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Editorial

Smart Sensor Networks: Theory and Practice

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Wireless sensor networks (WSNs) are a new and emerging type of networks. The ubiquitous nature of WSNs has led to a growing interest in rendering them smart and autonomous, which have the potential to enable a large class of applications in multiple fields such as smart power grids, smart health care, smart buildings, and smart industrial process. In spite of the increasing demand for smart services, we are still lacking a clear understanding of analytical and computational techniques, as well as best practices, to design resource allocation schemes, power efficient protocols, and self-organization algorithms for WSNs. Despite recent advances, dynamic spectrum access, cognitive radios, ultra-wideband and cooperative communications, among other techniques, will have a profound impact on smart sensor networks and applications. The objective of this special issue is to present a collection of high-quality research papers that report the latest research advances of WSNs in the area of smart technologies and applications.

There were 107 papers submitted for consideration for publication in this special issue. After two rounds of rigorous peer review and revision processes, only 30 papers were selected for publication. The acceptance rate is 28%. Unfortunately, not all of the excellent papers can be selected into this special issue due to the limited space available. The low acceptance rate reflects the very competitive selection process, and we believe that these papers included in this special issue represent the outstanding quality of the research outcomes in this field. The papers included in this special issue are categorized into the following areas.

The six papers selected in the group have proposed several new methods for multidisciplinary design and optimisation of smart protocols. The papers "*A self-organized and smart-adaptive clustering and routing approach for wireless sensor networks,*" "*Distributed algorithm for real-time energy optimal routing based on dual decomposition of linear programming,*" "*triangular energy-saving cache-based routing protocol by energy Sieving*", and "*SWR: smartness provided by simple, efficient, and self-adaptive algorithm*", concentrate on smart routing algorithm and protocol design, and the papers "*MAC protocols used by wireless sensor networks and a general method of performance evaluation*" and "*network-coding-based cooperative ARQ medium access control protocol for wireless sensor networks*" explore how to design efficient MACs protocols.

Power consumption is a key issue in WSNs. The five papers selected in the group propose several emerging schemes for designing smart power-saving methods. The papers "*DI-GEP: a new lifetime extending algorithm for target tracking in wireless sensor Networks*" and "*adaptive WSN scheduling for lifetime extension in environmental monitoring applications*" focus on lifetime extension. The paper "*An experimental study of WSN power efficiency: MICAz networks with XMesh*" provides the experimental results of power efficiency. The paper "*Interference-free wakeup scheduling with consecutive constraints in wireless sensor networks*" proposes a new wakeup scheme to reduce power consumption. The survey paper "*Survey: discovery in wireless sensor networks*" reviews recent progress on the problems of neighbour discovery for WSNs.

Smart coverage and location schemes are very important techniques in WSNs. The three papers selected into this group, "*Error-tolerant and energy-efficient coverage control based on biological attractor selection model in wireless sensor networks,*" "*The complexity of the minimum sensor cover problem with unit-disk sensing regions over a connected Monitored Region*" and "*Ion-6: A Positionless Self-Deploying Method for Wireless Sensor networks,*" propose several efficient design and optimisation schemes for intelligent coverage.

The papers "*Robust interval-based localization algorithms for mobile sensor networks*" and "*Localization algorithm based on maximum a posteriori in wireless sensor networks*" study the smart location algorithm in WSN.

In the fourth group, five papers, "*Information fusion-based storage and retrieve algorithms for WSNs in disaster scenarios,*" "*An efficient data-gathering scheme for heterogeneous sensor networks via mobile sinks,*" "*Intelligent collaborative event query algorithm in wireless sensor networks,*" "*A mutual algorithm for optimizing distributed source coding in wireless sensor networks*" and "*performance analysis of flow-based traffic splitting strategy on cluster-mesh sensor networks*" discuss data processing and performance optimization in WSNs.

Security and privacy is another key problem in WSNs; in this group, three papers "*Enhancing sink-location privacy in wireless sensor networks through k-anonymity,*" "*One-time broadcast encryption schemes in distributed sensor networks*" and "*Subjective logic-based anomaly detection framework in wireless sensor networks*" propose several schemes to improve the security performance in WSNs.

In the last group, there are six papers exploring the smart applications based on WSNs. Three papers, "*An integrated approach to the design of wireless sensor networks for structural health monitoring,*" "*Novel energy-efficient miner monitoring system with duty-cycled wireless sensor networks*" and "*Wireless sensor network for environmental monitoring: application in a coffee factory,*" discuss the monitoring systems based on WSNs in different cases. The paper "*A mobile computing framework for pervasive adaptive platforms*" *and* "*Analysis of mobility and sharing of WSNs by IP applications*" study mobile applications based on WSNs. The paper "*Enabling collaborative musical activities through wireless sensor networks*" proposes the use of an optimized WSN network for interconnecting MIDI (musical instrument digital interface) devices.

The thirty papers included in this special issue touch on six different topics. They reflect the diversity and the richness of smart WSNs research activities and applications. We hope that this special issue can help readers to get a better understanding about the breadth and depth of current research. We also hope that this special issue can boost further related research and technology improvements in the field of WSNs.

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