

# Song Han

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## RESEARCH INTEREST

Cyber-Physical Systems, Real-Time Systems, Database Systems and Wireless Networks

## EDUCATION

**The University of Texas at Austin** Austin, TX, U.S.A  
Ph.D. Candidate in Computer Science August 2006 ~ now  
Research Advisor: Prof. Aloysius K. Mok

**City University of Hong Kong** Hong Kong, P. R. China  
Master of Philosophy in Computer Science (GPA 4.0) June 2006  
Research Advisors: Dr. Kam-Yiu Lam

**Nanjing University** Nanjing, P. R. China  
Bachelor of Science in Computer Science Aug. 2003

## AWARDS AND HONORS

Professional Development Award, UT Austin	2009
Student Travel Award for Cyber Physical System Week	2009
Student Travel Award for Cyber Physical System Week	2008
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, China	2003
People's Scholarship, Nanjing University, China	2000 - 2003
First Prize of "Hope-Cup" National Mathematical Contest for High School, China	1998

## RESEARCH EXPERIENCE

DEPARTMENT OF COMPUTER SCIENCES, UNIVERSITY OF TEXAS AT AUSTIN

9/06 – now **WirelessHART: Reliable and Real-Time Industrial Wireless Mesh** In this project, we are collaborating with Emerson and working on WirelessHART communication stack, WirelessHART compliance testing suite and network management techniques for maintaining reliable and real-time communication in industrial wireless mesh.  
Advisors: Prof. Aloysius K. Mok (UT Austin) and Mark Nixon (Director of the Future Architecture Department in Emerson Process Management)

9/06 – now      **Transactions Scheduling in Flexible Real-Time System** In this project, we study the problem of maintaining data freshness in the presence of mode changes in real-time systems. We propose to apply different scheduling policies in different modes to reduce the online scheduling cost while still maintaining the data freshness in each mode and during the mode changes. Different algorithms are proposed to either search or adjust the schedules to achieve this goal.  
Advisors: Prof. Aloysius K. Mok (UT Austin)

#### DEPARTMENT OF COMPUTER SCIENCE, CITY UNIVERSITY OF HONG KONG

4/05 – 7/06      **Transactions Scheduling in Real-Time Database System** A deferrable scheduling algorithm (DS-FP) for minimizing imposed workload while maintaining temporal validity of real-time data objects was proposed. We dynamically adjusted update transaction jobs' deadlines and separations by judiciously deferring their sampling times. Based on this work, we also proposed two DESH (Deferrable Scheduling with Hyperperiod) algorithms, DESH-SC and DESH-SA, to construct a hyperperiod schedule offline for the real-time update transactions to reduce online scheduling overhead while achieving CPU utilization close to that of DS-FP.  
Advisors: Dr. Kam-yiu Lam (CityU of HK) and Dr. Ming Xiong (Bell Laboratories and Google)

8/04 - now      **Statistics-Based Network Node Selection** The focus of this research is the selection of the right set of sensors for multiple sensor aggregation in order to obtain data values that are precise enough to meet the requirements of the probabilistic queries. We used a statistics based approach and derived different forms of probabilistic requirements for several common query types such as MIN, MAX and AVERAGE. After analyzing the impact of data on accuracy of query results, we proposed algorithms to determine the accuracy requirements of individual data items being queried.  
Advisors: Dr. Kam-Yiu Lam, Dr. Edward Chan and Dr. Reynold C. K. Cheng (Hong Kong University)

### WORKING EXPERIENCE

Summer, 08      Intern in Emerson Process Management.  
Summer, 07      Intern in Emerson Process Management.  
2009 – now      Research Assistant, UT Austin  
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

### PAPERS UNDER SUBMISSION

- Jianping Song, **Song Han**, Aloysius K. Mok, Mark Nixon, Randy Reiss, Deji Chen. "Addressing the Challenges of Automation Applications with Wireless Mesh Networks", submitted to Transactions on Industrial Electronics.
- **Song Han**, Edward Chan. " A Continuous Location Update Scheme for Supporting Probabilistic Range Queries in Mobile Networks", submitted to International Journal of Wireless and Mobile Computing.
- **Song Han**, Deji Chen, Ming Xiong, Aloysius K. Mok. "Schedulability Analysis of Deferrable Scheduling in Fixed Priority Systems", submitted to IEEE Transactions on Computers.
- Jianping Song, **Song Han**, Xiuming Zhu, Aloysius K. Mok, Deji Chen, Mike Lucas, Mark Nixon. "Building WirelessHART Mesh Networks for Real-Time Industrial Process Automation", submitted to ACM Transactions on Embedded Computing Systems.
- Junghoon Lee, **Song Han**, Aloysius K. Mok. "Design of a Reliable Communication System for Grid-Style Traffic Control Networks", submitted to 16th IEEE Real-Time and Embedded Technology and Applications Symposium.
- **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", submitted to 9th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN).

## JOURNAL PUBLICATIONS

- Ming Xiong, **Song Han**, Deji Chen, K. Y. Lam, Shan Feng. "DESH: Overhead Reduction Algorithms for Deferrable Scheduling", to appear in Real-Time Systems Journal.
- **Song Han**, Edward Chan. "Hierarchy Energy Scan in Wireless Sensor Network using in-network aggregation", to appear in the International Journal of Distributed Sensor Networks.
- 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, vol. 57, no. 7, pp. 952-964, July, 2008.
- **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 (RTS), Vol . 35, No. 1, pp. 33-58, Jan 2007.

## CONFERENCE PUBLICATIONS

- **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 the proceedings of the 15th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), pp. 327-336, San Francisco, CA, 2009.
- 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**, Deji Chen, Ming Xiong, Al Mok. "Online Scheduling Policy Switch Based on Validity Constraint", in the 29th IEEE Real-Time Systems Symposium (WIP session), Barcelona, Spain, 2008.
- Xiuming 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 (WIP session), Barcelona, Spain, 2008.
- Jianping Song, **Song Han**, Xiuming Zhu, Al Mok, Deji Chen, Mark Nixon. "Demonstration of a Complete WirelessHART Network", in the Proceedings of the 6th ACM Conference on Embedded Networked Sensor Systems (SenSys 08 Demo), pp. 381-382, Raleigh, NC, 2008
- **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 the Proceedings of The 6th ACM Conference on Embedded Networked Sensor Systems (SenSys 08 Poster), pp. 437--438, Raleigh, NC, 2008.
- **Song Han**, Deji Chen, Ming Xiong, Al Mok. "A Schedulability Analysis of Deferrable Scheduling Using Patterns", in the proceedings of the 20th Euromicro Conference on Real-Time Systems (ECRTS), pp. 47-56, Prague, Czech Republic, 2008.
- **Song Han**, Zifei Zhong, Hongxing Li, Guihai Chen, Edward Chan, Aloysius K. Mok. "Coding-Aware Multi-path Routing in Multi-Hop Wireless Networks", in the proceedings of the 27th IEEE International Performance Computing and Communications Conference (IPCCC), pp. 93-100, Austin, TX, 2008.
- 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 the proceedings of the 14th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), pp.377-386, St. Louis, MO, 2007.

- Jiangping Song, **Song Han**, Aloysius K. Mok, Deji Chen, Mark Nixon. " Centralized Control of Wireless Sensor Networks for Real-Time Applications", in the proceedings of the 7th IFAC International Conference On Fieldbuses & Networks in Industrial & Embedded Systems, Toulouse, France, 2007.
- 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, 2007.
- Ming Xiong, **Song Han**, Deji Chen. "Deferrable Scheduling for Temporal Consistency: Schedulability Analysis and Overhead Reduction", in the proceedings of the 12th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA), Sidney, Australia, 2006.
- Feng Zou, Fu Lee Wang, Xiaotie Deng, **Song Han**, "Automatic Identification of Chinese Stop Words", Proc. 7th International Conference on Intelligent Text Processing and Computational Linguistics (Poster), Mexico City, Mexico, 2006.
- 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.
- 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.
- Ming Xiong, **Song Han**, K. Y. Lam. "A Deferrable Scheduling Algorithm for Real-Time Transactions Maintaining Data Freshness" in the proceedings of the 26th IEEE Real-Time Systems Symposium (RTSS), pp. 27-37, Miami, FL, 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, 2005.
- **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, 2005.
- 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 , 2005.
- **Song Han**, Edward Chan. "Hierarchy Energy Scan in Wireless Sensor Network using in-network aggregation", Proc. 2nd International Symposium on Parallel and Distributed Processing and Applications (ISPA), LNCS 3358, Hong Kong, 2004.

## **THESIS**

- **Song Han**, "Sampling and Scheduling Techniques for Sensor Data", Thesis for the Degree of Master of Philosophy in City University of Hong Kong. Advisor: Dr. Kam-Yiu Lam

## **TALKS AND PRESENTATIONS**

- RTSS 09 "Online Scheduling Policy Switch Based on Validity Constraint"
- RTAS 09 "Wi-HTest: Compliance Test Suite for Diagnosing Devices in Real-Time WirelessHART Network"
- 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**

- JSS Journal of System and Software
- RTSS IEEE Real-Time Systems Symposium
- RTCSA IEEE International Conference on Embedded and Real-Time Computing Systems and Applications
- ESTIMedia IEEE Workshop on Embedded Systems for Real-time Multimedia
- CASE IEEE Conference on Automation Science and Engineering
- EMSOFT International Conference on Embedded Software
- CRTS Workshop on Compositional Theory and Technology for Real-Time Embedded Systems