Preface

Xiaohua Jia

Computer School of Wuhan University,
Wuhan, Hubei, PRC 430072, China
E-mail: jia@cs.cityu.edu.hk

Peng-Jun Wan

Department of Computer Science,
City University, Hong Kong
E-mail: pwan@cs.cityu.edu.hk

Biographical notes: Xiaohua Jia received his BSc (1984) and MEng (1987) from the University of Science and Technology of China, and DSc (1991) in Information Science from the University of Tokyo, Japan. He is currently a Professor in Department of Computer Science at City University of Hong Kong and Cheung Kong Professor with the School of Computing, Wuhan University, China. He has published over 200 research articles (including over 100 international journal papers).

Peng-Jun Wan received his BS from Tsinghua University in 1990, his MS from the Chinese Academy of Sciences in 1993, and his PhD from the University of Minnesota in 1997. He has been a Faculty member in the Department of Computer Sciences at the Illinois Institute of Technology since 1997. He is presently also affiliated with the Computer Science Department of City University of Hong Kong. His research interests include wireless networks, optical networks, and algorithm design and analysis.

The fast growth of wireless communications and electronics has fuelled the extensive research and system development on wireless sensor networks. Sensor nodes consist of sensing, data processing and communication components which are typically low-cost and low-powered. Since sensor nodes are usually powered by batteries, and it is not possible to recharge or replace the batteries after they are deployed, energy conservation has been the central issue in the design of sensor networks. Object tracking and environment monitoring are typical applications of sensor networks. As for the design of sensor networks, there are two active research topics: network self-organisation, and query +dissemination and information collection. This special issue consists of eight research papers, which address those important issues. The eight papers are in three groups; the first two papers address issues of sensor network applications and deployments and the second two papers discuss the clustering methods for self-organisation of sensor nodes. The last four papers discuss routing issues in sensor networks, including multicast and broadcast routing.

The first paper 'Resilient and energy efficient tracking in sensor networks' by Halkidi et al. discusses an important application of sensor networks: detecting and monitoring objects as they move through a sensor area. The paper presents a distributed mechanism for tracking moving objects which is energy efficient and also fault tolerant. The paper also gives an algorithm for predicting the future location of an object, based on the past observations of many sensors. The second paper is 'Placement of network services in a sensor network' by Jennifer Yick et al. This paper discusses the placement of beacons and data loggers in a sensor monitoring system for a large habitat, the Cosumnes River Preserve. It assumes that the sensors are already deployed randomly in an irregular terrain and considers locations of the data loggers and beacons such that all sensors are covered and the total power consumption for collecting data is minimised.

The next two papers are about clustering of sensor nodes. In the first paper 'A distributed clustering method for energy efficient data gathering in sensor networks', Kamimura et al. propose a novel clustering method where energy-efficient clusters are organised in a distributed and self-organising fashion through local communication among sensor nodes. This method is based on the idea of ANTCLUST, a clustering method used by ants. Experiments show that this method can increase the lifetime of the system by 80% as compared with other clustering methods. The next paper, 'Energy efficient Chessboard Clustering and routing in heterogeneous sensor networks', proposes an interesting method for clustering sensor nodes. The method divides the sensing region into grids of cells and labels the cells 'green' and 'white' like a chessboard. The sensors in the white and green cells take the leaders' role in turn, and therefore the lifetime of the entire network could be doubled.

The four papers in the last group are about routings. The paper 'Bounds on hop distance in greedy routing approach in wireless ad hoc networks' by Swades De et al.

presents an analytical model for analysing the bounds on hop counts for a pair of nodes with a given Euclidean distance. This is a significant theoretical result which gives the worst case hop counts between two nodes in any geographical routing method. In the paper 'Distributed energy-efficient geographic multicast for Wireless Sensor Networks', the authors propose a set of distributed methods for multicast messages to a geographical region by using fewer message transmissions. Multicasting to geographic regions is an important operation for query dissemination in sensor networks, and the proposed methods are distributed and can be implemented in real systems. The last two papers, 'A distributed algorithm for computing Connected Dominating Set in ad hoc networks' and 'A novel tree-based broadcast algorithm for wireless ad hoc networks', are about algorithms for computing Connected Dominating Set (CDS) for a network. CDS is an important structure widely used as backbone of ad hoc (sensor) networks. It can be also used for efficient broadcasting, where a broadcast message is first sent to the nodes in CDS that then forward the message to all nodes in the network by on-hop transmission.