



UMass Lowell Computer Science Colloquium Announcement

Speaker: David Yates, Bentley College
Date & Time: Wednesday, October 11, 2006. 3:00pm-4:00pm
Place: Olsen 311. Refreshments are served at 2:30pm

Data Quality and Query Cost in Wireless Sensor Networks

Over the next several years, wireless sensor networks will enable many new sensing applications, ranging from environmental and infrastructure monitoring to commercial and industrial sensing. Networks of small, possibly microscopic sensors embedded in the fabric of our surroundings: in buildings, warehouses, and machinery, and even on people, will drastically enhance our ability to monitor and control our physical world. Our research in wireless sensor networks focuses on real-world applications for monitoring and control. Within these applications the volume of data being handled might be large or small, and sensor data queries and replies are sent in packets that are transmitted through a wireless sensor field. We examine the benefits and costs of caching data for sensor network-based applications. We propose and evaluate several approaches to querying for, and then caching data in a sensor field data server. We show that for some application requirements (i.e., when delay drives data quality), policies that emulate cache hits by computing and returning approximate values for sensor data yield a simultaneous quality improvement and cost savings. This win-win is because when system delay is sufficiently important, the benefit to both query cost and data quality achieved by using approximate values outweighs the negative impact on quality due to the approximation. In contrast, when data accuracy drives quality, a linear trade-off between query cost and data quality emerges. We identify caching and lookup policies for which the sensor field query rate is bounded when servicing an arbitrary workload of user queries. This upper bound is achieved by having multiple user queries share the cost of a sensor field query. Finally, we demonstrate that our results are robust to the manner in which the environment being monitored changes using two different sensor field models.

Bio

David Yates joined Bentley as an Assistant Professor of Computer Information Systems in the fall of 2005. David earned his PhD from the University of Massachusetts earlier this year. In the corporate arena, David was a co-founder and vice president of software development at InfoLibria – a startup that grew to become a leading provider of hardware and software for building content distribution and delivery networks before it was acquired.