Editorial

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Biographical notes: Qilian Liang is a Professor in the Department of Electrical Engineering, University of Texas at Arlington, where he has been since August 2002. Prior to this he was a Member of Technical Staff in Hughes Network Systems Inc at San Diego, California. He received the BS degree from Wuhan University, China, in 1993, MS degree from Beijing University of Posts and Telecommunications in 1996, and PhD degree from University of Southern California (USC) in May 2000, all in Electrical Engineering. His research interests include radar sensor networks, wireless sensor networks, etc. He has published more than 200 journal and conference papers, 6 book chapters, and has 6 US patents pending.

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The International Conference of Communications, Signal Processing, and Systems (CSPS) was held in October 2012 in Beijing, China. After the conference, we have selected six best papers in sensor networks area and have asked all authors to further extend them into journal versions. All extended versions have been reviewed by the guest editors. These papers span different topics in sensor networks, which include radar sensor networks imaging, sensor network routing, sensor network optimisation, target detection, sensor network based cognitive radio, etc.

Biao Zhang and Yiming Pi's paper presents a complex-valued generalised Radon transform (CGRT)-CLEAN algorithm for three dimensional (3D) imaging of circular radar sensor networks (CRSN). Based on the analysis of CRSN echo model, the echo of a scatterer in the range-azimuth domain can be modelled as a single cycle sinusoid. Combining the CGRT with CLEAN technique, the parameters of a scatterer which include position information and reflection coefficient is estimated and a three dimensional image of a target is reconstructed. The characteristic of the proposed algorithm provides a way for three dimensional imaging without analysing of azimuth spectrum.

Sheng Su, Haijie Yu and Zhenghua Wu's paper proposes a multi-objective evolutionary algorithm to solve the routing problem in wireless sensor network. Two performance metrics, which consist of the maximisation of remaining lifetime of the wireless sensor network and the minimisation of transmission delay, are considered. Dominating relationship and similarity between solutions are used to compute the fitness of a solution in a population. Moreover, a combination operator is presented to create new solutions. Finally, an exploitation operator is investigated to find better solutions at the neighbour of a solution space and an exploration operator is proposed to inject new genes into a population.

Rui Min, Ruizhi Hu and Qianqian Yang's paper presents a compressive sensing based sparse Bayesian Learning approach to reduce the required number of sensors and to obtain super-resolution in elevation direction for SAR sensor network imaging. Specifically, the Trench-Zohar inversion is used to the normal Sparse Bayesian Learning algorithm to reduce the computation time and storage requirements.

Jiasong Mu, Baoju Zhang and Wei Wang's paper proposes a transmission failure based routing algorithm (TFBRA) for low power consumption in ZigBee networks with changing mobility. The effects of different factors on data communication are discussed. In addition, the probability of transmission failure in one hop is used to describe node mobility. The scheme utilises the information in neighbour table and network address for mobility estimation without any extra communication.

Ishrat Maherin and Qilian Liang's paper presents a sensor network aided cognitive radio system which reduces the missed detection as well as interference. The performance of various sensing and power allocation schemes for an OFDM based cognitive radio system is also investigated in this paper. An optimisation problem to design the optimal sensing time and transmit power to maximise the throughput is formulated. The non-convex optimisation problem is then divided in two separate sub problems and solved to get a suboptimal solution.

Zhengwu Xu, Yuanjie Wu and Xiaoqian Lu's paper presents an estimation method of heartbeat and breath rate using Terahertz radar sensor networks. In order to detect the weak signals, a nonlinear time frequency analysis based on smoothed pseudo Wigner Ville distribution is presented. The echo model of a human target is established firstly. By combining the over-sampling technique with the T-F analysis method, the accurate speed information is obtained. Finally, the frequencies corresponding to heartbeat and breath, respectively, are estimated by down-sampling.

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