Guest editorial

Information processing and data management in wireless sensor networks

The rapid progress of wireless communication and embedded micro-sensing MEMS technologies has made wireless sensor networks possible. A wireless sensor network normally comes a large area with many inexpensive, tiny sensor nodes, each capable of collecting, processing, and storing environmental information, and communicating with neighboring nodes. In the past, sensors are connected by wired lines. Nowadays, ad hoc networking technologies can much simplify the network formation task. Installation and configuration of a wireless sensor network are thus effortless. Many applications of wireless sensor networks have been proposed, including field data collection, remote monitoring and control, smart home, factory automation, security, etc.

Communications in wireless sensor networks are data-centric, with the objective of delivering collected data in a timely fashion. Also, such networks are resource-constrained, in terms of sensor nodes' processing power, communication bandwidth, storage space and energy. This gives rise to new challenges in information processing and data management in wireless sensor networks. In-network data processing techniques, from simple reporting to more complicated collective communications, such as data aggregation, broadcast, multicast and gossip should be developed. On the other hand, data collected by sensors can intrinsically be viewed as signals. By exploiting signal processing techniques, collective communications can be done in more energy-efficient ways. Moreover, distributed data management schemes need to be devised when sensed data is collected from different sources at different rates.

This special issue addresses novel information processing and data management techniques involving in disciplines in signal processing, signal detection, communication protocols, networking, embedded computing, data management and distributed processing. From 33 submissions, the guest editors have selected 10 papers into this special issue. This acceptance rate makes this special issue very selective. Each paper is reviewed by at least two reviewers. Furthermore, authors of selected papers are required to revise their papers according to review comments.

The accepted papers are divided into three categories: data management, routing, and security. In the data management category, Xu et al. investigate in-network query processing strategies for K nearest neighbor (KNN) queries in location-aware wireless sensor networks. Brayner et al. propose an adaptive query processing mechanism to dynamically adjust query processing in wireless sensor networks. Akcan et al. develop a distributed, weighted sampling algorithm to sample sensing data to reduce energy consumption. By exploring the adaptive model selection algorithms, Borgne et al. derive an adaptive, lightweight and on-line algorithm for prediction sensing data. In the routing category, Nakamura et al. propose an interface engine that explores information fusion techniques to determine whether the routing topology should be rebuilt or not. Tang et al. study a random-binning-based distributed source coding scheme for efficient data transmissions. Chuang et al. develop a simple and scalable approach to multi sink routing in wireless sensor networks. By exploiting data function and QOS, Pan et al. apply genetic algorithm to balance the loads of energy consumptions of all sensor nodes. Leu et al. utilize polar coordinates to identify sensor positions and route network packets. In the security category, Oliveira

et al. develop a random key pre-distribution scheme for hierarchical sensor networks.

These papers represent an exciting, insightful observation into the state of the art, as well as emerging future topics, in this important new area of wireless sensor networks. We thank reviewers who spent time and efforts reviewing manuscripts for this special issue and the Editor-in-Chief for great support to make this special issue possible.

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