

Spring 2016 Seminar Series

COLLABORATIVE MOBILE CHARGING AND COVERAGE IN WIRELESS SENSOR NETWORKS

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1:30 PM – HEC 113

The limited battery capacity of sensor nodes has become the biggest impediment to wireless sensor network (WSN) applications over the years. Recent breakthroughs in wireless energy transfer, based on rechargeable lithium batteries, provide a promising application of mobile vehicles. These mobile vehicles act as mobile chargers to transfer energy wirelessly to static sensors in an efficient way. In this talk, we discuss some of our recent results on several charging and coverage problems involving multiple mobile chargers. In collaborative mobile charging, a fixed charging location, called a base station (BS), provides a source of energy to mobile chargers, which in turn are allowed to recharge each other while collaboratively charging static sensors. The objective is to ensure sensor coverage while maximizing the ratio of the amount of payload energy (used to charge sensors) to overhead energy (used to move mobile chargers from one location to another). This is done such that none of the sensors will run out of batteries. Here, sensor coverage spans both dimensions of time and space. We first consider the uniform case, where all sensors consume energy at the same rate, and propose an optimal scheduling scheme that can cover a one-dimensional (1-D) WSN with infinite length. Then, we present several greedy scheduling solutions to 1-D WSNs with non-uniform sensors and 2-D WSNs, both of which are NP-hard. Finally, we study another variation, in which all mobile chargers have batteries of unlimited capacity without resorting to a

BS for recharging. The objective is then to deploy and schedule a minimum number of mobile chargers that can cover all sensors. Again, we provide an optimal solution to this problem in a 1-D WSN with uniform sensors and several greedy solutions with competitive approximation ratios to the problem setting of 1-D WSNs with non-uniform sensors and 2-D WSNs, respectively.

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Jie Wu is the Associate Vice Provost for International Affairs at Temple University. He also serves as the Chair and Laura H. Carnell professor in the Department of Computer and Information Sciences. Prior to joining Temple University, he was a program director at the National Science Foundation and was a distinguished professor at Florida Atlantic University. His current research interests include mobile computing and wireless networks, routing protocols, cloud and green computing, network trust and security, and social network applications. Dr. Wu regularly publishes in scholarly journals, conference proceedings, and books. He serves on several editorial boards, including IEEE Transactions on Service Computing and the Journal of Parallel and Distributed Computing. Dr. Wu was general co-chair/chair for IEEE MASS 2006, IEEE IPDPS 2008, IEEE ICDCS 2013, and ACM MobiHoc 2014, as well as program co-chair for IEEE INFOCOM 2011 and CCF CNCC 2013. He was an IEEE Computer Society Distinguished Visitor, ACM Distinguished Speaker, and chair for the IEEE Technical Committee on Distributed Processing (TCDP). Dr. Wu is a CCF Distinguished Speaker and a Fellow of the IEEE. He is the recipient of the 2011 China Computer Federation (CCF) Overseas Outstanding Achievement Award.

