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Editorial
Substitution and Wireless Sensor and Actuator/Robot Networks

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Wireless sensor and robot/actuator networks (SANETs) are an integration of wireless sensor networks and multirobot systems, bringing many new applications including the critical real-time monitoring of critical infrastructures that might be subjected to natural and/or human-induced hazards. In SANET, sensors often have small size and low capacity, while robots are resource rich that allow controlled mobility and actions on environment or networks with failures. Such heterogeneity, unreliability, and many other associated features together introduce open technical, social, and economic problems that are calling for more research attentions.

The aim of this special issue is to present to both academy and industry communities the most recent researches and developments investigating these open problems. Out of 16 submissions, 8 exceptional contributions were finally selected after several rounds of review by the invited reviewers and the guest editors.

The paper by Ch. Paschalidis and R. Wu addresses the problem of energy optimized (network lifetime maximized) routing with and without energy allocation. The authors formulate a worst case problem and propose robust solutions. Unlike existing routing methods, which are shown to be optimistic, the proposed robust solutions are practical and able to balance between performance and robustness. Energy efficiency is critical for the performances of resource-constrained SANET. In the paper "*remaining energy-level-based transmission power control for energy-harvesting WSNs*," Dai et al. propose a transmission power control scheme to coordinate the communication ranges of sensor nodes, by which to balance the energy consumption and harvesting speed in energy harvesting sensor networks.

Mobility management is a substantial new problem of wireless sensor and robot/actuator networks, and how to enhance the network performances taking advantage of the mobile nodes is still a challenging issue. The paper by I. Amundson et al. proposes a waypoint navigation system, integrated with a lightweight localization algorithm, based on resource-constrained mobile sensor networks. By simulations, the authors show that the navigation performance is robust against location errors, and that navigation can run without the use of digital compass. The paper by C. Q. Nguyen et al. demonstrates the ability of using mobile robots to establish wireless mesh networks and increase the network throughput by redistributing the nodes of the existing network. In the paper "*Distributed control of mobile sensor networks under RF connectivity constraints*," Y. Stergiopoulos et al. proposes a novel motion control algorithm for mobile wireless sensor networks under connectivity constraints. The algorithm is shown to be able to optimize area coverage while preserving connectivity. The paper by K. Miranda et al. proposes a localized and adaptive approach to adjust the deployment of mobile relays, which is shown to outperform static sensor networks in terms of delay, jitter, loss, and throughput.

The rest two papers are concerned with SANET hardware and applications. The paper by J. Zhang et al. identifies the challenges of the most existing wheeled robots in unfriendly environment, for example, with obstacles. Therefore, the authors design a jumping robot that can jump up to or over obstacles to recover connections in wireless sensor networks. The paper by J. V. Marti et al. proposes a fingerprinting localization method for mobile sensor and actuator networks deployed in smoke-filled indoor areas.

The eight papers included in this special issue reflect the research diversity and richness in substitution and wireless sensor and actuator/robot networks. We hope that this special issue will provide readers with the most recent insights to, and also stimulate researchers' interests in, this field. Finally, we would like to extend our gratitude to all authors for considering this special issue as a publishing avenue of their research results, and for their valuable contributions.

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