mechanics (ME 501)  Probability and Random Processes (EECS 501)  Dynamics & Vibrations (ME 440)  Intermediate Dynamics (ME/AERO 540)  Modeling Dynamic Systems (ME 560)  Design Optimization (ME 555)  Dynamic Programming (IOE 512)  Grid Integration of Alt. Energy (EECS 498)  Stochastic Control (EECS 558)  Adaptive Control (NA 531)  Teaching Engineering (CHE 580)\* |

**\*Indicates the class was taken as a visitor (audit)**