JAEIN JEONG

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RESEARCH INTERESTS

Wireless sensor networks and embedded systems

EDUCATION

University of California, Berkeley Berkeley, CA
Doctor of Philosophy, Computer Science Spring 2009
Dissertation topic: *A Practical Theory of Micro-Solar Power Sensor Networks*
Advisor: Prof. David Culler
GPA: 3.70 / 4.0

Master of Science, Computer Science May 2004
Thesis: *Incremental Network Programming for Wireless Sensors*
Advisors: Prof. Kris Pister and Prof. David Culler

Seoul National University Seoul, Korea
Bachelor of Science, Computer Engineering February 1997
GPA: 4.13 / 4.3

RESEARCH & PROFESSIONAL EXPERIENCE

University of California, Berkeley, Berkeley, CA 2002 - 2009
Research Assistant, Computer Science Division

Energy Harvesting and Energy Management for Wireless Sensor Networks

- *A Building Block Approach to Sensornet Systems*: Presented a building block approach to sensor hardware platform, epic, which is an architecture that supports all three stages of sensornet hardware development – prototype, pilot, and production. Epic achieves this by systematically partitioning functionality, exporting a wide electrical interface, eliminating a standard system bus, and supporting many physical interconnect options for modules and carriers, including inlining. We evaluated this architecture by constructing a family of reusable modules and application-specific carriers, and building three platforms that achieve a high degree of reuse despite very different application requirements. Our experience showed that this approach shortened platform development time-to-result to a week for a novice graduate student, making custom platforms broadly accessible.
- *Design, Modeling, and Capacity Planning for Micro-Solar Power Sensor Networks*: Demonstrated a systematic approach to building micro-solar power subsystems for wireless sensor networks in the context of a micro-climate monitoring project through the design of the node, micro-solar subsystem, and network, which was deployed in a challenging, deep forest setting.

- *Design and Analysis of Micro-Solar Power Systems for Wireless Sensor Networks*: Developed a taxonomy of the microsolar design space identifying key components, design choices, interactions, challenges, and trade-offs. Provided an empirical and mathematical analysis of two prominent designs of micro-solar power systems.
- *An Architecture for Energy Management in Wireless Sensor Networks*: Proposed an energy management architecture that allows sensornet applications to accurately view and efficiently manage the energy budget of a node.
- *Trio: Enabling Sustainable and Scalable Outdoor Wireless Sensor Network Deployments*: Presented the philosophy, design, and initial evaluation of the Trio Testbed, the outdoor sensor network deployment for DARPA NEST Final Experiment that consists of 557 solar-powered motes, seven gateway nodes, and a root server.

Sensing Applications of Wireless Sensor Networks

- *Experiments in Instrumenting Wireless Sensor Networks for Real-Time Surveillance*: Demonstrated a large-scale, real-time, surveillance and control application on a wireless sensor network that tracks multiple human targets walking through a 5041 square meter sensor field and dispatch simulated pursuers to capture them.
- *HomeHawk*: Developed a home monitoring sensor network product covering topics over different fields − sensor circuitry, embedded and host application, enclosure design and manufacturing, and business model.
- *Wireless Indoor Climate Monitoring (ICM) Sensor*: Developed a Mica2Dot sensor interface to ICM sensor box that measures air speed, ambient temperature and radiant temperature.

Over-The-Air Programming for Wireless Sensor Networks

- *Incremental Network Programming for Wireless Sensors*: Developed an incremental network programming mechanism that reprograms wireless sensors quickly by transmitting the incremental changes for the new program version.

Media Access Control for Wireless Sensor Networks

- *Forward Error Correction in Sensor Networks*: Implemented a few versions of error-correction code (ECC) that correct single-bit or double-bit errors on Chipcon CC1000 radio-based wireless sensor nodes. Investigated the feasibility of the ECC implementation in outdoor and indoor environments.
- *Localization using Dot3 wireless sensors*: Investigated the feasibility of radio signal strength based localization on CC1000 based Mica2Dot wireless sensor nodes.
- *Dot3 Radio Stack*: Developed a MAC for CC1000 radio based Mica2Dot sensor nodes and evaluated its performance by measuring packet reception rate for different experimental settings such as distance, error correction code, number of retransmissions, and multiple channels.

United Technologies Research Center, East Hartford, CT Summer 2004
Research Intern, worked with Dr. Jae-Hyuk Oh.

- *Empirical Analysis of Transmission Power Control Algorithms for Wireless Sensor Networks*: Studied the effects of a dynamic transmission-power-control algorithm on throughput and energy consumption using multi-hop WSN workloads and a large Mica2dot-based WSN testbed.

Korea Trade Network, Seoul, Korea 1997 - 2000
System Administrator

- Administrated EDI*Net on Tandem Himalaya system, which is an online transaction system that relays Electronic Data Interchange (EDI) messages among Korea Customs Service, trading companies and other EDI service providers.
- Ported the source code of EDI*Net for Year 2000 compliance.

SYSTEM DEVELOPMENT EXPERIENCE

- **HydroWatch Project** (06/2006 - 12/2008)
  - Developed a micro-solar power simulator.
  - Designed and built the HydroWatch solar energy harvesting board in charge of circuit design, PCB design, pilot system manufacturing and validation of the assembled system. Developed the HydroWatch board in two versions (TelosB and EPIC).
- **DARPA NEST Final Experiment** (01/2005 - 12/2005)
  - Developed the system software for the Trio node which allows
    (a) solar energy harvesting and
    (b) multiplexing and boot-up configuration of sensors, actuators and other I/O components.
  - Co-designed the hardware for the Trio and verified its operation.
  - Designed and built Tier-2 nodes which are solar-powered 802.15.4-to-801.11 gateways.
- **DARPA NEST Midterm Demo** (05/2003 - 05/2004)
  - Developed an incremental network programming mechanism that reprograms wireless sensors quickly by transmitting the incremental changes for the new program version.
- **IVY Project** (05/2002 - 12/2003)
  - Developed a MAC protocol for CC1000 radio based Mica2Dot sensor nodes.
  - Developed a ICM-to-Mica2Dot interface board that translates the sensor reading of an ICM sensor box in the ADC interface of a Mica2Dot node.

TEACHING EXPERIENCE

- **University of California, Berkeley**, Berkeley, CA (Fall 2002)
  Teaching Assistant, *Machine Structure* - CS61C. Taught an introductory computer architecture class for undergrad students with Prof. David Patterson and Dr. Dan Garcia in charge of discussion sessions and lab sessions.

- **Advanced Institute of Information Technology**, Seoul, Korea (7/9/2007 - 7/14/2007) *Wireless Embedded Systems and Networking Foundations of IP-based Ubiquitous Sensor Networks.* Taught a summer session with Prof. David Culler for Korean faculty in charge of labs, which included wireless sensor nodes deployment, sensor network IP networking, and TinyOS 2.0 based embedded application program development.
- **Advanced Institute of Information Technology**, Seoul, Korea (6/30/2008 - 7/4/2008) *Wireless Embedded Internetworking: Foundation of IP-based Ubiquitous Sensor Networks.* Taught a summer session with Prof. David Culler for Korean faculty in charge of labs, providing in-depth hands-on experience in the application of core concepts using a 6LoWPAN-based IPv6 wireless network kernel on state-of-the art microcontrollers.

HONORS

- Korea Foundation for Advanced Studies Scholarship (2000-2005)
- Graduated *magna cum laude* from Seoul National University (1997)
- Programming Competition for College Students by Hyundai Electronics.
  Gold Medal in Group Competition (1996)
- Seoul National University Scholarship (1995-1997)

SERVICE

- Reviewer: ACM TECS '08, IPSN '08, ACM TOSN '07, ACM Sensys '06
- Membership to ACM and IEEE

REFEREED PUBLICATIONS

- **Jaein Jeong**. *Evaluation of Network Stack Optimization Techniques for Wireless Sensor Networks.* To appear at the International Journal of Communications, Network and System Sciences (IJCNS).
- **Jaein Jeong** and David Culler. *Incremental Network Programming for Wireless Sensors.* International Journal of Communications, Network and System Sciences (IJCNS), Volume 2, Number 5, pp. 433 – 452, August 2009.
- Prabal Dutta, Jay Taneja, **Jaein Jeong**, Xiaofan Jiang and David Culler. *A Building Block Approach to Sensornet Systems.* The Sixth International Conference on Embedded Networked Sensor Systems (SenSys 2008), November 2008.
- **Jaein Jeong**, Xiaofan Jiang and David Culler. *Design and Analysis of Micro-Solar Power Systems for Wireless Sensor Networks.* The Fifth International Conference on Networked Sensing Systems (INSS 2008), June 2008.
- Jay Taneja, **Jaein Jeong**, and David Culler. *Design, Modeling, and Capacity Planning for Micro-Solar Power Sensor Networks.* The Seventh International Conference on Information Processing in Sensor Networks (IPSN/SPOTS 2008), April 2008.

- **Jaein Jeong**, David Culler, and Jae-Hyuk Oh. *Empirical Analysis of Transmission Power Control Algorithms for Wireless Sensor Networks.* The Fourth International Conference on Networked Sensing Systems (INSS 2007), June 2007.

- **Jaein Jeong** and Cheng-Tien Ee. *Forward Error Correction in Sensor Networks.* The First International Workshop on Wireless Sensor Networks (WWSN 2007), June 2007.

- Xiaofan Jiang, Jay Taneja, Jorge Ortiz, Arsalan Tavakoli, Prabal Dutta, **Jaein Jeong**, David Culler, Phil Levis, and Scott Shenker. *An Architecture for Energy Management in Wireless Sensor Networks.* The First International Workshop on Wireless Sensor Network Architecture (WWSNA 2007), April 2007.

- Arsalan Tavakoli, Prabal Dutta, **Jaein Jeong**, Sukun Kim, Jorge Ortiz, David Culler, Phil Levis, and Scott Shenker. *A Modular Sensornet Architecture: Past, Present, and Future Directions.* The First International Workshop on Wireless Sensor Network Architecture (WWSNA 2007), April 2007.

- Prabal Dutta, Jonathan Hui, **Jaein Jeong**, Sukun Kim, Cory Sharp, Jay Taneja, Gilman Tolle, Kamin Whitehouse, and David Culler. *Trio: Enabling Sustainable and Scalable Outdoor Wireless Sensor Network Deployments.* The Fifth International Conference on Information Processing in Sensor Networks (IPSN/SPOTS 2006)

- Kamin Whitehouse, Gilman Tolle, Jay Taneja, Cory Sharp, Sukun Kim, **Jaein Jeong**, Jonathan Hui, Prabal Dutta, and David Culler. *Marionette: a Tool Suite for Debugging and Scripting of Wireless Sensor Networks.* The Fifth International Conference on Information Processing in Sensor Networks (IPSN/SPOTS 2006)

- Phoebus Chen, Songhwai Oh, Michael Manzo, Bruno Sinopoli, Cory Sharp, Kamin Whitehouse, Gilman Tolle, **Jaein Jeong**, Prabal Dutta, Jonathan Hui, Shawn Shaffert, Sukun Kim, Jay Taneja, Bonnie Zhu, Tanya Roosta, Mike Howard, David Culler and Shankar Sastry. *Experiments in Instrumenting Wireless Sensor Networks for Real-Time Surveillance.* 2006 IEEE International Conference on Robotics and Automation (ICRA 2006), May 2006.

- **Jaein Jeong** and David Culler. *Incremental Network Programming for Wireless Sensors.* The First IEEE Communications Society Conference on Sensor and Ad Hoc Communications and Networks (SECON 2004), October 2004.

PUBLICATION IN SUBMISSION

- **Jaein Jeong** and David Culler. *Predicting the Long-term Behavior of a Micro-Solar Power System.* In submission to the ACM Transactions on Embedded Computing Systems.

- **Jaein Jeong** and David Culler. *A Practical Theory of Micro-Solar Power Sensor Networks.* In submission to the ACM Transactions on Sensor Networks.

- **Jaein Jeong** and David Culler. *Incremental Network Programming for Multihop Wireless Sensors.* In submission to the ACM Transactions on Sensor Networks.

TECHNICAL REPORTS

- **Jaein Jeong** and David Culler. *Wireless Embedded Systems and Networking - Labs Based on the AIIT Lecture*. UC Berkeley Technical Report UCB/EECS-2008-14
  `http://www.eecs.berkeley.edu/Pubs/TechRpts/2008/EECS-2008-14.pdf`
- Danie Pretorius, **Jaein Jeong**, and Niranjan Kanvinde. *Bluephone - Bt's Killer App? Fixed-Mobile Convergence In The UK.*
  `http://www.cs.berkeley.edu/~jaein/papers/mot_telecom_paper_bluephone.pdf`
- Dina Lee, **Jaein Jeong**, and Young Ko. *KT's Portable Internet Deployment in Korea: Can the Empire Stroke Back?*
  `http://www.cs.berkeley.edu/~jaein/papers/KT_PI_Ko_Lee_Jeong_0511.pdf`
- **Jaein Jeong**, Hengsi Lin, Julian Lippmann, Yatish Patel, and Sharvari Prabhu. *HomeHawk*. `http://www.cs.berkeley.edu/~jaein/papers/ME221Business.pdf`
- **Jaein Jeong**, Lance Doherty, and Kris Pister. *Wireless Indoor Climate Monitoring Sensor*.
  `http://www.cs.berkeley.edu/~jaein/presentations/icm_poster.pdf`
- **Jaein Jeong** and Sukun Kim. *Localization using Dot3 wireless sensors*.
  `http://www.cs.berkeley.edu/~jaein/papers/cs268_paper_localization.pdf`
- **Jaein Jeong** and Sukun Kim. *Dot3 Radio Stack*.
  `http://www.cs.berkeley.edu/~jaein/papers/cs262_paper_dot3radio.pdf`

SKILLS

- **Languages:** Fluent spoken/written English and Korean
- **Platforms:** TinyOS, Linux, and MS Windows
- **Programming Languages:** C/C++, Java, LaTeX, HTML, PHP, SQL, nesC, Matlab
- **Hardware Development:** OrCad, Eagle, VHDL

REFERENCES

The most complete assement of my PhD study can be given by my advisor, Professor Culler.

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Professors Sanders, Wright and Stoica advised me shaping my dissertation, and Dr. Oh supervised and gave guidance to me during my internship in UTRC.

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