

## Editorial

# QoS Based Cooperative Communications and Security Mechanisms for Ad Hoc Sensor Networks

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Wireless sensor networks (WSNs) are composed of sensor nodes and sinks. Sensor nodes have the capability of self-healing and self-organizing. They are decentralized and distributed in nature where communication takes place via multihop intermediate nodes. The main objective of a sensor node is to collect information from its surrounding environment and transmit it to the sink. WSNs have many applications and are used in scenarios such as detecting climate change, monitoring environments and habitats, and various other surveillance and military applications. Mostly sensor nodes are used in such areas where wired networks are impossible to be deployed. WSNs are deployed in physical harsh and hostile environments where nodes are always exposed to physical security risks damage.

Wireless sensor networks (WSNs) are gaining significant interest from academia and industry. Multihop wireless networks are self-organizing and self-healing with cost-effective deployment and maintenance, yet a lot needs to be done in terms of efficient and robust solutions. WSN has been an interesting area of research in the last years for various disciplines. WSN is the most appropriate choice for different environments monitoring.

In this special issue, we concentrate mainly on quality-of-service (QoS) based cooperative communication and advanced security mechanisms for wireless sensor network. We are interested in novel ideas, advanced techniques, comparative analysis of different methodologies, detailed surveys, and technical reviews on all aspects of QoS based cooperative communications and security mechanisms in wireless sensor

networks. This special issue covers industrial applications and academic research contributions.

Potential topics included, but were not limited to, context and location aware applications; data gathering, fusion, and dissemination in WSNs; operating system and middleware support; multimedia over sensor networks; smart cities and smart environment; cooperative communication; relaying techniques; attacks and countermeasures; security tools; cross layer security mechanisms; authentication and key management; intrusion detection systems; security policies and information hiding; privacy and anonymity; active, passive, and denial of service (DoS) attacks; and secure routing protocols.

We welcomed papers about techniques and applications, awareness, experiences, and best practices as well as future trends and needs related to all aspects of QoS based cooperative communication and security mechanisms.

The papers have been peer reviewed and have been selected on the basis of their quality and relevance to the topic of this special issue.

The paper “*Grid-Based Hybrid Network Deployment Approach for Energy Efficient Wireless Sensor Networks*” introduces a novel Grid-based Hybrid Network Deployment (GHND) framework which ensures energy efficiency and load balancing in wireless sensor networks. This research is particularly focused on merge and split technique to achieve even distribution of sensor nodes across the grid. Low density neighboring zones are merged together whereas high density zones are strategically split to achieve optimum

balance. Extensive simulations reveal that the proposed method outperforms state-of-the-art techniques in terms of load balancing, network lifetime, and total energy consumption.

Coverage range and coverage probability are important aspects to be considered for deploying WSN. The authors in “A New Energy-Efficient Coverage Control with Multinodes Redundancy Verification in Wireless Sensor Networks” propose an energy-efficient coverage control with multinodes redundancy verification (ECMRV) scheme.

Energy-efficient spectrum sharing in WSN is an emerging and challenging research area. The authors in “Statistical Delay QoS Provisioning for Energy-Efficient Spectrum-Sharing Based Wireless Ad Hoc Sensor Networks” develop the statistical delay QoS provisioning framework which is capable of ensuring QoS based spectrum sharing in WSN.

In underwater acoustic channel, signal transmission may experience significant latency and attenuation that would degrade the performance of underwater communication. The paper “Time Reversal Aided Bidirectional OFDM Underwater Cooperative Communication Algorithm with the Same Frequency Transmission” proposes time reversal aided bidirectional OFDM underwater cooperative communication algorithm. The algorithm allows all underwater sensor nodes share the same uplink and downlink frequency simultaneously to improve the spectrum efficiency.

Increasing research efforts have been dedicated to the ubiquitous Internet of Things (IoT) access which demands robust quality-of-service (QoS) assurance in terms of security and reliability over wireless channels. The authors in “Robust Relay in Narrow-Band Communications for Ubiquitous IoT Access” propose a robust wireless relay scheme in narrow-band communications, which matches the typical features of IoT access carrying relatively low data rate with limited bandwidth

We hope that this special issue will be useful for researchers from the academia and the industry, standard developers, policy makers, professionals, and practitioners.

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