
Editorial

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Qiangfu Zhao (M'97) received his PhD degree from Tohoku University of Japan in 1988. He joined the Department of Electronic Engineering of Beijing Institute of Technology of China in 1988, first as a Post-Doctoral Fellow and then Associate Professor. He was an Associate Professor from October 1993 at the Department of Electronic Engineering of Tohoku University of Japan. He joined the University of Aizu of Japan from April 1995 as an Associate Professor, and became tenure full Professor in April 1999. His research interests include image processing, pattern recognition, machine learning, and awareness computing.

Wireless sensor networks (WSNs) have received significant attention in the past 10 years and have found a variety of applications in environmental monitoring, precision agriculture and human health monitoring, among others. Awareness plays a significant role in WSNs because it allows for interpreting context information (e.g., energy, location, situation, user behaviour, etc.) such that various WSN problems can be solved in a smart way under the constrained energy and computation capability.

Awareness is the ability to perceive, to feel, or to be conscious of events, objects or sensory patterns. It often implies vigilance in observing and alertness in drawing inferences from what one experiences. This special issue aims to gather contributions that explore awareness computing in WSNs in both theory and engineering implementation.

In this special issue, we received 17 submissions and the accepted eight papers fall in the following various aspects of awareness computing in WSNs.

User behaviour awareness

The paper, ‘On human mobility assisted data collection in wireless sensor networks’ by Li et al. considers the application of mobile users serving as sinks for WSNs, where data from sensors will be collected through the wireless devices (e.g., smart phone and iPad) carried by mobile users only when they pass by. The user mobility pattern has been exploited by the authors in developing efficient data collection schemes for combinatorial cases of single/multiple user and unlimited/limited bandwidth. The performance of proposed schemes has been evaluated by both analysis and simulations.

Energy awareness

The paper, ‘An energy-balanced self-deployment algorithm based on virtual force for mobile sensor networks’ by Jia and Chen investigates the sensor redistribution problem in WSN. By introducing the concept of virtual sensing radius, a self-deployment algorithm based on virtual force is proposed to maximise network lifetime.

The paper, ‘A square-based coverage and connectivity probability model for WSNs’ by Xing et al. proposes an efficient approximation algorithm to find a largest cover set (LCS) under certain network connectivity. Their theoretical results show that the redundant sensor nodes can be greatly reduced by constructing the LCS of the network, leading to much improved energy efficiency.

The paper, ‘Biquaternion Capon beamformer using four-component vector-sensor arrays’ by Gou et al. proposes a hyper-complex variant of Capon beamformer that minimises the output power of the array constrained by the distortionless response of the signal-of-interest (SOI). Their experimental results show that the proposal outperforms the standard long-vector counterpart in convergence and sensitivity.

Location awareness

The paper, ‘A 3D localisation method for searching survivors/corpses based on WSN and Kalman filter’

by Wang et al. proposes a 3D localisation method for searching survivors/corpses in WSN-based disaster recovery system. In particular, the authors have evaluated the proposed method by real experiments using a robot car with a sensor node acting as a mobile beacon node.

The paper, ‘Particle filter based device free localisation and tracking for large scale wireless sensor networks’ by Wang et al. presents a particle filter-based approach to realise the target localisation and tracking task for large scale. To make their strategies applicable to resource-limited large scale WSNs, additional practical scheme has been studied and evaluated by experiments as well.

The paper, ‘An indoor location system based on neural network and genetic algorithm’ by Chen et al. develops a framework using multiple Back-Propagation neural networks with genetic algorithm for a radio frequency identification (RFID) indoor location system to provide location services for applications in patient care, smart homes, and smart spaces.

Situation awareness

The paper, ‘OTSP: an optimised time synchronisation protocol for wireless sensor networks’ by Beghdad and Tinsalhi exploits the knowledge of neighbouring nodes in the development of new time synchronisation protocol for WSNs. Performance analysis and simulations show its superiority in terms of synchronisation error.

By putting these eight papers together to form this special issue on Awareness in Sensor Networks, we hope that readers will find the papers informative and get some useful references for their own work in this area.

The Guest Editors would like to thank all the authors who submitted papers to this special issue. We would also like to express our gratitude to all volunteer reviewers, who ensure the quality of the accepted papers by providing valuable feedback and thoughtful comments. Finally, we would like to thank the Editor-in-Chief, Professor Yang Xiao, for his strong and consistent support and guidance.