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Editorial

Adaptive Sensing in Emerging Sensor Networks

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Wireless sensor networks (WSNs) have been a remarkably hot topic in the last decade. With a WSN, the interesting physical information can be automatically sensed and filtered at node level and when transmitted to sink nodes, fused, and analyzed at system-wide level, thereby bridging the physical domain and information domain. Given that sensor nodes are of typically small size, how to perform adaptive sensing to ensure quality of sensing (also known as coverage) while maintaining the sustainability of sensor networks is a fundamental issue. With technology advance, new types of sensor networks have emerged, such as camera sensor networks, wireless rechargeable sensor networks, and radar sensor networks. Meanwhile, more sensors are being embedded in popular pocket-sized electronic devices, and this gives rise to a new paradigm of mobile sensor networks, that is, crowd sensing. With these emerging sensor networks, existing studies on sensing may not work since the sensing models, energy management, and network topology could be radically different from traditional ones. It is, therefore, of great interest to study the adaptive sensing in these emerging sensor networks.

This special issue provides the chance for researchers in sensor networks to provide their state-of-the-art thoughts and solutions to address the fundamental sensing problem. Out of 42 submissions, we have finally chosen some papers, which are concerned with different kind of interesting sensing problem.

The paper titled "One-Tier versus Two-Tier Wireless Sensor Networks: Coverage Problem" by T. Sheltami focuses on coverage problem in homogenous and heterogeneous wireless sensor networks. It considers a sensor network of two ties, super nodes and satellite nodes, and studies the intrinsic coverage problem. The paper "Fault Tolerant Line-Based Barrier Coverage Formation in Mobile Wireless Sensor Networks" by J. Shen et al. deals with barrier coverage problem in Mobile Wireless Sensor Networks when the nodes have location errors. Frequency domain analysis is used to obtain the probability of uncovered holes existing on the barrier. The paper "Verifiable Top-k Query Processing in Tiered Mobile Sensor Networks" by F. Liu et al. presents a tiered mobile sensor network model named TMSN and proposes an effective verification scheme called VTMSN to verify the authentication theoretical analysis. The paper "Energy Hole Minimization with Field Division for Energy Efficient Routing in WSNs" by K. Latif et al. designs algorithms for reducing energy hole in sensor networks.

The paper "SAFM: An Adaptive Socially Aware Feedback Mechanism in Delay Tolerant Sensor Networks" by Y. Lui et al. proposes an adaptive socially aware feedback mechanism (SAFM). The proposed mechanism can reach a tradeoff between overhead and delivery efficiency. The paper "Channel-Aware Adaptive Quantization Method for Source Localization in Wireless Sensor Networks" by G. Liu et al. develops a channel-aware adaptive quantization method under imperfect communication channels. The paper "Downlink and Uplink Cooperative Transmission for Primary Secrecy Based Cognitive Radio Sensor Networks" by D. Wang et al. deals with the cooperative transmission in cognitive radio sensor networks. The paper "Trust-Based Anomaly Detection in Emerging Sensor Networks" by R. Wu et al. studies the anomaly detection by social trust in sensor networks.

The paper "Repeated Game for Distributed Estimation in Autonomous Clustered Wireless Sensor Networks" by G. Liu et al. considers the distributed estimation problems in wireless sensor networks for autonomous clustered scenarios. The paper "Decomposition Based Localization for Anisotropic Sensor Networks" by B. Gao et al. adopts the decomposition method to increase localization accuracy in anisotropic sensor networks. The paper "Adaptive Sensing Private Property Protection Protocol Based on Cloud" by K. Fan et al. devises a privacy protection protocol for adaptive sensing based on cloud. The paper "WSNs-Based Mechanical Equipment State Monitoring and Fault Diagnosis in China" by J. Huang et al. focuses on how to adaptively detect fault and mechanical equipment state by sensor networks.

The paper entitled "Routing Protocols in Underwater Acoustic Sensor Networks: A Quantitative Comparison" by G. Han et al. analyzes routing protocols for underwater acoustic sensor networks and compares the performance of several classical routing algorithms. The paper "Optimal Jamming Attack Scheduling in Networked Sensing and Control Systems" by L. Zhang et al. investigates the security issues in Networked Sensing and Control Systems (NSCS). Specifically, they study the optimal DoS attack policy against Linear Quadratic Gaussian (LQG) control when the attacker has limited energy budget in a finite time horizon. The paper "An Adaptive Aggregation Scheduling Algorithm Based on the Grid Partition in Large-Scale Wireless Sensor Networks" by X. Qi et al. studies the scalable aggregation scheduling schemes in sensor networks. The paper "Spatiotemporal Correlation Based Fault-Tolerant Event Detection in Wireless Sensor Networks" by K. Liu et al. proposes a spatiotemporal correlation based fault-tolerant event detection scheme for the binary detection of interesting environmental events in WSNs, which leverages a two-stage decision fusion scheme to solve the problem. The paper "NDSL: Node Density-Based Subregional Localization in Large Scale Anisotropy Wireless Sensor Networks" by Z. Tang et al. proposes a localization method NDSL based on node density and regional division. The network is divided into many subregions where the nodes density is relatively uniform, and then the single-hop distance in each subregion is corrected to locate unknown nodes. Practical deployment and simulation experiments show that the accuracy of NDSL obviously outperforms traditional DV-Hop algorithm.

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