
Song Han

Department of Computer Science
The University of Texas at Austin
Austin, TX, 78712

Phone: 469-450-3016
www.cs.utexas.edu/~shan
shan@cs.utexas.edu

RESEARCH INTEREST

Cyber-Physical Systems, Real-Time and Embedded Network Systems, Wireless Networks

EDUCATION

The University of Texas at Austin

Ph.D. Candidate in Computer Science (GPA 3.87)
Research Advisor: Prof. Aloysius K. Mok

Austin, TX, U.S.A
Expected August, 2012

City University of Hong Kong

Master of Philosophy in Computer Science (GPA 4.0)
Research Advisors: Dr. Kam-Yiu Lam

Hong Kong, P. R. China
June 2006

Nanjing University

Bachelor of Science in Computer Science

Nanjing, P. R. China
Aug. 2003

AWARDS AND HONORS

James C. Browne Graduate Fellowship (the only recipient), UT Austin	2009-2010
Professional Development Award, UT Austin	2009, 2010, 2011
Student Travel Award for Cyber Physical System Week	2008, 2009, 2011
Professional Development Award, UT Austin	2008
Emerson Publication Award, Emerson	2008
Microelectronics and Computer Development (MCD) Fellowship, UT Austin	2006 - 2009
Excellent Graduate Award, Nanjing University, P. R. China	2003
People's Scholarship, Nanjing University, P. R. China	2000 - 2003
First Prize of "Hope-Cup" National Mathematical Contest for High School, P. R. China	1998

RESEARCH EXPERIENCE

8/11 – now **Cyber-Physical Avatar** In this project, we are collaborating with the Human Centered Robotics Laboratory in the ME department to build a cyber-physical avatar which can be operated remotely in unconstrained environments. Our research goals include: 1) applying reliable and real-time wireless technologies to achieve close-loop control to provide robots better flexibility and mobility; 2) building a campus-wide programmable network to achieve QoS guarantee on remote operations; and 3) designing novel control algorithms to operate robots in unconstrained environments.

Advisors: Prof. Aloysius K. Mok and Prof. Luis Sentis (UT Austin)

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- 5/11 – now **Real-Time Wireless Embedded Internet** In this project, we are building a prototype for the next generation Internet, the embedded Internet where heterogeneous wireless embedded sensors and devices with different physical and data link layers are enhanced with a protocol adaptation layer and connected through existing Internet infrastructure. Our research focuses on the infrastructure design and how to achieve the end-to-end real-time performance and security requirements in this paradigm shift.
Advisors: Prof. Aloysius K. Mok, Prof. Simon S. Lam (UT Austin), Mark Nixon (Director of the Future Architecture Department in Emerson Process Management)
- 9/10 – now **Collaborative Energy-efficient Localization System** In this project, we are working on a radical design of a collaborative localization system called HartFi. HartFi enhances existing devices with a low-power 802.15.4-based interface which has energy consumption up to two orders of magnitude less than that of a standard Wi-Fi interface, but provides a comparable range of coverage by forming a multi-hop mesh among the low-power interfaces. In the HartFi system, we use the low-power interfaces whenever and wherever it is feasible to share location information. We are also working on reducing location error accumulation in HartFi, which raises its localization accuracy to a level comparable to that of Wi-Fi localization.
Advisors: Prof. Aloysius Mok, Prof. Simon Lam (UT Austin) and Prof. Douglas Leith (NUI Maynooth)
- 9/06 – now **WirelessHART: Reliable and Real-Time Wireless Mesh** In this long-term joint research project with Emerson, we are working on the design and development of WirelessHART communication stack, WirelessHART compliance testing suite and studying network management techniques to achieve reliable routing and real-time end-to-end communication in industrial wireless mesh in presence of network dynamics and interference. The co-existence issues in 2.4GHz ISM band among the Wi-Fi traffic and other low-power sensor communications are also been studied.
Advisors: Prof. Aloysius Mok (UT Austin) and Mark Nixon (Emerson Process Management)
- 9/06 – now **Data Management Techniques in Dynamic Real-Time Sensing and Control Systems** In this project, we study the problem of maintaining sensor data freshness and maximizing control quality in real-time sensing and control systems in presence of mode changes. Based on different task models, corresponding scheduling algorithms are designed to minimize the CPU utilization imposed by update transactions with data freshness requirement satisfied while maximizing the average quality of control tasks. In presence of mode changes in the system, we propose to apply different scheduling algorithms in different modes to reduce the online scheduling cost and design novel mode change algorithms to maintain the data freshness during the mode changes.
Advisors: Prof. Aloysius Mok (UT Austin), Prof. Krithi Ramamritham (UMass Amherst/IIT Bombay), Prof. Kam-yiu Lam (CityU of Hong Kong), Prof. Sang H. Son (U of Virginia)

WORKING EXPERIENCE

2009 – now	Research Assistant, UT Austin
Summer, 11	Intern in Emerson Process Management
Summer, 08	Intern in Emerson Process Management
Summer, 07	Intern in Emerson Process Management
Spring, 09	Teaching Assistant for Course CS303e: Programming with Python, UT Austin
Fall, 08	Teaching Assistant for Course CS372: Operating Systems, UT Austin
Spring, 08	Teaching Assistant for Course CS372h: Operating Systems (Honor), UT Austin
Fall, 07	Teaching Assistant for Course CS327e: Database Systems, UT Austin
Fall, 05	Teaching Assistant for Course CS4404: Distributed Systems, City University of Hong Kong
8/03 – 6/06	Research Assistant, City University of Hong Kong

WORKS UNDER SUBMISSION

- Jiantao Wang, **Song Han**, Kam-yiu Lam, Aloysius K. Mok, "Maintaining Temporal Consistency of Real-time Data in Distributed Real-Time Systems", submitted to Real-time System Journal.
- **Song Han**, Deji Chen, Ming Xiong, Kam-yiu Lam, Aloysius K. Mok, Krithi Ramamritham. "Schedulability Analysis of Deferrable Scheduling Algorithms for Maintaining Real-Time Data Freshness" submitted to IEEE Transactions on Computers.
- **Song Han**, Jianping Song, Xiuming Zhu, Aloysius K. Mok, Deji Chen, Mark Nixon, Wally Pratt, Veena Gondhalekar, "Wi-HTest: Compliance Test Suite for Diagnosing Devices in Real-Time WirelessHART Network" (extended version), submitted to Journal of Systems and Software (JSS).
- **Song Han**, Kam-yiu Lam, Jiantao Wang, Sang H. Son, Aloysius K. Mok, "Adaptive Co-Scheduling for Periodic Update and Application Transactions in Real-Time Database Systems", submitted to Journal of Systems and Software (JSS).
- Xiuming Zhu, Pei-Chi Huang, **Song Han**, Aloysius K. Mok, Deji Chen, Mark Nixon, "RoamingHART: A Collaborative Localization System on WirelessHART", submitted to the 18th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS 2012).

JOURNAL PUBLICATIONS

- Ming Xiong, **Song Han**, Deji Chen, K. Y. Lam, Shan Feng. "DESH: Overhead Reduction Algorithms for Deferrable Scheduling", Real-Time System Journal (RTSJ), Volume 44, Issue 1-3, pp. 1-25, March, 2010.
- **Song Han**, Edward Chan. "Hierarchy Energy Scan in Wireless Sensor Network using in-network

aggregation", In the International Journal of Distributed Sensor Networks, Vol. 5, pp. 1-23, 2009.

- Ming Xiong, **Song Han**, K. Y. Lam, Deji Chen. "Deferrable Scheduling for Maintaining Real-Time Data Freshness: Algorithm, Analysis and Results", in IEEE Transactions on Computers (TC), vol. 57, no. 7, pp. 952-964, July, 2008. ([9+ Citations](#))
- **Song Han**, Edward Chan, Reynold Cheng, K. Y. Lam. "A Statistics-based Sensor Selection Scheme for Continuous Queries in Sensor Networks", In Real Time Systems Journal (RTSJ), Vol . 35, No. 1, pp. 33-58, Jan 2007. ([9+ Citations](#))

CONFERENCE AND WORKSHOP PUBLICATIONS

- Jiantao Wang, Kam-yiu Lam, **Song Han**, Sang H. Son, Aloysius K. Mok, "On Co-Scheduling of Periodic Update and Application Transactions with Fixed Priority Assignment for Real-Time Monitoring", to appear in the 26th IEEE International Conference on Advanced Information Networking and Applications (AINA), 2012.
- Kam-yiu Lam, **Song Han**, Jiantao Wang, Aloysius K. Mok, "On Least Idle Slot First Co-Scheduling of Update and Control Tasks in Real-time Sensing and Control Systems", to appear in the 17th IEEE International Conference on Parallel and Distributed Systems (ICPADS), 2011.
- **Song Han**, Tianji Li, Chen Qian, Douglas Leith, Aloysius K. Mok, Simon S. Lam, "HartFi: An Energy-Efficient Localization System", to appear in ACM SIGCOMM Workshop on Energy and IT: from Green Networking to Smarter Systems, Toronto, ON, Canada, 2011.
- Xiuming Zhu, **Song Han**, Aloysius Mok, Deji Chen, Mark Nixon, "Hardware Challenges and Their Resolution in Advancing WirelessHART" in proceedings of the 9th IEEE International Conference on Industrial Informatics, Lisbon, Portugal, 2011.
- Xiuming Zhu, **Song Han**, Pei-Chi Huang, Aloysius K. Mok, Deji Chen, "MBStar: A Real-time Communication Protocol for Wireless Body Area Networks", to appear in the 23rd Euromicro Conference on Real-Time Systems (ECRTS), Porto, Portugal, 2011.
- **Song Han**, Xiuming Zhu, Deji Chen, Aloysius K. Mok, Mark Nixon, "Reliable and Real-time Communication in Industrial Wireless Mesh Networks" in proceedings of the 17th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 3-12, Chicago, IL, 2011. (**Nominated for Best Paper Award**) ([4+ Citations](#))
- **Song Han**, Xiuming Zhu, Jianping Song, Aloysius K. Mok, Deji Chen, Mark Nixon, Wally Pratt, Veena Gondhalekar. "A Virtual Network Approach for Testing Wireless Mesh in Industrial Process Control", to appear in the 16th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA), Macau, China, 2010.

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- **Song Han**, Xiuming Zhu, Aloysius K. Mok, Mark Nixon, Terry Blevins, Deji Chen. "Control over WirelessHART Network", in proceedings of the 36th Annual Conference of the IEEE Industrial Electronics Society (IECON), special session on Wireless Sensor Networks in Industrial and Factory Automation, Phenix, AZ, 2010.
 - Junghoon Lee, **Song Han**, Aloysius K. Mok. "Design of a Reliable Communication System for Grid-Style Traffic Control Networks", in proceedings of the 16th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), pp. 133-142, Stockholm, Sweden, 2010. ([9+ Citations](#))
 - **Song Han**, Deji Chen, Ming Xiong, Aloysius K. Mok. "Online Scheduling Switch for Maintaining Data Freshness in Flexible Real-Time Systems", in the proceedings of the 30th IEEE Real-Time Systems Symposium (RTSS), Washington, D.C., USA, 2009.
 - **Song Han**, Jianping Song, Xiuming Zhu, Aloysius K. Mok, Deji Chen, Mark Nixon, Wally Pratt and Veena Gondhalekar. "Wi-HTest: Compliance Test Suite for Diagnosing Devices in Real-Time WirelessHART Network", in proceedings of the 15th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), pp. 327-336, San Francisco, CA, 2009. ([15+ Citations](#))
 - Xiuming Zhu, Wei Dong, Aloysius K. Mok, **Song Han**, Jianping Song, Deji Chen, Mark Nixon. "A Location-determination Application in WirelessHART", in proceedings of the 15th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA), Beijing, P.R.China, 2009.
 - **Song Han**, Zifei Zhong, Hongxing Li, Guihai Chen, Edward Chan, Aloysius K. Mok. "Coding-Aware Multi-path Routing in Multi-Hop Wireless Networks", in proceedings of the 27th IEEE International Performance Computing and Communications Conference (IPCCC), pp. 93-100, Austin, TX, 2008. ([2+ Citations](#))
 - **Song Han**, Deji Chen, Ming Xiong, Al Mok. "A Schedulability Analysis of Deferrable Scheduling Using Patterns", in proceedings of the 20th Euromicro Conference on Real-Time Systems (ECRTS), pp. 47-56, Prague, Czech Republic, 2008. ([3+ Citations](#))
 - Jianping Song, **Song Han**, Al Mok, Deji Chen, Mike Lucas, Mark Nixon and Wally Pratt. "WirelessHART: Applying Wireless Technology in Real-Time Industrial Process Control", in proceedings of the 14th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), pp.377-386, St. Louis, MO, 2008. ([100+ Citations](#))
 - Jianping Song, **Song Han**, Aloysius K. Mok, Deji Chen, Mark Nixon, "A study of process data transmission scheduling in wireless mesh networks", in ISA EXPO Technical Conference, Houston, TX, 2007. ([7+ Citations](#))
 - Feng Zou, Fu Lee Wang, Xiaotie Deng, **Song Han**, "Automatic Identification of Chinese Stop

Words", a special issue on Advances in Natural Language Processing of the journal Research on Computing Science, pp. 151-162, 2006. ([10+ Citations](#))

- Feng Zou, Fu Lee Wang, Xiaotie Deng, **Song Han**, "Evaluation of Stop Word List in Chinese Language", the 5th edition of the International Conference on Language Resources and Evaluation (LREC), Genoa, Italy, 2006.
- Ming Xiong, **Song Han**, Deji Chen. "Deferrable Scheduling for Temporal Consistency: Schedulability Analysis and Overhead Reduction", in proceedings of the 12th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA), pp. 117-124, Sidney, Australia, 2006. ([6+ Citations](#))
- Ming Xiong, **Song Han**, K. Y. Lam. "A Deferrable Scheduling Algorithm for Real-Time Transactions Maintaining Data Freshness" in proceedings of the 26th IEEE Real-Time Systems Symposium (RTSS), pp. 27-37, Miami, FL, 2005. ([30+ Citations](#))
- **Song Han**, Edward Chan. "Probabilistic Continuous Update Scheme in Location Dependent Continuous Queries" ,Proc. 6th International Workshop on Advanced Parallel Processing Technologies (APPT), LNCS 2834, Hong Kong, P.R.China, 2005.
- **Song Han**, Edward Chan, Reynold Cheng, K. Y. Lam. "A Statistics-based Sensor Selection Scheme for Continuous Queries in Sensor Networks", Proc. 11th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA), pp. 331-336, Hong Kong, P. R. China, 2005. ([5+ Citations](#))
- Yuequan Chen, Edward Chan, **Song Han**. "Energy Efficient Multipath Routing in Large Scale Sensor Networks with Multiple Sink Nodes", Proc. 6th International Workshop on Advanced Parallel Processing Technologies (APPT), LNCS 2834, Hong Kong, P. R. China, 2005. ([7+ Citations](#))
- **Song Han**, Edward Chan. "Continuous Residual Energy Monitoring in Wireless Sensor Networks", Proc. 2nd International Symposium on Parallel and Distributed Processing and Applications (ISPA), LNCS 3358, Hong Kong, P. R. China, 2004. ([13+ Citations](#))

DEMOS AND POSTERS

- **Song Han**, Deji Chen, Ming Xiong, Al Mok. "Online Scheduling Policy Switch Based on Validity Constraint", in the 29th IEEE Real-Time Systems Symposium (RTSS WIP session), Barcelona, Spain, 2008.
- Xuming Zhu, Aloysius K. Mok, **Song Han**, Jianping Song, Deji Chen, Mark Nixon. "A Location Aware Application In WirelessHART", in the 29th IEEE Real-Time Systems Symposium (RTSS WIP session), Barcelona, Spain, 2008.

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- Jianping Song, **Song Han**, Xiuming Zhu, Al Mok, Deji Chen, Mark Nixon. "Demonstration of a Complete WirelessHART Network", in proceedings of the 6th ACM Conference on Embedded Networked Sensor Systems (SenSys 08 Demo), pp. 381-382, Raleigh, NC, 2008 ([4+ Citations](#))
 - **Song Han**, Jianping Song, Xiuming Zhu, Al Mok, Deji Chen, Mark Nixon, Wally Pratt, Veena Gondhalekar. "HTest-W: Testing Suite for Diagnosing WirelessHART Devices and Networks", in proceedings of The 6th ACM Conference on Embedded Networked Sensor Systems (SenSys 08 Poster), pp. 437--438, Raleigh, NC, 2008.

TECHNICAL REPORTS

- **Song Han**, Deji Chen, Ming Xiong, Kam-yiu Lam, Aloysius K. Mok, Krithi Ramamritham. "Schedulability Analysis of Deferrable Scheduling Algorithms for Maintaining Real-Time Data Freshness". The University of Texas at Austin, Department of Computer Science. Report# TR-11-38 (regular tech report). November 2nd, 2011.
- **Song Han**, Kam-yiu Lam, Jiantao Wang, Sang H. Son, Aloysius K. Mok. "Adaptive Co-Scheduling for Periodic Update and User Transactions in Real-Time Database Systems". The University of Texas at Austin, Department of Computer Science. Report# TR-11-35 (regular tech report). October 12th, 2011.
- **Song Han**, Jianping Song, Xiuming Zhu, Aloysius K. Mok, Deji Chen, Mark Nixon, Wally Pratt, Veena Gondhalekar. "Wi-HTest: Compliance Test Tool for Real-Time WirelessHART Mesh Network Devices". The University of Texas at Austin, Department of Computer Science. Report #TR-10-41 (regular tech report). December 18th, 2010.
- **Song Han**, Xiuming Zhu, Aloysius K. Mok, Deji Chen, Mark Nixon. "Reliable and Real-time Communication in Industrial Wireless Mesh Networks". The University of Texas at Austin, Department of Computer Sciences. Report #TR-10-34 (regular tech report). October 7th, 2010.
- **Song Han**, Mike Sheldon, Deji Chen, Mark Nixon, Aloysius K. Mok. "A Practical Approach to Deploy Large Scale Wireless Sensor Networks", The University of Texas at Austin, Department of Computer Sciences. Report# TR-08-05 (regular tech report). January 28, 2008
- Ming Xiong, **Song Han**, K. Y. Lam, Deji Chen. "Deferrable Scheduling for Maintaining Real-Time Data Freshness: Algorithm, Analysis and Results". The University of Texas at Austin, Department of Computer Sciences. Report #TR-07-44 (regular tech report), September 5, 2007.

MASTER THESIS

- **Song Han**, "Sampling and Scheduling Techniques for Sensor Data", Thesis for the Degree of

TALKS AND PRESENTATIONS

- SIGCOMM'11 "HartFi: An Energy-Efficient Localization System"
- RTAS'11 "Reliable and Real-time Communication in Wireless Industrial Mesh Networks"
- IECON'10 "Control over WirelessHART Networks"
- RTCSA'10 "A Virtual Network Approach for Testing Wireless Mesh in Industrial Process Control"
- RTSS'09 "Online Scheduling Switch for Maintaining Data Freshness in Flexible Real-Time Systems"
- RTAS'09 "Wi-HTest: Compliance Test Suite for Diagnosing Devices in Real-Time WirelessHART Network"
- RTSS'08 "Online Scheduling Policy Switch Based on Validity Constraint"
- IPCCC'08 "Coding-Aware Multi-path Routing in Multi-Hop Wireless Networks"
- RTCSA'05 "A Statistics-based Sensor Selection Scheme for Continuous Queries in Sensor Networks"
- APPT'05 "Probabilistic Continuous Update Scheme in Location Dependent Continuous Queries"
- ISPA'04 "Hierarchy Energy Scan in Wireless Sensor Network using in-network aggregation"

CONFERENCE AND JOURNAL REFEREEING

- International Journal of Communication Systems (IJCS)
- Journal of Global Optimization (JGO)
- Knowledge and Information Systems (KAIS)
- ACM Transactions on Sensor Networks (TOSN)
- Wireless Communications and Mobile Computing (WCM)
- Ad Hoc Networks (ADHOC)
- Journal of System and Software (JSS)
- Future Internet
- ACM Computing Surveys
- IEEE Transactions on Industrial Informatics (TII)
- IEEE Communication Letter (CL)
- IEEE Real-Time Systems Symposium (RTSS)
- IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA)
- IEEE Workshop on Embedded Systems for Real-time Multimedia (ESTIMedia)
- IEEE Conference on Automation Science and Engineering (CASE)
- International Conference on Embedded Software (EMSOFT)
- Annual Conference of the IEEE Industrial Electronics Society (IECON)
- Workshop on Compositional Theory and Technology for Real-Time Embedded Systems (CRTS)
- IEEE International Conference on Industrial Informatics (INDIN)
- ACM Workshop on Real-World Wireless Sensor Networks (REALWSN)
- ACM International Conference on Information and Knowledge Management (CIKM)