Editorial

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Research in Wireless Sensor Networks (WSNs) has received tremendous attention in recent years from both academia and industry. With the advance of technologies for microsensors, wireless networking and embedded processing, WSNs are now widely tested and deployed for different application domains. Existing applications include environmental monitoring, industrial sensing/diagnosing, healthcare and data collecting for battlefield awareness.

While many applications have been developed over small/medium-size areas, dense and extensive deployments of sensor nodes in large-scale regions are anticipated in the near future. How to effectively extend results in WSNs from small-range indoor environments to extremely large spaces is very challenging. The aim of this Special Issue is to disseminate the state-of-the-art R&D results on large-scale WSNs and to facilitate the deployments of large-scale WSNs. Research results from both academia and industry are sought with an objective in fostering interactivities among researchers and developers.

This Special Issue is composed of six outstanding papers that emphasise different aspects of large-scale WSNs.

In the first paper, "Message-efficient in-network location management in a multi-sink wireless sensor network", C-Y. Lin et al. open our Special Issue with an interesting topic. They propose an efficient location management scheme for object tracking in a multisink sensor network. In this scheme, an in-network update and query algorithm for the multisink sensor network is presented. They conclude that when the query cost dominates the communication cost, using multiple sinks can achieve better performance and loads of sensors are easily balanced through the usage of multiple sinks.

In the second paper, "Reliable data transport and congestion control in wireless sensor networks", Q. Pang et al. explore the challenges in the designing of transport layer functions for WSNs. The issues with applying traditional transport protocols over WSNs are discussed and recent research progress in developing suitable transport protocols for WSNs is reviewed. Also, they

elaborate on some future research directions of transport protocol in WSNs.

In the third paper, "Efficient available energy monitoring in wireless sensor networks", V.C. Gungor focuses on the issue of available energy monitoring for the entire wireless sensor network. In this paper, a new Forecasting-based Monitoring and Tomography (FMT) framework is presented to achieve overall monitoring and to capture the tomography of the available energy in WSNs with minimum energy expenditure.

In the fourth paper, "Performance implications of periodic key exchanges and packet integrity overhead in an 802.15.4 beacon enabled cluster", J. Misic et al. highlight the challenges in secure data exchange for 802.15.4-based WSNs. They discuss the impacts of key exchange protocols and security mechanisms on the performance measures such as key cost, blocking probability and throughput.

In the fifth paper, "Minimising the effect of WiFi interference in 802.15.4 wireless sensor networks", R. Musaloiu-E et al. identify the problem of interference for the coexistence of WiFi with 802.15.4 WSNs. They present interference estimators that can be efficiently implemented on resource constrained motes. These estimators are extremely effective in reducing loss rate from 58% to less than 1%.

In the sixth paper, "A fault-tolerant routing protocol in wireless sensor networks", H-L. Chao et al. propose a fault-tolerant routing protocol for WSNs to support reliable data delivery.

In the last paper, "MOCUS: moving object counting using ultrasonic sensor networks", Q. Chen et al. present a moving object counting system by using ultrasonic sensors. They deploy a network of three-node ultrasonic sensor clusters to count moving objects and the counting accuracy can reach 90% by using an intra-cluster analysis and an inter-cluster cooperation techniques.

In closing, we would like to thank all the authors for their high-quality contributions to this Special Issue. Also, we are indebted to the referees for their time and effort in carefully reviewing all the papers and providing valuable comments. Our special thanks go to Dr. Yang Xiao, the Editor-in-Chief, for his continued support, encouragement and guidance during the entire process of this Special Issue.