

# MUNTHER A. HASSOUNEH

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## EDUCATION

**Ph.D. in Electrical Engineering**, December 2003, GPA: 3.93/4.0

*University of Maryland, College Park, MD*

**Dissertation:** Feedback Control of Border Collision Bifurcations in Piecewise Smooth Systems

Advisor: Professor Eyad H. Abed

**M.S. in Electrical Engineering**, May 1999, GPA: 3.9/4.0

*University of Maryland, College Park, MD*

**B.S. in Electrical Engineering (with high distinction)**, February 1997, and

**Minor in Computer Science**, June 1997

*Birzeit University, West Bank*

## RESEARCH INTERESTS

- Dynamic system modeling, analysis and simulation
- Swarm intelligence and its application to wireless sensor networks
- Hybrid systems modeling and control design
- Signal-based approaches to monitoring and control of nonlinear and uncertain systems
- Application of advanced control to power and communication networks and to regulation of cardiac arrhythmia
- Signal processing

## PUBLICATIONS

### Journal Articles

- M. A. Hassouneh, E. H. Abed and H. E. Nusse, "Analysis and stabilization of border collision bifurcations in piecewise smooth discrete-time systems," submitted for publication.
- M. A. Hassouneh, E. H. Abed and H. E. Nusse, "Robust dangerous border-collision bifurcations in piecewise smooth systems," *Physical Review Letters*, Vol. 92, No. 7, paper no. 070201, Feb. 2004.
- M. A. Hassouneh and E. H. Abed, "Border collision bifurcation control of cardiac alternans," *International Journal of Bifurcation and Chaos*, Vol. 14, No. 9, Sept. 2004, to appear.

### Book Chapters

- E. H. Abed, M. A. Hassouneh and Mohamed Saad, "Instability monitoring and control of power systems," in *Applied Mathematics for Deregulated Electric Power Systems*, J. H. Chow, F. F. Wu and J. A. Momoh, Eds., Kluwer, to appear.
- M. A. Hassouneh and E. H. Abed, "Control of border collision bifurcations," in *New Trends in Nonlinear Dynamics and Control, and Their Applications*, Lecture Notes in Control and Information Sciences, Vol. 295, W. Kang, M. Xiao and C. Borges, Eds., Springer-Verlag, pp. 49-64, 2003.
- M. A. Hassouneh, H. Yaghoobi and E. H. Abed, "Monitoring and control of bifurcations using probe signals," in *Dynamics, Bifurcations and Control*, Lecture Notes in Control and Information Sciences, Vol. 273, F. Colonius and L. Gruene, Eds., Berlin: Springer Verlag, pp. 51-65, 2002.

- E. H. Abed and M. A. Hassouneh, “Bifurcation control and stability monitoring,” *Modern Applied Mathematics Techniques in Circuits, Systems and Control*, N.E. Matsorakis, Editor, Athens: World Scientific and Engineering Press, pp. 284-288, 1999.

#### Conference Articles

- M. A. Hassouneh and E. H. Abed, “Lyapunov-based feedback control of border collision bifurcations in piecewise smooth systems,” submitted for publication in *Conference on Decision and Control*, Dec. 2004.
- M. A. Hassouneh and E. H. Abed, “Discrete-time washout filters in feedback control of nonlinear systems,” *Proc. 23rd IASTED International Conference on Modelling, Identification and Control*, Grindelwald, Switzerland, pp. 25-31 (paper number 412-130), Feb. 23-25, 2004.
- M. A. Hassouneh, H-C. Lee and E. H. Abed, “Washout filters in feedback control: benefits, limitations and extensions,” *Proceedings of the American Control Conference*, pp. 3950–3955, Boston, MA, June-July 2004.
- M. A. Hassouneh and E. H. Abed, “Border collision bifurcation control of cardiac alternans,” *Proceedings of the American Control Conference*, pp. 459-464, Denver, CO, June 2003.
- H. Yaghoobi, M. A. Hassouneh and E. H. Abed, “Detection of impending bifurcation using a near-resonant probe signal,” *Proceedings of the American Control Conference*, Vol. 3, pp. 2285-2291, Arlington, VA, 2001.

#### Articles in Preparation

- M. A. Hassouneh, H. Yaghoobi and E. H. Abed, “Input-to-state participation factors,” in preparation.
- M. A. Hassouneh, H.-C. Lee and E. H. Abed, “Generalized washout filters for feedback control of nonlinear systems,” in preparation.
- M. A. Hassouneh and E. H. Abed, “Lyapunov and LMI-based analysis and feedback control of border collision bifurcations,” in preparation.

#### Technical Reports

- M. A. Hassouneh, H-C. Lee and E. H. Abed, “Washout filters in feedback control: benefits, limitations and extensions,” Technical Report, ISR, University of Maryland, TR 2004-16, 2004 (<http://techreports.isr.umd.edu/reports/2004/TR.2004-16.pdf>).
- M. A. Hassouneh and E. H. Abed, “Border collision bifurcation control of cardiac alternans,” Technical Report, ISR, University of Maryland, TR 2004-16, 2004 (<http://techreports.isr.umd.edu/reports/2003/TR.2003-41.pdf>).

#### PRESENTATIONS

- “Washout Filters in Feedback Control: Benefits, Limitations and Extensions,” presented at *American Control Conference*, Boston, MA, July, 2004.
- “Feedback Control of Border Collision Bifurcations with Application to Cardiac Arrhythmia Control,” presented at *Nonlinear Dynamics and Chaos Seminar Series*, University of Maryland, March 2003.
- “Border Collision Bifurcation Control of Cardiac Arrhythmia,” presented at the *American Control Conference*, Denver, CO, June 2003.
- “Monitoring and Control of Bifurcations Using Probe Signals,” presented at *Virginia Polytechnic Institute and State University*, Blacksburg, VA, Oct. 2000.
- “Bifurcation Control and Stability Monitoring,” presented at *Circuits, Systems, Communications and Computers Conference*, Athens, Greece, July 1999.

#### EXPERIENCE

**Postdoctoral Research Associate**, Institute for Systems Research, University of Maryland  
January 2004 to present.

- Conducting research on dynamic system modeling, analysis and simulation.

- Conducting research on swarm intelligence and its application in wireless sensor networks.
- Continuing my earlier work on developing and numerically testing new techniques for real time stability monitoring in electric power systems.

**Graduate Research Assistant**, Institute for Systems Research, University of Maryland  
September 1997 to December 2003.

- Designed and numerically verified stabilizing controllers for nonlinear phenomena (bifurcations and chaos) in piecewise smooth systems.
- Applied research results to control of cardiac arrhythmia (alternans).
- Conducted research on monitoring systems for detecting impending instability in dynamical systems using probe signals.
- Applied research results to models of electric power systems.

**Summer Intern**, Hughes Network Systems, Germantown, Maryland  
June 2001 to August 2001.

- Intensive work on devising testing methods and writing test code generators using C for the Packet Radio Channel Unit (PRCU) of the integrated system of the HNS Satellite Ground Station.

**Field Engineer**, NCR Company, West Bank  
May 1997 to August 1997

- Installed and maintained automated teller machines.
- Installed and maintained Unix servers.

**Student Trainee**, TTE Management and Training Center, Durham, England  
June 1996

- Configured Programmable Logic Controllers (PLCs).
- Electronic circuitry assembly and testing.

**Student Support Team Member**, Computer Center, Birzeit University, West Bank  
October 1994 to July 1995

- Upgraded computers.
- Installed software.
- Assisted new students.

## TEACHING EXPERIENCE

**Substitute instructor on an occasional basis for courses on:**

- Nonlinear Systems
- Probability Theory
- Signals and Systems
- Digital Signal Processing

## PROFESSIONAL AFFILIATIONS

- Institute of Electrical and Electronics Engineers (IEEE)
- Sigma Xi Scientific Research Society
- Society for Industrial and Applied Mathematics (SIAM)

## REVIEWING ACTIVITIES

Reviewed articles for

- American Control Conference
- IEEE Transactions on Circuits and Systems I and II
- Journal of Dynamic Systems, Measurement, and Control
- Journal of Latin American Applied Research
- Nonlinear Dynamics
- Systems and Control Letters

## CLASS PROJECTS

- Adaptive control of chaos
- Multirate filter design for image compression
- Signal modeling
- Decoding messages masked with chaos generated by one-dimensional maps
- Senior Project (undergraduate): An interprocessor high speed serial link for real time applications

## SELECTION OF COURSES TAKEN

Advanced Digital Signal Processing	Identification and Adaptive Control
Random Processes for Communication and Control	Numerical Analysis
Estimation and Detection	Nonlinear Control Systems
Systems Theory	Optimization and Optimal Control
Dynamical Systems and Chaos	Control of Bifurcation and Chaos
Communication Systems	Software Engineering

## HONORS AND AWARDS

- *Jacob K. Goldhaber Travel Grant Award*, 2002, to participate in “Symposium on New Trends in Nonlinear Dynamics and Control,” Monterey, CA.
- *Sigma Xi Scientific Society*, full member since 2001.
- *Outstanding Graduate Achievement Award*, August 1997, Ministry of Higher Education, Palestinian Authority.
- *Exchange Student Scholarship*, September 1995 to June 1996, University of Durham, Durham, England, Academically based award.
- *The CEGB Prize in Electrical Engineering*, June 1996 School of Engineering, University of Durham. Awarded annually to top undergraduate student in the department of electrical engineering.
- *Outstanding Student Award*, Birzeit University, June 1995. Academically based award given to top three students university-wide.
- *Honor Roll*, Birzeit University, June 1993- February 1997.

## COMPUTER SKILLS

- Languages: C/C++, Pascal, Fortran.
- Software: Matlab (with Simulink package), Mathematica, Maple, Latex, Microsoft Office.
- Operating Systems: Unix, Windows 2000 and XP.

## REFERENCES

Available upon request.