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Editorial

Mobile Sensor Networks: Theory, Control, Communication, and Computation Issues

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In recent years, a rapid growth has been witnessed in the use of wireless sensor technologies and mobility for different application scenarios. It is envisaged that, due to the advantages offered, the trend toward mobility will not only continue but is likely to increase over the years to come. However, such employment unveils a variety of opportunities and problems. The steady increase in the use of wireless sensor networks that are designed based on a requirement for mobility is necessarily shifting the more traditional centralized network architecture toward a distributed topology. A direct consequence of this is that many open issues related to theory, control, communication, and computation need to be addressed to ensure the fail-safe operation of mobile sensor networks (MSNs).

MSNs bridge several existing research areas, including multiagent systems, sensor networks, robotics, control theory, and machine learning. Recent years have witnessed the proliferation of application scenarios in which MSNs are used, ranging from environment monitoring to emergency search and rescue operations whereby large numbers of pervasive computing devices are connected to a wireless networking infrastructure in an ad hoc manner.

In an effort to disseminate current advances on MSNs, this special issue aims at bringing together some of the most promising state-of-the-art exemplars in the field of MSNs. The 6 papers contained in this special issue cover the bases in terms of theoretical rigor along with practical implementation. The application areas discussed involve some of the more traditional along with some of those newly emerging. Overall, however, the emphasis here has been on selecting papers for this issue that contain innovative, exciting, and insightful solutions to the problems witnessed.

In the paper "*An evolutionary game-based trust cooperative stimulation model for large scale mANETs*" by X. Wang et al., in order to realize a methodical, effective cooperative stimulation for large scale mobile ad hoc networks (MANETs) and search dynamic trust cooperative stimulation scheme in environment under a high malicious ratio, an evolutionary game-based trust cooperative stimulation model is proposed. The authors demonstrated that their model can effectively stimulate cooperation among members and meanwhile be robust under the condition where the environment is harsh under a high original malicious ratio in large scale MANETs.

In "*HMM and rule based hybrid intruder detection approach by synthesizing decisions of sensors*," a novel methodology to unify the decisions from individual sensors on a sensor field through the hidden Markov model (HMM) and rules is proposed. By the use of contextual knowledge, the success of a decision process is improved. Also, a discretization method to express the state space of sensor field is proposed in the paper.

The paper "*An efficient resource management protocol for handling small resource in wireless sensor networks*" reported that wireless sensor nodes can feasibly borrow the memory or computational resource from the gateway or the server. In this respect, a resource management protocol (RMP) that enables wireless sensor nodes to efficiently use the resources including the memory and the CPU in the gateway or the server is proposed, and the effectiveness of the RMP is validated by experiments.

The paper entitled "*A TDMA scheme for mobile sensor networks*" proposes a time division multiple access (TDMA)-based protocol for MSNs. In this paper, a mechanism is used to overcome the shortcomings of the existing TDMA-based protocols in dynamic networks where the cluster memberships may change frequently. The proposed mechanism provides significant performance improvements compared to the other existing approaches in terms of different network performance metrics.

In the paper, "*A multichannel cross-layer architecture for multimedia sensor networks*" by T. Çevik and A. Zaim, a multichannel cross-layer architecture for Quality of Service (QoS) constrained multimedia sensor networks is proposed. The proposed architecture considers both the time and energy efficiency concepts. The authors demonstrated that the proposed architecture provides higher performance than the greedy approach and the LEERA scheme.

In "*Self-stabilizing TDMA algorithms for dynamic wireless ad hoc networks*," a self-stabilizing MAC algorithm for dynamic wireless ad hoc networks that guarantees a short convergence period, and can facilitate the satisfaction of severe timing requirements, is proposed. The results of simulation studies validated that the proposed algorithm can facilitate the implementation of MAC protocols that guarantee satisfying severe timing requirements.

We are hopeful that these papers will prove to be useful sources of reference for both the researchers and the practitioners.

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