

Liqian Luo

4103 Siebel Center
201 N Goodwin Ave
Urbana, IL 61801-2302

(425)698-5150
lluo2@cs.uiuc.edu
<http://www.cs.uiuc.edu/homes/lluo2>

RESEARCH INTERESTS

Wireless sensor networks, distributed embedded systems, ubiquitous computing, smart devices and environments, disruption tolerant networks

EDUCATION

- University of Illinois at Urbana-Champaign**, Urbana, IL *Summer 2007 (expected)*
Ph.D., Computer Science (GPA 4.0+/4.0)¹
Advisor: Tarek F. Abdelzaher
- University of Virginia**, Charlottesville, VA *May 2004*
Master of Computer Science (GPA 4.0+/4.0)
Advisor: Tarek F. Abdelzaher
- Tsinghua University**, Beijing, China *July 2000*
B.E. with honors, Computer Science (GPA 87.4/100)

HONORS

- Vodafone-U.S. Foundation Graduate Fellowship**, UIUC *2006 - 2007*
- Distinguished Ph.D. Student** (top 10% CS Ph.D. students), UIUC *2005 - 2006*
- Excellent Graduating Student**, Tsinghua University *2000*
- Scholarship for Outstanding Students**, Tsinghua University *1997, 1998, 1999*
- Scholarship for Excellent Freshmen**, Tsinghua University *1996*
- No.1 of Zhejiang Province** in National College Entrance Examination *1996*

RESEARCH EXPERIENCE

- University of Illinois at Urbana-Champaign** *2005 - present*
Research Assistant
Explored research problems related to disruption tolerant sensor networks and audio sensor networks.
- University of Virginia** *2002 - 2005*
Research Assistant
Explored research problems on sensor network debugging, programming paradigms, and large scale systems.

PUBLICATIONS

Journal Articles

- Achieving Real-Time Target Tracking Using Wireless Sensor Networks.
T. He, P. A. Vicaire, T. Yan, **L. Luo**, L. Gu, G. Zhou, R. Stoleru, Q. Cao, J. A. Stankovic, and T. Abdelzaher.
ACM Transaction on Embedded Computing System (TECS), to appear in 2007.
- EnviroSuite: An Environmentally Immersive Programming Framework for Sensor Networks.
L. Luo, T. Abdelzaher, T. He, and J. A. Stankovic.
ACM Transactions on Embedded Computing Systems (TECS), August 2006.

¹GPA computed based on A:4.0, A+:4.3

VigilNet: An Integrated Sensor Network System for Energy-Efficient Surveillance.

T. He, S. Krishnamurthy, **L. Luo**, T. Yan, B. Krogh, L. Gu, R. Stoleru, G. Zhou, Q. Cao, P. Vicaire, J. A. Stankovic, T. F. Abdelzaher, and J. Hui.
ACM Transactions on Sensor Networks (TOSN), February 2006.

Conference Papers

Enviromic: Towards cooperative storage and retrieval in audio sensor networks.

L. Luo, Q. Cao, C. Huang, T. Abdelzaher, J. A. Stankovic, and M. Ward.
Proceedings of the 27th International Conference on Distributed Computing Systems (ICDCS '07), June 2007.

EnviroStore: A Cooperative Storage System for Disconnected Operation in Sensor Networks.

L. Luo, C. Huang, T. F. Abdelzaher, J. A. Stankovic, and X. Liu.
Proceedings of the 26th Annual IEEE Conference on Computer Communications (Infocom '07), May 2007.

Towards a Layered Architecture for Object-Based Execution in Wide-Area Deeply Embedded Computing.

T. Abdelzaher, Q. Cao, R. Ganti, M. Khan, J. Heo, C. Huang, P. Jayachandran, H. K. Le, **L. Luo**, Y. Tsai.
Proceedings of the 10th IEEE International Symposium on Object/component/service-oriented Real-time Distributed Computing (ISORC '07), May 2007, invited.

Achieving Repeatability of Asynchronous Events in Wireless Sensor Networks with EnviroLog.

L. Luo, T. He, G. Zhou, L. Gu, T. F. Abdelzaher, and J. A. Stankovic.
Proceedings of the 25th Conference on Computer Communications (Infocom '06), April 2006.

Achieving Long-Term Surveillance in VigilNet.

T. He, P. Vicaire, T. Yan, Q. Cao, G. Zhou, L. Gu, **L. Luo**, R. Stoleru, J. A. Stankovic, and T. Abdelzaher.
Proceedings of the 25th Conference on Computer Communications (Infocom '06), April 2006.

Achieving Real-Time Target Tracking Using Wireless Sensor Networks.

T. He, P. A. Vicaire, T. Yan, **L. Luo**, L. Gu, G. Zhou, R. Stoleru, Q. Cao, J. A. Stankovic, and T. F. Abdelzaher.
Proceedings of the 12th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS '06), April 2006.

Lightweight Detection and Classification for Wireless Sensor Networks in Realistic Environments.

L. Gu, D. Jia, P. Vicaire, T. Yan, **L. Luo**, A. Tirumala, Q. Cao, T. He, J. A. Stankovic, T. F. Abdelzaher, and B. Krogh.
Proceedings of the 3rd international conference on Embedded networked sensor systems (SenSys '05), November 2005.

An Overview of the VigilNet Architecture.

T. He, **L. Luo**, T. Yan, L. Gu, Q. Cao, G. Zhou, R. Stoleru, P. Vicaire, Q. Cao, J. A. Stankovic, S. H. Son and T. F. Abdelzaher.
Proceedings of the 11th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA '05), August 2005, invited.

Design and Comparison of Lightweight Group Management Strategies in EnviroSuite.

L. Luo, T. Abdelzaher, T. He, and J. A. Stankovic.
Proceedings of the International Conference on Distributed Computing in Sensor Systems (DCOSS '05), June 2005.

Energy-Efficient Surveillance System Using Wireless Sensor Networks.

T. He, S. Krishnamurthy, J. A. Stankovic, T. Abdelzaher, **L. Luo**, R. Stoleru, T. Yan, L. Gu, J. Hui, and B. Krogh.
Proceedings of the 2nd international conference on Mobile systems, applications, and services (MobiSys '04), June 2004.

EnviroTrack: Towards an Environmental Computing Paradigm for Distributed Sensor Networks.

T. Abdelzaher, B. Blum, Q. Cao, D. Evans, J. George, S. George, T. He, **L. Luo**, S. Son, R. Stoleru, J. A. Stankovic and A. Wood.
Proceedings of the International Conference on Distributed Computing Systems (ICDCS '04), March 2004.

Other Publications

An Overview of Data Aggregation Architecture for Real-Time Tracking with Sensor Networks.

T. He, L. Gu, **L. Luo**, T. Yan, J. A. Stankovic, and S. H. Son.

Proceedings of the 14th International Workshop on Parallel and Distributed Real-Time Systems (WPDRTS '06), April 2006, invited.

Autonomous Motion Planning on Mars.

W. He, C. Huang, X. Liu, **L. Luo**, M. Wu (in alphabetical order).

Embedded Real-Time Systems Implementation Workshop (ERTSI '05), in conjunction with the 26th IEEE International Real-Time Systems Symposium (RTSS '05), December, 2005.

Electronic Tripwires for Power-Efficient Surveillance and Target Classification.

T. He, Q. Cao, **L. Luo**, T. Yan, L. Gu, J. A. Stankovic, and T. Abdelzaher.

Proceedings of the 2nd international conference on Embedded networked sensor systems (SenSys '04), November 2004, demo.

SELECTED PROJECTS

EnviroMic: a distributed acoustic monitoring, storage and trace retrieval sensor network system geared for a prolonged interval of disconnected operation (paper in ICDCS '07). It identifies and records acoustic events of interest, limits redundant data via cooperative recording, and avoids local storage overflow through distributed data balancing. Developed a prototype of EnviroMic on MicaZ motes with MTS300 sensor boards. Investigated system attributes such as data storage redundancy, load balancing and quality of recording via both an indoor testbed of 48 MicaZ motes and outdoor deployments in a forest.

EnviroStore: a cooperative storage system for disruption tolerant sensor networks (paper in Infocom '07). The system maximizes its data storage capacity by appropriately redistributing storage utilization and opportunistically offloading data to external devices when possible. Implemented EnviroStore in nesC for TinyOS and evaluated in TOSSIM through various application scenarios.

EnviroLog: a distributed service that improves repeatability of experimental testing of sensor networks by capturing and reproducing external inputs on demand (paper in Infocom '06). It facilitates real world deployment of sensor networks by supporting in-field debugging and tuning as well as collecting statistical results via repeated tests. Designed and developed EnviroLog. Validated the service through numerous outdoor experiments with XSM motes. Integrated EnviroLog into VigilNet for performance tuning and collected lots of statistical results on the classification subsystems of VigilNet (paper in SenSys '05).

EnviroTrack/EnviroSuite: a new distributed computing paradigm suitable for sensor network applications marked by heavy interactions with an external environment (papers in TECS, DCOSS '05, and ICDCS '04). The paradigm is centered around an address space that combines logical objects and (addressable representations of) external physical objects. The framework consists of a set of language primitives, a compiler to interpret them, as well as run-time mechanisms that maintain object abstractions. Lead design and implementation of EnviroTrack. Evaluated and demonstrated its efficacy via both simulations and multiple outdoor deployments with a network of up to 200 sensor devices.

VigilNet/SOWN/NEST: a large-scale (targeted for 1,000 nodes), self-organized, wireless sensor network system for long-term (6 months) surveillance, involving detection, classification, tracking, and identification of various targets (papers in TOSN, RTCSA '05, and SenSys '04). VigilNet incorporates more than 30 protocols including power management (papers in Infocom '06 and MobiSys '04), sensing and classification (paper in SenSys '05), data aggregation (paper in WPDRTS '06), and realtime tracking (papers in TECS and RTAS '06). The system consists of 40,000 lines of nesC and Java code, supporting XSM, Mica2 and Mica2dot hardware platforms. The system has been transitioned to the DIA in 2005. Co-designed and developed VigilNet. Responsible for design, implementation, and in-field tests of distributed group management protocols to classify, track and identify targets. Deployed and demonstrated various versions of the system on multiple occasions to DARPA, SOCOM, and in Washington.

IMPACT

- EnviroTrack/EnviroSuite was included in graduate seminars at Berkeley, Stanford, UIUC, the University of Virginia, Washington University, Freie Universität Berli, and Politecnico di Milano, among others
- Invited talks on EnviroTrack/EnviroSuite were delivered at Berkeley (10/27/2005), Washington University (10/13/2005), Radcliffe Institute for Advanced Study, Harvard (6/23/2004), UC Santa Cruz (5/10/2004), and the University of Pittsburgh (4/23/2004), among others
- VigilNet was included in graduate seminars at Harvard, Stanford, Washington University, Rutgers, the University of Nebraska-Lincoln, and the National Taiwan University of Science and Technology, among others
- VigilNet was classified and transitioned to the Defense Intelligence Agency (DIA)
- VigilNet patent application pending
- EnviroLog was included in graduate seminars at the University of Virginia and the University of Minnesota
- EnviroTrack/EnviroSuite was used at the University of Virginia, UIUC, and the University of Minnesota

SERVICE

Reviewer for several journals and conferences including ACM Transactions on Sensor Networks (TOSN), Ad Hoc Networks, International Conference on Distributed Computing Systems (ICDCS), ACM SIGPLAN/SIGBED Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES), and the IEEE Communications Society Conference on Sensor and Ad Hoc Communications and Networks (SECON).

REFERENCES

Tarek F. Abdelzaher

Associate Professor

Department of Computer Science
University of Illinois at Urbana-Champaign
Urbana, IL 61801
Phone: (217)265-6793
Email: zaher@cs.uiuc.edu

Klara Nahrstedt

Ralph M. and Catherine V. Fisher Professor

Department of Computer Science
University of Illinois at Urbana-Champaign
Urbana, IL 61801
Phone: (217)244-6624
Email: klara@cs.uiuc.edu

Sang H. Son

Professor

Department of Computer Science
University of Virginia
Charlottesville, VA 22904
Phone: (434)982-2205
Email: son@cs.virginia.edu

John A. Stankovic

BP America Professor

Department of Computer Science
University of Virginia
Charlottesville, VA 22904
Phone: (434)982-2275
Email: stankovic@cs.virginia.edu

Feng Zhao

Principal Researcher and Manager

Networked Embedded Computing Group
Microsoft Research
Redmond, Washington 98052
Phone: (425)706-8777
Email: zhao@microsoft.com