Hindawi Publishing Corporation
EURASIP Journal on Wireless Communications and Networking
Volume 2010, Article ID 439890, 2 pages
doi:10.1155/2010/439890

Editorial

Design, Implementation, and Evaluation of Wireless Sensor Network Systems

Jiangchuan Liu,[1] Jiannong Cao,[2] Xiang-Yang Li,[3] Limin Sun,[4] Dan Wang,[2] and Edith C.-H. Ngai[5]

[1] *School of Computing Science, Simon Fraser University, BC, Canada V5A1S6*
[2] *Department of Computing, Hong Kong Polytechnic University, Hong Kong*
[3] *Department of Computer Science, Illinois Institute of Technology, Chicago, IL, USA*
[4] *Institute of Software, Chinese Academy of Science, Beijing, China*
[5] *Department of Information Technology, Uppsala University, 75105 Uppsala, Sweden*

Correspondence should be addressed to Jiangchuan Liu, jcliu@cs.sfu.ca

Received 15 December 2010; Accepted 15 December 2010

The recent advances in embedded software/hardware design have enabled large-scale and cost-effective deployment of Wireless Sensor Networks (WSNs). Such a network consists of many small sensor nodes with sensing, control, data processing, communications, and networking capabilities. The wireless sensor networks have a broad spectrum applications ranging from wild life monitoring and battlefield surveillance to border control and disaster relief and have attracted significant interests from both academy and industry.

A wireless sensor node generally has limited storage and computation capabilities, as well as severely constrained power supplies, and the networks often operate in harsh unattended environments. Successful design and deployment of wireless sensor networks thus call for technology advances and integrations in diverse fields including embedded hardware manufacturing and signal processing as well as wireless communications and networking across all layers. We have seen the initial and incremental deployment of real sensor networks in the past decade, for example, the ZebraNet for wildlife tracking, the CitySense for weather and air pollutants reporting, and the Sensormap portal for generic monitoring services, to name but a few; yet the full potentials of such networks in the real world remain to be explored and demonstrated, which involves numerous practical challenges in diverse aspects.

This special issue aims to summarize the latest development in the design, implementation, and evaluation of wireless sensor systems. We received a total of XX papers by the deadline of February 2010, and through a rigorous review process, we have selected 12 papers from them.

The first paper "*Ambient data collection with wireless sensor networks*" presents a general survey of the current data collection designs for wireless sensor networks. It is divided into data gathering and message dissemination, which reflects on the many-to-one data collection pattern and the one-to-many control dissemination pattern.

We classify the remaining papers into two categories: (1) system implementation, prototyping, and deployment; and (2) individual module/protocol design and optimization.

The First Category Consists of 3 Papers

The first paper "A *High-accuracy nonintrusive networking testbed for wireless sensor networks*" presents a high-accuracy nonintrusive networking testbed (HINT) for wireless sensor networks. In HINT, the interconnected chip-level signals are passively captured with auxiliary test boards and the captured data are transferred in additional networks to test server. The test server of HINT collects all the test data and depicts the full network behavior. HINT supports networking test, protocol verification, performance evaluation, and so forth.

The second paper "*Design and implementation of a generic energy harvesting framework applied to the evaluation*

of a large-scale electronic shelf labeling wireless sensor network" explores the use of energy harvesters to scavenge power for nodes in a WSN. The design and implementation of a generic energy-harvesting framework, suited for a WSN simulator as well as a real-life testbed, are proposed.

The third paper "A *novel real-time coal miner localization and tracking system based on self-organized sensor networks*" proposes a prototype system for real-time coal miner localization and tracking based on self-organized sensor networks. The system is composed of a hardware platform and a software platform.

The Second Category Consists of 8 Papers

The paper "*A Novel secure localization approach in wireless sensor networks*" proposes three attack-resistant localization schemes, the basic Temporal Spatial Consistent-based Detection (TSCD), an enhanced TSCD, and a mobility-aided TSCD. The idea behind the basic TSCD scheme is to adopt the temporal and spatial properties of locators to detect some attacked locators firstly and then utilize the consistent property of the detected attacked locators to identify other attacked locators.

The paper "*A study on event driven TDMA protocol for wireless sensor networks*" presents ED-TDMA, an event driven TDMA protocol for wireless sensor networks. The ED-TDMA protocol improves channel utility by changing the length of TDMA frame according to the number of source nodes and reduces the length of TDMA schedule packets with a bitmap-assisted TDMA schedule to decrease the schedule overhead.

The paper "*A Random ant-like unicast routing protocol for wireless ad hoc sensor networks and performance evaluation*" proposes a random ant-like unicast routing (RAUR) routing protocol for wireless ad hoc sensor networks.

The paper "*Design and analysis of an energy-saving distributed MAC mechanism for wireless body sensor networks*" examines the IEEE 802.15.4 limitations for wireless body network and introduced energy-aware radio activation polices into a high performance distributed queuing medium access control (DQ-MAC) protocol.

The paper "*A fast network configuration algorithm for TDMA wireless sensor networks*" proposes 2C-WSN, a conflict resolution protocol to be used for network configuration during the setup phase of a TDMA-based WSN.

The paper "*Modelling and implementation of QoS in wireless sensor networks: a multi-constrained traffic engineering model*" proposes a traffic engineering model that relies on delay, reliability, and energy-constrained paths to achieve faster, reliable and energy-efficient transmission of the data routed by a wireless sensor network.

The paper "*Impact of LQI-based routing metrics on the performance of a one-to-one routing protocol for IEEE 802.15.4 multihop networks*" presents an experimental evaluation of LQI-based (Link Quality Indication) routing metrics. LQI is a parameter provided by IEEE 802.15.4 physical layer. The paper shows that a single LQI sample per link is sufficient for route discovery.

Finally, the paper "*Distributed KDC-based random pairwise key establishment in wireless sensor networks*" proposes a random pair-wise key establishment scheme for WSNs that differentiates the roles of sensors as either auxiliary nodes or ordinary nodes prior to network deployment.

Jiangchuan Liu
Jiannong Cao
Xiang-Yang Li
Limin Sun
Dan Wang
Edith C.-H. Ngai