Editorial

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Biographical notes: Xiang-Yang Li has been an Associate Professor (since 2006) and Assistant Professor (from 2000 to 2006) of Computer Science at the Illinois Institute of Technology. He received MS (2000) and PhD (2001) Degree at Department of Computer Science from University of Illinois at Urbana-Champaign, a Bachelor Degree at Department of Computer Science and a Bachelor Degree at Department of Business Management from Tsinghua University, China, both in 1995. He published a monograph 'Wireless Ad Hoc and Sensor Networks: Theory and Applications'. He also co-edited the book 'Encyclopedia of Algorithms' and the book 'Sensor and Ad-Hoc Networks: Theoretical and Algorithmic Aspects'. The research of Dr. Li has been supported by USA NSF, Hong Kong RGC, and China NSF. His research interests span the wireless sensor networks, game theory, computational geometry, and cryptography and network security. He served various positions (as chairs and TPC members) at several international conferences. He is an editor of several international journals, such as IEEE Transaction on Parallel and Distributed Systems (2009 to present), and steering committee member of AAIM conference. He is a senior member of the IEEE.

Chang Wu Yu (James) received the BS Degree from Soochow University in 1985, MS degree from National Tsing Hua University in 1989, and PhD degree from National Taiwan University in 1993, all in Computer Sciences. From 1995 to 1998, he was an Associate Professor at the Department of Information Management, Ming Hsin Institute of Technology. Currently, he is a Professor at the Department of Computer Science & Information Engineering, Chung Hua University. His current research interests include graph algorithms and wireless networks. He received best paper awards at 2008 ACM International Conference on Sensor, Ad Hoc, and Mesh Networks and at both 2004 and 2007 Mobile Computing Workshop. He is an Editor of *Ad Hoc & Sensor Wireless Networks*: An International Journal and an organiser of two workshops: *International Workshop on Wireless Network Algorithm and Theory* (WiNA) and *International Workshop on Performance Evaluation of Wireless Networks* (PEWiN).

Wireless networks raise a number of interesting and undiscovered algorithmic issues, while traditional techniques are not sufficient to solve these problems in the right way. For example, the algorithms in vehicular ad hoc networks require a high degree of communication reliability, performance, scalability, security, and privacy-preserving technologies under harsh condition. Researchers need to design practical distributed and centralised algorithms and to introduce novel theoretical models or evaluation methodologies to challenge various kinds of research problems originated from these wireless networks.

This special issue is devoted to algorithms and theoretical methods in wireless networks including mobile ad hoc networks, wireless sensor networks, vehicular ad hoc networks, underwater sensor networks, and all kinds of wireless networks. We hope that this special issue can push the theoretical and practical research forward for a deeper understanding in the fundamental algorithm, modelling theory, and analysis techniques of wireless networks.

Three papers in this special issue are selected and invited from papers in the *Second International Workshop on Wireless Network Algorithm and Theory* (*WiNA 2009*), held on October 12 in Macau in conjunction with *6th IEEE International Conference on Mobile Ad Hoc and Sensor Systems* (*IEEE MASS 2009*). Additional five papers are selected form 28 submissions, coming from different countries all around the globe in response to call for paper. We also invited four excellent articles related to this special issue.

Each accepted paper has been reviewed by at least three program committee members or guest editors. We believe that accepted papers provide a good balance of

the application of algorithms and theory to different networking problems.

The paper entitled 'Performance analysis for indoor location determination' analysed theoretical localisation limits and proposes a precision bound as a benchmark standard to evaluate the performance of indoor systems under various configuration settings and environmental dynamics.

In the paper 'Adaptive technologies for hybrid ad-hoc/cellular network architecture', Ahmed Barnawi proposed two evolving adaptive technologies: adaptive modulation and adaptive smart antenna system. The results show that data throughput rate can be doubled using the developed cross-layer protocol design.

In the paper 'Tree-based Multicast Key Management in ubiquitous computing environment', Yao et al. proposed a Tree-based Multicast group Key Management (TMKM) protocol for ubiquitous computing to generate, distribute, and update the group key securely and efficiently. According to the actual topology of ubiquitous computing environment, the whole group is divided into the server layer and the user layer which is further divided into subgroups.

The paper entitled 'Multiple-metric hybrid anycast protocol for heterogeneous access networks' proposed a new routing protocol that integrates multiple metrics to calculate path cost based on diverse selection criteria. In addition, a hybrid proactive/reactive anycast routing paradigm is applied to guide the discovery of one out of multiple available access points.

In 'CCTF: congestion control protocol based on trustworthiness of nodes in Wireless Sensor Networks using fuzzy logic', Zarei et al. present a Congestion Control protocol for building a sense of trustworthiness in the network is ascertainable. As a result, each node can reduce the effects of malfunctioning neighbour node(s) via dropping valueless packets. This action increases the buffer capacity for legitimate packets and reduces the chances of network congestion.

Yang et al. proposed a distributed Multi-phase Maximum Weighted Matching algorithm, making use of both reliable and un-reliable channels. They prove that the algorithm will achieve maximised overall network throughput with relatively high stability in a distributed manner. They also apply channel bundles to effectively improve stability in the network, and the problem proves to be *NP*-hard. The approximate ratio and complexity of the algorithm are also analysed in a structural manner.

The paper 'EBQP: Enhanced Binary Query Protocol for RFID tag collision resolution with progressive population estimation' proposed an Enhanced Binary Query Protocol (EBQP) for the resolution of collisions caused by the memoryless passive RFID tags. In a collision resolution cycle of this protocol, after each frame, according to the amount of tag identifiers already gathered and the value which the binary query string broadcasted by the reader in the frame maps to the overall population of tags within the vicinity of the reader is estimated, and an optimal binary query string for the protocol to adopt and the reader to broadcast in the next frame is calculated.

In 'A force-driven evolutionary approach for multi-objective 3D differentiated sensor network deployment', Chen and Kang proposed a multi-objective genetic algorithm with a force-driven method to solve 3D differentiated WSN deployment problems with the objectives of the coverage of sensors, satisfaction of detection levels, and energy conservation.

The paper 'Integrated scheduling for mobility-assisted Wireless Sensor Networks' showed that with a limited number of mobile sensors, the network lifetime can be largely extended under the proposed integrated scheduling on both mobile and stationary sensors. The authors addressed the challenge of concurrently optimising the motion planning of mobile sensors and the duty cycles of stationary sensors. They also formulated this scheduling problem as Mixed Coverage Problem (MCP), and prove its NP-hardness.

The paper entitled 'Removing dubious feedback from mobile wireless ad hoc peer-to-peer systems' proposed an extensive reputation based trust management scheme, termed as TruthMOP. TruthMOP encourages peers to provide honest feedback by involving the quality of their evaluations of others into computing reputations. The simulation results show that TruthMOP can effectively mitigate the impact of dubious feedback in mobile wireless ad hoc Peer-to-Peer Networks.

In 'Beyond rigidity: obtain localisability with noisy ranging measurement', Wang et al. introduced the concept of *strong localisability* and propose an algorithm, called LAS, to identify and locate a kind of strongly localisable networks. Taking the geometric constraints into account, LAS is more realistic than existing rigidity-based approaches. They conduct extensive simulations and the results show that LAS can entirely localise a network of the average degree about 12.

Finally, the paper entitled 'Localised sensing strategies for point coverage in directional Wireless Sensor Networks' addressed the point coverage problem in directional WSN with adjustable sensing range, orientation and field of view. They refer to a decision process at each node by building its own corresponding Voronoi polygon (*Vp*) that makes use of only information for a neighbourhood within its acceptable sensing range. By the locality property of *Vp*, a heuristic rule is proposed to minimise the overlapping of coverage of target points while each sensor is responsible to cover target points in its corresponding *Vp* with configuration of minimal sensing area to reduce energy consumption.

Finally, the guest editors appreciate the outstanding review work performed by the TPC members of WiNA 2009, as well as the continuous support from Professor Yuh-Shyan Chen, Editor-in-Chief of IJAHUC.