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Editorial

Smart and Cooperative Sensor Networks

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During the last decade sensor networks have drawn significant interest for providing ubiquitous access to information anywhere and anytime. Sensor networks are now being developed by both academia and industries for supporting various applications within industrial automation, military, e-health, home, and so forth. The designs of sensor networks are application specific and this makes the sensor networks difficult to manage in an easy way. In addition, it can lead to problems with resource utilization, in which multiple sensor networks are developed for different applications and numerous vendors are developing multiple sensor networks without sharing common resources. These challenges motivate the research for developing smart and cooperative sensor networks, in which the sensor networks can be flexibly adapted to various applications and easily managed.

This special issue provides a chance for both academic and industry professionals to discuss recent progress in the area of smart and cooperative design for sensor network, including smart and cooperative systems and architecture, new directions, algorithm design, and security issues. Totally, 14 papers are selected from numerous submissions with various aspects in smart and cooperative sensor networks research.

The paper "*Control theory-based load balancing for wireless sensor network*" by S. Zhou and Y. Chen proposes a novel real-time load balancing technique which does not require the knowledge of static traffic demands and is based on control theory. They formulate the packet forwarding problem into a classic control model and derive a controller model. And they have proposed an algorithm to implement the controller.

The paper "*Energy-aware service composition algorithms for service-oriented heterogeneous wireless sensor networks*" by T. Wang et al. proposes an energy-aware service composition framework for developing various applications in heterogeneous wireless sensor networks. They formulate the process of energy-aware sensor service composition into a combinatorial optimization problem and an improved discrete particle swarm optimization algorithm with inertia weights adjustment and extreme perturbation scheme is proposed to solve the combinatorial optimization problem.

In the paper "*Energy consumption evaluation for wireless sensor network nodes based on queuing Petri net,*" J. Li et al. present a state-event-transition formal description for WSN nodes and propose an event-driven QPN-based modeling technique to simulate its energy behaviors. The framework architecture of a dedicated energy evaluation platform has also been introduced to simulate the energy consumption of WSN nodes and to evaluate the system lifetime of WSN.

The paper "*Improving the indoor localization accuracy for CPS by reorganizing the fingerprint signatures*" by J. Qiu et al. presents a novel localization scheme on localization of CPS by reorganizing the fingerprint signatures for improving the indoor localization accuracy. The scheme is achieved by site survey and received signal comparison and location correction phases.

In the paper "*Application of wireless sensor networks for indoor temperature regulation,*" B. R. Stojkoska et al. propose a framework for indoor temperature regulation and

optimization using wireless sensor networks based on ZigBee platform. Particularly, they consider architectural design of the system, as well as implementation guidelines in the paper.

The paper "*Hierarchical aggregation of uncertain sensor data for M2M wireless sensor network using reinforcement learning*" by I. Doh and Y. Choi presents a hierarchical aggregation for uncertain sensor data using reinforcement learning to get correct and efficient data gathering result for reliable wireless sensor network. A new category for uncertain data is added and they are classified through reinforcement learning using hierarchical subcategories.

The paper "*Game theoretic request scheduling with queue priority in video sensor networks*" by J. Zhao et al. proposes a game strategic request scheduling based on a queue priority model in which a handover mechanism ensures that the abnormal requests are processed in time. The request scheduling game optimizes the utilities of both abnormal data-reporting requesters and normal data-reporting requesters and balances the load on cluster heads.

In the paper "*An energy-efficient cooperative communication method for wireless sensor networks*" by K. Lee and H. Lee, an energy-efficient cooperative communication method is proposed which forms clusters and establishes intercluster routes directly or via relay nodes. The proposed model attempts to maximize the network lifetime and to maintain load balance through clustering and intercluster routing by using relay nodes.

The paper "*Cross-layer optimization scheme using cooperative diversity for reliable data transfer in wireless sensor networks*" by Y. Chen et al. investigates the problem of transmission power minimization and network lifetime maximization using cooperative diversity for wireless sensor networks under the constraint of a target end-to-end transmission reliability and a given transmission rate. By utilizing a cross-layer optimization scheme, distributive algorithms which jointly consider routing, relay selection, and power allocation strategies are proposed for the reliability constraint wireless sensor networks.

The paper "*Cooperative energy efficient management scheme for multimedia information dissemination*" by J. Chen and H. Zhou investigates the energy efficient management problem in information centric sensor network, in which both transmission energy and caching energy are considered. The exact analytical expression for the energy consumption model is derived in such network and cooperative energy efficient management scheme is proposed for multimedia information dissemination.

The paper "*A cross-layer cooperation mechanism of wireless networks based on game theory*" by C. Chunsheng et al. proposes a mechanism of directed cooperative path net, guided by the wireless network's cross-layer design methods and node cooperation principles to solve the wireless network congestion control problem. Particularly, considering the virtual collision and "starved" phenomenon in congested networks, the queue and rate dispatch mechanism and channel competition mechanism queue transmission path of channel game are proposed, with introducing the game theory into the cross-layer design.

The paper "*Secure and efficient authentication scheme for mobile sink in WSNs based on bilinear pairings*" by J. Zhang et al. presents a bilinear pairing based authentication and key agreement scheme for the authentication between mobile sinks and cluster head in WSNs. The proposed scheme solves the problems of mobile sink authentication and provides data confidentiality and integrity.

The paper "*Small cell deployment and smart cooperation scheme in dual-layer wireless networks*" by S. Wei et al. presents a new cooperation scheme for energy saving in dual-layer networks. This scheme is implemented through a functional modular, named by Area Control Center (ACC).

The paper "*An analysis of performance in a hierarchical structured vehicular ad hoc network*" by W. Zhu et al. presents a deep performance analysis of a large-scale VANET and extends the technology of Mobile IP used in a MANET into the VANET. In addition they apply the destination-sequenced distance-vector (DSDV) routing protocol and the Mobile IP to support intra- and intercommunications of local VANETs.

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