Xiaohui Liu

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Education

2008–2014 **Wayne State University**, *Ph. D. in Computer Science.*

2004–2008 **Wuhan University, China**, *B. S. in Computer Science.*

Experience

6/09 – 11/14 **Research Assistant**, *Wayne State University*, Dr. Hongwei Zhang.

Through my Ph. D. training, I have gained over six years of hands-on experience in devising and developing distributed, embedded, and real-time wireless networking protocols/software, including implementing over ten protocols verified in multiple real-world testbeds of 127+ nodes. More specifically, my responsibilities as a research assistant include the following.

- Define research problems in real-time reliable wireless scheduling and routing and propose solutions.
- Evaluate solutions by implementing protocols/software using nesC, a variant of embedded C; run them in simulators using TOSSIM and gdb or real-life testbeds using TinyOS.
- Parse, analyze, present/visualize large amount of data collected from simulations and testbeds using Matlab.
- Write papers using LaTeXto present our findings.

1/10 – 1/12 **President**, *ACM Student Chapter at Wayne State University.*

Organized programming competitions and invited speakers to give technical talks.

1/09 – 9/09 **Technical Team Member**, *LifeCode Health.*

Built a Windows mobile phone application to read and display biometric parameters collected by sensors strapped on the body and transmitted via Bluetooth in real-time to the phone using C#.

8/08 – 5/09 **Teaching Assistant and System Administrator**, *Wayne State University.*

- Taught CSC1000 Introduction to Computer Science.
- Added machine breakdown reporting function into existing attendance system using LAMP stack.

12/07 – 3/08 **Software Engineer Intern**, *Wicresoft Company.*

Microsoft Forefront Security is a business antivirus software product that can be controlled over the network. Participated in writing test cases for and automating test of Microsoft Forefront Security on different Windows families, architectures, and languages.

5/07 – 12/07 **Chief Development Officer**, *Trinity Studio.*

Participated in building websites for small businesses, government agencies, and universities using ASP and SQL Server.

Selected Projects

Physical-Ratio-K based Scheduling Protocol (PRKS)

PRKS guarantees the reliability of a wireless link is no less than requirement in the presence of interference while maximizing throughput. I single-handedly implemented PRKS, its two variants, and four state-of-the-art protocols from the ground up, on resource-constrained sensors using TinyOS. Through measurement studies in two sensor network testbeds, each consisting of 127+ sensors, we observed that PRKS enables predictably high link reliability (95% vs 0% in others) . The source code is publicly available at `https://github.com/xhliu/prks`.

Multi-Timescale Adaptation (MTA) Routing Protocol

MTA identifies minimal energy paths that can meet probabilistic deadlines of real-time traffic, given the notorious dynamics and uncertainties of path delays in wireless networks. I managed to independently implement the whole protocol, its seven variants, and four other protocols from scratch on sensors using TinyOS. Two testbeds of 127+ sensors have verified MTA's significant advantages over the state of the art for a variety of settings, improving deadline success ratio by 89% and reducing transmission cost by a factor of 9.7. Code is at `https://github.com/xhliu/mta`.

Open Source Community Participation

TinyOS is the de facto operating system for low-power wireless devices, such as those used in sensor networks, personal area networks. `http://www.tinyos.net`. Besides active discussions in the mailing list, I have also reported several bugs, including:

- Patch accepted: fixing bug to set default tx power in CC2420X, a radio communication stack for chip CC2420. `https://github.com/sallai/tinyos-main/commit/974ff870551d6fcc86f44e311dcbfd0fb71dbc94`
- Patch accepted: fixing bug in duplicate detection in CTP, the default routing protocol in TinyOS, send queue. `https://www.millennium.berkeley.edu/pipermail/tinyos-help/2010-March/045095.html`

Technical Skills

Languages: expert in C, TinyOS/nesC, and Matlab; proficient in C++ and LaTeX; prior experience in Java, C#, Objective-C, ASP, HTML, Javascript, and PHP

Wireless Standards: 802.11, 802.15.4

Operating systems: Linux, Mac OS X, Windows

Awards

2009 Microsoft Imagine Cup US Software Design Top 15 Finalist

2012 Outstanding Graduate Research Assistant (GRA) Award, Wayne State University

2005 National Scholarship, China

Patent

Hongwei Zhang, Xiaohui Liu, Chuan Li, "PRK-Based Scheduling for Predictable Link Reliability", U.S. Provisional Application #61/788,445, International Application #PCT/US2014/27055

Selected Publications

Adaptive Instantiation of the Protocol Interference Model in Wireless Networked Sensing and Control. Hongwei Zhang, Xin Che, Xiaohui Liu, Xi Ju. In *ACM Transactions on Sensor Networks (ToSN), 2014.*

Taming Uncertainties in Real-Time Routing for Wireless Networked Sensing and Control. Xiaohui Liu, Hongwei Zhang, Qiao Xiang, Xin Che, Xi Ju. In *IEEE Transactions on Smart Grid (TSG), 2013.*

When In-Network Processing Meets Time: Complexity and Effects of Joint Optimization in Wireless Sensor Networks. Qiao Xiang, Jinhong Xu, Xiaohui Liu, Hongwei Zhang, Loren J. Rittle. In *IEEE Transactions on Mobile Computing (TMC), 2011.*