

UCLA Electrical Engineering ARR 2011

Session 7. Emerging Sensor and Wireless Networks North Ridge Room

1:15-1:40

"Variability-Aware Tasking for Sensor Networks"

Lucas Wanner, Rahul Balani, Puneet Gupta, and Mani Srivastava

Abstract:

Instance and temperature-dependent power variation has a direct impact over quality of sensing for battery powered, long running sensing applications. We introduce variability-aware operating system abstractions that allow sensing applications to specify minimum lifetime and quality requirements for individual tasks, so that the system can dynamically adjust and activate tasks, and overall quality of service is maximized in the presence of power variability. We show that variability-aware task scheduling yields an average improvement of 6x in total active time over schedules based on worst-case estimations of power for a contemporary embedded processor.

1:40-2:05

"Context Guided and Personalized Activity Classification System"

James Y. Xu and Gregory Pottie

Abstract:

Continued rapid progress in the development of embedded motion sensing enables wearable devices that provide fundamental advances in the capability to monitor and classify human motion, detect movement disorders, and estimate energy expenditure. We present a novel end-to-end system that provides context guided personalized activity classification. The system introduces interface models that feature a context classification committee, the concept of context specific activity classification, the ability to manage sensors given context, and the ability to operate in real time through web services. We also present an implementation that demonstrates accurate context classification and accurate activity classification using context specific models.

2:05-2:30**"Energy Aware Multicasting for Wireless Networks"**

Jeffrey Tan, Reuven Cohen, and Izhak Rubin

Abstract:

We consider a wireless network, such as a public safety network or an LTE-based cellular system, in which multiple base stations (or access points) coordinate their operations to efficiently utilize the wireless downlink channels in distributing multicast messages to interested user clients. We develop adaptive power scheduling algorithms that determine which base stations will simultaneously multicast messages to their associated user clients in each time slot, and set the transmit power levels employed by these scheduled base station. Our aim is to present and study such algorithms that enable the multicasting of outstanding load of packets to all identified multicast group clients (or to as many as feasible) located in the area of operation within a short period of time. Thus achieving a high receive multicast throughput rate. We first develop a mathematical formulation for minimizing the schedule length required to complete the transmission of the multicast messages. We show that the problem can be represented as a mixed-integer linear programming model, and prove that the joint scheduling and power control problem is NP-hard. Consequently, we develop and evaluate three heuristic algorithms of polynomial complexity for solving the problem in a timely and practical manner. Heuristic Algorithm 1 is a centralized algorithm that is based on the construction of a power controlled multicast interference graph. We then introduce Heuristic Algorithm 2, which is of lower computational complexity. It operates by iteratively selecting for activation, in a given time slot, a base station transmission that covers the highest residual number of multicast clients.

2:30-2:55**"Efficient Sampling and Inferencing in Wireless Health Systems"**

Zainul Charbiwala and Mani Srivastava