

ELECTRICAL & COMPUTER ENGINEERING SEMINAR

“Taming the Uncertainty in Supporting Distributed Sensor Applications”

by

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Abstract & Biography

Abstract. With the advances in computational, communication, and sensing capabilities, large-scale sensor-based distributed environments are becoming a reality. However, the dynamic nature of wireless sensor networks causes many uncertainties in supporting applications. In this talk, I will focus on approaches in taming one aspect of the uncertainties - timeliness. The nature of many sensor applications as well as continuously changing sensor data often impose real-time requirements on wireless sensor network protocols. However, due to numerous design constraints, such as limited bandwidth, memory and energy of sensor platforms, and packet collisions that can potentially lead to an unbounded number of retransmissions, timeliness techniques designed for real-time systems and real-time databases cannot be applied directly to wireless sensor networks. Existing real-time techniques designed for wireless sensor networks cannot be applied directly because of either fundamentally different timeliness objectives or unrealistic assumptions. We formulated the problem as a graph coloring problem, and then designed TIGRA -- a distributed heuristic for graph coloring that takes into account application semantics and special characteristics of sensor networks to support periodic collection of raw data reports from the entire network in a timely manner. TIGRA ensures that no interference occurs and spatial channel reuse is maximized by assigning a specific time slot for each node. Although the end-to-end delay incurred by sensor data collection largely depends on a specific topology, platform, and application, TIGRA provides a transmission schedule that guarantees a deterministic delay on sensor data collection. Finally, I will touch upon how uncertainty in sensor data can be managed.

Biography. Qi Han is an Assistant Professor in the Department of Mathematical and Computer Sciences at Colorado School of Mines. Her research interests include distributed systems, middleware support for distributed sensor applications, and network-aware data management. She received the Ph.D. degree from the Donald Bren School of Information and Computer Science at the University of California, Irvine in 2005.

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