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Editorial: Network coverage: From theory to practice

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Coverage problems have been a hot topic in the last two decades with the rising of wireless sensor networks. This topic is concerned with the quality of sensing the targets of interest for which the sensor network is deployed. Extensive efforts have been devoted to exploring coverage theory, which ranges from point coverage and barrier coverage to area coverage in line with the dimension of concerned targets. Though these theoretical investigations provide insightful understanding about coverage, there are limited previous studies reporting coverage application in practical scenarios. How much can we gain by applying theoretical coverage results from the practical point of view? Further, some recent results have been provided about coverage problems in other research fields, such as cellular networks and social networks. Is it possible to provide a general theoretical framework for network coverage given the understanding gained from sensor networks? The answers to these two fundamental questions would extend the boundaries of traditional sensor coverage and push the coverage research from theory to practice.

The objective of this special issue is to bring forward the latest thoughts and applications in generic network coverage, which may help to put together a clear map for this important area. We have received many submissions, and 11 papers have been selected for publication. These 11 papers focus on issues from sensing to monitoring, to obstacle detection and to network control, etc.

The first paper, titled "An Efficient Coverage Hole-Healing Algorithm for Area-Coverage Improvements in Mobile Sensor Networks" by C. So-In, T. G. Nguyen, et al., considers the coverage hole-healing issue. It designs an efficient distributed coverage hole-healing algorithm (CHHA) that can maximize the area of coverage by moving sensors with minimum distance to heal the coverage holes.

The second paper, "Multi Working Sets Alternate Covering Scheme for Continuous Partial Coverage in WSNs" by M. Huang, A. Liu, et al., designs a multiple working sets alternate covering scheme to achieve continuous partial coverage of sensor networks. The scheme is designed specifically for constructing the maximum number of working sets by scheduling sleeping time of nodes, which in turn enables the alternating coverage of multiple working sets.

The third paper, namely "An Algorithm for Calculating Coverage Rate of WSNs Based on Geometry Decomposition Approach" by Xu Hui, Wang Bailing, et al., proposes a new accurate calculating method, CRGD, for calculating coverage rate, based on geometry decomposition approach. It segments the irregular coverage region into several regular bows and triangles, which can be calculated quickly.

The fourth paper, "Incentive Mechanisms for Mobile Crowd Sensing based on Supply-demand Relationship" by J. Xu, W. Lu, et al., designs incentive mechanisms for mobile crowd sensing, where the price and supply of the resource contributed by the smartphone users are determined by the supply-demand relationship of market. It presents two models of mobile crowd sensing based on the supply-demand relationship of market, and designs an incentive mechanism for each of the two models.

The fifth paper, titled "Two-Tiered Relay Node Placement for WSN-based Home Health Monitoring System" by Y. Li, C. Chen, et al., studies connected k-radio coverage ($k \geq 3$) for

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the location-aware home health monitoring system and models it as a minimum connected k-dominating set problem. This problem is proved to be NP-hard and an efficient greedy algorithm is proposed, which outperforms existing solutions and can substantially reduce the number of relays required.

The sixth paper, "Sensing and Monitoring of Information Diffusion in Complex Online Social Networks" by M. Vitoropoulou, V. Karyotis, et al., proposes an inference framework for an information diffusion process, where information is considered to belong to different classes, characterized by different spreading dynamics and possibly different topical content. Interestingly, it defines an edge coloring scheme, based on which it is possible to keep track of information diffusion.

The seventh paper, "Energy-Efficient Scheduling Strategies for Minimizing Big Data Collection in Cluster-based Sensor Networks" by H. Harb and A. Makhoul, proposes a novel method for searching the spatial-temporal correlation among sensory data. With this, it devises two sleep/active strategies for scheduling sensors in the network.

The eighth paper, "Asynchronous Neighbor Discovery with Unreliable Link in Wireless Mobile Networks" by W. Li, J. Zhang, et al., designs two Quorum Systems (QSs): deterministic and probabilistic, and accordingly proposes two algorithms for mobile device neighbor discovery.

The ninth paper, "Connectivity Preserving Obstacle Avoidance Localized Motion Planning Algorithms for Mobile Wireless Sensor Networks" by M. Y. Hassan, F. Hussain, et al., designs Cellular Automaton (CA) based localized motion planning algorithms for both dispersion and gathering problems.

The tenth paper, "Hybrid-triggered state feedback H∞ control for networked control systems with stochastic nonlinearity and quantization" by Y. Tan, M. Xiong, et al., designs a hybrid-triggered transmission scheme (HTTS) and a measurement size reduction scheme to establish a higher utilization of the network resources.

The eleventh paper, "Set-valued Kalman Filtering: Event Triggered Communication with Quantized Measurements" by Daxing Xu, Yan Qin, et al., aims to improve the remote estimation quality by measurement quantization and event-triggered communication in sensor networks. Quantization strategy and an event-triggering mechanism are presented to describe the set region of original measurements, and a closest ellipsoid approximation of measurement sets method is then provided.

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