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Editorial

Fault-Tolerant and Ubiquitous Computing in Sensor Networks

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The wireless sensor networks have already been used in world-wide various applications and are expected to change the future of our world. To connect these heterogeneous networks is still a pioneering issue since people generally require to obtain ubiquitous services anywhere on the earth and ignore the harsh environment where sensors are located. The development of the future sensor networks needs fully new proposals for network architecture varying from the physical layer to upper application layer. The main focus of this special issue will be on the new fault-tolerant and ubiquitous computing issues for large-scale wireless sensor networks. Of course, the selected topics and papers are not an exhaustive representation of the area of fault-tolerant and ubiquitous computing in sensor networks. Nonetheless, they represent the rich and many-faceted knowledge which we have the pleasure of sharing with the readers.

This special issue contains seven papers, where four papers are related to fault-tolerant issue in the distributed wireless sensor networks. Two papers are regarding the media access control and topology controls in network architecture. One paper concerns with the sensor applications and issues in cloud environments.

In the paper, "*Node selection algorithms with data accuracy guarantee in service-oriented wireless sensor networks*," H. Cheng et al. study the node selection problem with data accuracy guarantee in service-oriented wireless sensor networks by exploiting the spatial correlation between the service data. Firstly, they formulate the problem into an integer nonlinear programming problem to illustrate its NP-hard property. Secondarily, they propose two heuristic algorithms for this problem: the previous is designed to select nodes for each service in a separate way, and the second is designed to select nodes accordingly to their contribution increment. And finally, they introduce the simulation results by comparing the algorithms in different environments.

In the paper, "*Energy-efficient bridge detection algorithms for wireless sensor networks*," O. Dagdeviren and V. K. Akram present two distributed energy-efficient bridge detection algorithms for wireless sensor networks. The first algorithm is the improved version of Pritchard's algorithm where two phases are merged into a single phase, and radio broadcast communication is used instead of unicast. The second runs proposed rules on 2-hop neighborhoods of each node and try to detect all bridges in a breadth-first search (BFS) execution session.

In the paper, "*A fault-tolerant method for enhancing reliability of services composition application in WSNs based on BPEL*," Z. Wu et al. present a framework and approach to enhance the reliability of service composition applications in wireless sensor networks. Firstly, they analyze the possible states during the execution of BPEL instance in wireless sensor networks. Secondarily, they present a state framework for modeling execution context in BPEL instance and analyze state transition proposing the state transition models for three types of activities in BPEL instance. Finally, they present a formal approach to model the execution context in BPEL based on this state transition model.

In the paper, "*Distributed fault-tolerant event region detection of wireless sensor networks*," D.-R. Duh et al. present a distributed fault-tolerant event region detection algorithm for wireless sensor networks. The proposed algorithm can identify faulty and fault-free sensors and ignore the abnormal

readings to avoid false alarm. Moreover, every event region can also be detected and identified. The simulation results demonstrate that the algorithm has better performance compared with related works.

In the paper, "*A time slot reservation in modified TDMA-based ad hoc networks with directional antennas*," Y. Li et al. present the bandwidth reservation issue in wireless ad hoc networks with directional antennas and propose a time slot reservation algorithm. The time slot reservation algorithm allows a path reservation with maximal available bandwidth. The performance is analyzed, and simulation results show that it performs better in terms of end-to-end delay, percentage of control packets, and successfully received packets. The scheme is a help to QoS provisioning in wireless ad hoc networks with directional antennas.

In the paper, "*A PSO-optimized minimum spanning tree-based topology control scheme for wireless sensor networks*," W. Guo et al. present a PSO-optimized minimum spanning tree-based topology control scheme NDPSO for the wireless sensor networks by transforming the problem into a model of multicriteria degree constrained minimum spanning tree (mcd-MST). Simulation results show that NDPSO can converge to the nondominated front quite evenly, and the topology derived under the proposed topology control scheme has lower total power consumption, higher robust structure, and lower contention among nodes.

In the paper, "*IM-Dedup: an image management system based on deduplication applied in DWSNs*," J. Zhang et al. study the cloud computing platform for the distributed wireless sensor networks and design an image management system IM-Dedup which uses static chunking (SC) to divide image file into blocks of data and avoid duplication data blocks transmission on network by using fingerprint pretransmission technology and reduce storage space.

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