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Editorial for Special Issue on Industrial Networks and Intelligent Systems

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Editorial:

In this special issue we have our vision for "Industrial Networks and Intelligent Systems" as "With the development of wireless communication technologies, e.g., wireless sensor networks, wireless mesh networks, large scale industrial plants slowly gets the opportunities to adapt their advantages. Traditional industrial fieldbus can be replaced by wireless networks, which give more flexibility with lower cost and risk of single point of failure. Thousands of industrial equipment can also be monitored by using wireless sensors to detect their health status and even diagnosis the type/location of fault based on extracted features." We see a huge potential of applying wireless technologies and artificial intelligences to make the existing large scale industrial plants smarter. We also see a huge amount of effort should be made to realize this beautiful computing vision. This special issue features six selected papers with high quality from both the conference Chinacom 2014 and open calls. The Chinacom 2014 was held in Maoming, China, August 14–16, 2014.

With the advancement of the Internet of Things (IoT), billions of smart devices should be available for sensing environment variables and reporting events periodically that may happen in certain regions, for supporting industrial applications. Usually, certain sensory data may not change significantly within a certain time duration in certain applications, where sensory data are queried from the network periodically and these contiguous queries on point-of-interests may have some region overlapping. In this setting, sensory data retrieved by recent queries may be used for answering the queries forthcoming when these data have not been varied remarkably and fresh enough. This first article, "Periodic Query Optimization Leveraging Popularity-Based Caching in Wireless Sensor Networks for Industrial IoT Applications", co-authored by ZhangBing Zhou, Deng Zhao, Xiaoling Xu, Chu Du, Huilin Sun, proposed a popularity-based caching strategy for optimizing periodic query processing. Specifically, the network region is divided using a cell-based manner, where each grid cell is abstracted as an elementary unit for the caching purpose. Fresh sensory data are cached in the memory of the sink node. And these cached sensory data are used for facilitating the query answering afterwards. The popularity of grid cells are calculated

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according to the queries issued in recent time slots, which reflects the possibility that grid cells may be covered by the queries forthcoming. Prefetching may be performed for grid cells with a higher degree of popularity when missed in the cache. The simulation results show that our approach can reduce the communication cost significantly and increase the network capability.

Energy saving is vital for a sustainable heterogeneous networks (HetNet) in the forthcoming 5G system. Among the many technologies for energy saving, bandwidth allocation is an important and efficient methods. The second article titled "Energy Efficient Bandwidth Allocation in Heterogeneous Wireless Network" from Xing Zhang, Kun Yang, Pingyang Wang, Xuefen Hong, presents several bandwidth allocation schemes in HetNet where the large-scale user behavior is taken into account. Then the closed-form formulas of bandwidth allocation schemes are given which establish the quantitative relationship between the large-scale user behavior and bandwidth allocation strategy. The theoretical and simulation results show that the proposed scheme is effective in guaranteeing both the demands of the large-scale user behavior and keeping low power consumption.

In the third paper "Coalition Graph Game for Robust Routing in Cooperative Cognitive Radio Networks", the authors (Xin Guan, Aohan Li, Zhipeng Cai, Tomoaki Ohtsuki) mainly study the problem of robust multi-hop routing selection in cooperative cognitive radio networks. They combine the multi-hop routing problem with the graph-based cooperative game and bipartite graph model and a novel effective multi-hop routing selection algorithm is proposed. Theoretical analysis and simulation results show that both PUs and SUs can improve their communication performance when they cooperate with each other.

This fourth article, "Dynamic Time-slice Scaling for Addressing OS Problems Incurred by Main Memory DVFS in Intelligent System", co-authored by Gangyong Jia, Guangjie Han, Jinfang Jiang, Aohan Li, aims to solve the problems of unpredictable performance decreasing, unfair performance sharing and priority inversion after adopting memory DVFS in intelligent system. A dynamic time-slice scaling is proposed in addressing the problem of fairness sharing computing resources in intelligent system with MemScale.

The paper "Optimal Energy Strategy for Node Selection and Data Relay in WSN-based IoT" as the fifth one, from the authors (Juan Luo, Di Wu, Chen Pan, Junli Zha) studied the energy consumption in WSN-based IoT by theoretic analysis on a particular deployment, called one-dimensional queue network. This network is widely used in many industrial monitoring and management applications, where sensors and control units need to collaborate with each other and relay spatial-temporal information to maintain the stability of whole system. The paper first analyzed related energy consumption model and data relay model, and then proposed a feasible strategy to select the relay nodes by leveraging residual energy and multi-hop network connectivity.

Along with the rapid development of Internet and wireless communication technologies, Vehicular Adhoc Networks (VANETs) have been widely applied in various applications by collecting and processing various physical sensing and logic data. Sending collected data to central serve for further mining based on sparse distribution of vehicles is considered one of the core issues in VANETs technologies, particularly the high speed of vehicles can cause the problem be worse. Considering this problem, in this last article with the title "An Intelligent Context-aware Congestion Resolution Protocol for Data Dissemination in Vehicular Ad Hoc Networks", the authors (Amit Dua, Neeraj Kumar, Seema Bawa, Joel J.P.C. Rodrigues) proposed a new intelligent algorithm for processing the contextual data by varying the velocity and density of the vehicles on the road. The authors evaluated the proposed scheme in various performance metrics and compared it with several other state-of-the-art existing schemes. Finally, it concluded that this research work obtained better performs than other existing schemes.

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