



## ICWS Seminar Series



### **CROWD-SOURCED MOBILE URBAN SENSING**

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141 COORDINATED SCIENCE LAB/4:00 P.M.

**Abstract:** Wide area urban sensing is a topic of interests for both industry and academia, and a technique urgently needed by both city government and residents. The urban sensing system provides up-to-date, complete and detailed observations of the climate, the environment, the traffic, and the population for governor to make wiser decisions in the fast-paced urbanization. And it is also a frontier of Internet development which enables the cyber space to sense the ambient environments that it is embedded in. There are two major challenges of the urban sensing, namely, communication capacity and sensing capability. In this talk, I will introduce a taxi-cab based mobile sensor network system that we designed for wide-area urban sensing purposes. The system addresses both challenges together with considerations of economic and technical feasibility. It crowd-sources the sensing tasks to a group of taxi cabs that roaming in the city, and uses the store-carry-and-forward mechanism to collect the sensory data to the data center for processing. Compared to static dedicated sensor network, the system enjoy extremely low deployment costs and fairly good coverage performance. The talk will also get to the details of the system designs, including the wireless channel measurement, an energy efficient neighbor discovery method, a utility-based routing protocol for data delivery, and a compressive sensing field recovery algorithm that exploit the sparsity of the physical field to reduce the volume of the required sensing data. I would also like to discuss the future deployment plans and research directions of the system.

**Biography:** Lin Zhang received all his degrees from Tsinghua University in Beijing (B.Sc. '98, M.Sc. '01, Ph.D. '06) and is currently an associate professor at Tsinghua University and a visiting associate professor at Stanford University. His current research focuses on wireless sensor networks, distributed data processing, and information theory. He is a co-author of more than 40 peer-reviewed technical papers and five U.S. or Chinese patents. Lin and his team were also the winner of IEEE/ACM SenSys 2010 Best Demo Awards.

In 2006 Lin led a 2008 Beijing Olympic Stadium (the "Bird's Nest") structural security surveillance project, which deployed more than 400 multi-hop wireless temperature and tension sensor nodes across the stadium's steel support structure and dome. The system adopted a flexible spectrum sensing and adaptive multi-hop routing algorithm to overcome strong radio interference and long-distance transmission channel-fading, and played a critical role in the construction of the stadium. Since then he has implemented wireless sensor networks in a wide range of application scenarios, including underground mine security, precision agriculture, and industrial monitoring. Since 2008 Lin has been working in close association with CISCO to develop a Metropolitan Area Sensing and Operating Network (MASON). MASON provides a smart-city and intelligent-urbanization sensor network system for metropolitan areas. MASON has attracted the interests of several large-sized Chinese cities, including Beijing, Shenzhen, Tianjing, and Chengdu.

At Tsinghua University Lin has been teaching Selected Topics in Communication Networks (40230992) and Information Theory (70230063) to upper-level undergraduate and graduate students, respectively, for the past years. In 2004 and 2009, he received the Excellent Teacher Awards from Tsinghua University.