

Mark D. Hempstead

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EDUCATION

Harvard University, Cambridge MA

2003 – present

S.M Engineering Sciences, June 2005

PhD Expected June 2009, Engineering Sciences in the power-aware architecture and mixed-signal VLSI groups

Academic Advisors: Prof. Gu-Yeon Wei and Prof. David Brooks (Co-Advised)

Research Interests: Computer Engineering, power-aware computer architecture, low-power VLSI design, wireless sensor networks, accelerator-based architectures, high performance/mobile and low-power embedded

Dissertation: “Accelerator-based computing for wireless sensor networks and future multicore microprocessors”

Dissertation Committee: Prof. Gu-Yeon Wei, Prof. David Brooks, Prof. Paul Horowitz

Tufts University, Medford MA

1999 – 2003

B.S. in Computer Engineering, May 2003

Summa Cum Laude, GPA 3.81

RESEARCH EXPERIENCE

Harvard University, Cambridge MA

Research Assistant

9/2003 – present

Modeling of multi-core vs. accelerator-based architectures in the context of future technologies. Investigated low power architecture and circuit techniques for wireless sensor network applications under Prof. Gu-Yeon Wei and Prof. David Brooks. Evaluated architecture and circuit ideas and taped out microprocessor prototypes in 130 nm and 180 nm CMOS and tested the results.

Intel Corporation, Hudson MA

Research Intern, VSSAD Group

5/2005 – 8/2005

Conducted a study of the performance and power tradeoffs of x86 decoding structures. Modified a P6 based simulator and ran extensive simulations of real traces. Prepared a final report for use in future internal projects.

TEACHING EXPERIENCE

Tufts University

Lecturer

Starting January 2009

Hired to teach digital logic systems (EE26) to junior computer engineering students. Lectures on reliable digital design, combinational logic, state-machine minimization, PLAs, FPGAs, and arithmetic and control logic. Lab involves VHDL design and Altera software.

Harvard University

Teaching Fellow

ES96 Engineering Design (Spring 08) – Prof. Woodward Yang. Seminar for all juniors in engineering. Guided the class as they tackled a real world problem (planning a transportation system for the new Harvard Allston campus) and presented results to university clients.

QR48 BITS (Spring 06, Spring 07) – Prof. Harry Lewis. Harvard Core course on digital technology for non-science majors. Discussed coding theory, signal representation, encryption, current technology policy and future technology directions. Led a weekly section and gave a guest lecture.

ES154 Introduction to Electronics (Fall 05) - Topics include: Op-Amp Circuits, Device Physics, BJT, MOSFET, Single Stage and Multi-stage amplifiers, DC and small signal models, and high-frequency models.

Resident Tutor, Lowell House Harvard University – (9/2006 – present) Living in a undergraduate residence. Responsible for the resident life of 35 undergraduates. Involved in the house community of undergraduate students, faculty, and graduate students. Responsibilities also include academic advising and server/website support.

OTHER PROFESSIONAL EXPERIENCE

Fairchild Semiconductor, South Portland ME **Customer Quality Engineer Co-Op** 5/2002 – 8/2002
Researched and managed a corporate-wide initiative to provide customer qualification data for the external website. Met with and coordinated the efforts of various groups including IS, Product Lines, and QA.

Good Shepherd Food-Bank Inc., Auburn ME **Director of Information Services** 6/98 – 9/2001
Technology manager for statewide non-profit corporation. Implemented and supported all computer and information technology. Garnered several technology grants. During the construction of a new three million dollar facility, designed and coordinated all electrical, voice, and data network technology.

JOURNAL, CONFERENCE AND WORKSHOP PUBLICATIONS

An accelerator-based wireless sensor network processor in 130nm CMOS. Mark Hempstead, David Brooks, and Gu-Yeon Wei [In preparation – Journal of Solid State Circuits (JSSC)]

Navigo: A Model to Study Power-Constrained Architectures and Specialization. Mark Hempstead, Gu-Yeon Wei, and David Brooks [Under Review – ISCA'09]

SMASH: A Shared Memory Framework for Accelerator Based Architectures. Michael Lyons, Mark Hempstead, Gu-Yeon Wei and David Brooks. [Under Review – ISCA'09]

System Design Considerations for Sensor Network Applications (Invited) Mark Hempstead, Gu-Yeon Wei, and David Brooks. *International Symposium on Circuits and Systems (ISCAS)*. Seattle WA., May 2008. (Invited Session: Energy-Efficient Building Blocks for Ubiquitous Sensing)

Survey of hardware systems for wireless sensor networks (Invited) Mark Hempstead, Michael J. Lyons, David Brooks and Gu-Yeon Wei. *ASP Journal of Low Power Electronics*, Vol. 4., No. 1, April 2008.

Ultra Low Power System Architecture for Wireless Sensor Network Applications Mark Hempstead, Gu-Yeon Wei, and David Brooks. *Nanoelectronic Devices for Defense & Security Conference (NANO-DDS)*. Washington D.C., June 2007.

Architecture and Circuit Techniques for Low-Throughput, Energy-Constrained Systems Across Technology Generations, Mark Hempstead, Gu-Yeon Wei and David Brooks. *In Proceedings of the International Conference On Compilers, Architecture, And Synthesis For Embedded Systems(CASES)*. Seoul South Korea. October 2006.

Design and Implementation of An Ultra Low Power System Architecture for Wireless Sensor Network Applications (Design Contest), Mark Hempstead, Xiaoyao Liang, Patrick Mauro, Gu-Yeon Wei, and David Brooks *SRC Student Symposium – SoC design contest Phase 2, 1st place*. Raleigh/Durham NC, October 2006.

A Realistic Power Consumption Model for Wireless Sensor Network Devices, Qin Wang, Mark Hempstead, and Woodward Yang. In Proceedings of the Third Annual IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON). Reston, VA, September 2006.

Design and Implementation of An Ultra Low Power System Architecture for Wireless Sensor Network Applications (Design Contest), Mark Hempstead, Xiaoyao Liang, Patrick Mauro, Gu-Yeon Wei, and David Brooks *SRC Techcon – SoC design contest Phase 1, 2nd place*. Portland, OR, October 2005.

Power and Thermal Effects of SRAM vs. Latch-Mux Design Styles and Clock Gating Choices. Yingmin Li, Mark Hempstead, Patrick Mauro, David Brooks, Zhigang Hu, Kevin Skadron. *In Proceedings of the International Symposium on Low Power Electronics and Design (ISLPED'05)*, San Diego, CA, August 2005

An Ultra Low Power System Architecture for Wireless Sensor Network Applications, Mark Hempstead, Nikhil Tripathi, Patrick Mauro, Gu-Yeon Wei, and David Brooks *In Proceedings of the 32nd International Symposium on Computer Architecture (ISCA)*, Madison, WI, June 2005.

Simulating the Power Consumption of Large-Scale Sensor Network Applications, Victor Shnayder, Mark Hempstead, Bor-rong Chen, Geoff Werner-Allen, and Matt Welsh. *In Proceedings of the Second ACM Conference on Embedded Networked Sensor Systems (SenSys'04)*, Baltimore, MD, November 2004

TinyBench: The Case For A Standardized Benchmark Suite for TinyOS Based Wireless Sensor Network Devices, Mark Hempstead, David Brooks, and Matt Welsh. *In Proceedings of the First IEEE Workshop on Embedded Networked Sensors (EmNets'04)*, Tampa FL November 2004.

PRESENTATIONS AND TALKS

- | | |
|---------|---|
| 10/2008 | Tufts University – “Designing Ultra Low-Power Systems for Wireless Sensor Networks” |
| 5/2008 | ISCAS Seattle WA – “System Design Considerations for Sensor Network Applications” |
| 6/2007 | NANO-DDS, Washington DC – “Ultra Low Power System Architecture for Wireless Sensor Network Applications” |
| 10/2006 | SRC Student Symposium, Raleigh/Durham NC – “Design and Implementation of An Ultra Low Power System Architecture for Wireless Sensor Network Applications” |
| 10/2006 | CASES, Seoul South Korea – “Architecture and Circuit Techniques for Low-Throughput, Energy-Constrained Systems Across Technology Generations” |
| 10/2005 | SRC Techcon, Portland OR – “Design and Implementation of An Ultra Low Power System Architecture for Wireless Sensor Network Applications” |
| 6/2005 | ISCA, Madison WI – “An Ultra Low Power System Architecture for Wireless Sensor Network Applications” |

PATENTS

US Patent Application US 2007/0214374 A1 “Ultra Low Power System for Sensor Network Applications.”

PROFESSIONAL SERVICE AND REVIEWS

Reviewer:

ASP Journal of Low Power Electronics
IEEE Transactions on CAD
Transactions on Sensor Networks
SenSys 2008
ACM Computing Frontiers (CF) 2008
ISPASS 2007, 2006
ISLPED 2007, 2006, 2005
IISWC 2006
HPCA 2006
MASS 2006
ISCAS 2006

FUNDING

SRC 2006 Design Contest 1st Place – \$30,000
SECON 2006 Travel Grant
ISCA 2005 Travel Grant

Assisted with proposal submissions: DARPA YFA, NSF NOSS, NSF NET-NOSS, NSF ITR

HONORS AND MEMBERSHIPS

2006 SRC Design Contest 1st Place - included free fabrication in IBM 180nm CMOS
Member Eta Kappa Nu – Electrical Engineering Honor Society.
Member Tau Beta Pi – Engineering Honor Society
IBM Thomas Watson Scholar – Funding for Undergraduate Degree
Certifications: Registered Engineer in Training (FE) - State of Massachusetts
Memberships: IEEE, ACM, IEEE Computer Society, ACM SIGARCH

LEADERSHIP, ACTIVITIES, INTERESTS

Long Distance Running, Travel, Piano, Hiking, Camping
Graduate Student Life Committee, Harvard SEAS – Co-President (Jan 2006 – Jan 2008)
Tufts Mountain Club: Trip Leader, Communications Director (2001 – 2002)
Tufts Theater: Sound Designer or Accompanist involved in fourteen productions (1999 – 2003)
Tufts Wilderness Orientation: Staff & Trip Leader (2001-2002)
Boy Scout Troop 35 Yarmouth: Eagle Scout, Assistant Scout Master (1993 – 1999)

REFERENCES

Available upon request

List of References for Mark D. Hempstead

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RESEARCH

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TEACHING

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UNDERGRADUATE

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