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Editorial

Wireless Sensor Networks for Agriculture and Forestry

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The emergence and development of wireless sensor networks (WSNs) technology brought a lot of opportunities for the agriculture and forestry field. WSNs are suitable for large range, real-time, and continuous monitoring of agriculture and forestry applications. Last decades witness the proliferation of this trend, and researchers published a wealth of application works of using WSNs. Nowadays, the real practice brings real challenge in advance, and we aim to reveal that the problem exists in real systems and further provide guidance to all other researchers in this field. The majority of this special issue concerns the agriculture and forestry part of adopting WSNs into real practice, which is really a fundamental challenge for all researchers in this field. The special issue finally collected some outstanding articles submitted from various researchers coming from different universities. They all report real application issues on this topic and did solid work across different small areas in WSNs.

From a public need perspective, M. R. Ceballos et al. in "Fuzzy System of Irrigation Applied to the Growth of Habanero Pepper (Capsicum chinense Jacq.) under Protected Conditions in Yucatan, Mexico" have exploited the WSNs applied in the precise agriculture. An irrigation scheme defined by an algorithm that automates the amount of water supplied is presented, and it considers the consumption of Habanero pepper crop and a fuzzy system evaluates the necessary duration of irrigation.

For the wide area of agricultural or forestal lands, good deployment strategy can maintain network performance and the monitoring accuracy using fewer nodes in a wireless sensor network, which can effectively reduce the cost of whole network when the nodes are expensive. G. Wang et al. in "Time Domain Similarity of Lightweight Parameters Based Soil Respiration Sensor Network Deployment" focused on this requirement and proposed a deployment approach, *TimSim*, for soil respiration sensor network based on time domain similarity of lightweight parameters.

RFID is an important technology in wireless sensor networks for agriculture and forestry applications. R. Li et al. in "An Empirical Study on Hidden Tag Problem" present an empirical study adopting radio frequency tags and readers. The authors aim to explore the hidden tag problem in real applications. Moreover, the authors introduce a general model to expose that the results of theory analysis are far from real situations. The solid implementation and evaluation approaches validate the guesses and provide further evidence in this field.

To construct a well-communicated wireless sensor network for agriculture and forestry applications, three papers have given some useful methods. Z. Ge et al. in "Analysis and Solutions to 3G Gateway Issues in Agriculture WSNs" investigate the issues caused by Radio Resource Control (RRC) state transitions, which introduce high sudden delays in TCP packets. The authors presented their strategies for improvements in both ideal and actual cases, and the solutions are applicable in agriculture WSNs. M. Tong et al. in "An Energy-Efficient Multipath Routing Algorithm Based on Ant Colony

Optimization for Wireless Sensor Networks" proposed an energy efficient ACO-based multipath routing algorithm, which is a hybrid multipath algorithm. The proposed EAMR has improved in the ant packet structure, pheromone update formula, pheromone update mode, and the mechanism of multipath. S. Zeyu et al. in "ECAPM: An Enhanced Coverage Algorithm in Wireless Sensor Network Based on Probability Model" introduced an efficient coverage algorithm in WSNs, called ECAPM, which applied probability model during the whole procedure. And the heterogeneous sensor network can be covered multiply after further expansion of the proposed algorithm.

To prolong the lifetime of a wireless sensor network, two papers have given their solutions from different perspectives. D. Cheng et al. in "Improving Energy Adaptivity of Constructive Interference-Based Flooding for WSN-AF" proposed EACIF to improve energy adaptivity of CI-based flooding. The authors implement ASNA to construct a sparse backbone and further report KMSA algorithm to control the flooding process. And they take intensive evaluations based on real data trace to validate the effectiveness. L. Mo et al. in "Passive Diagnosis for WSNs Using Time Domain Features of Sensing Data" presented a passive diagnosis method used for fault detection and classification based on time domain features. Through the analysis of the data collected from GreenOrbs system, the diagnosis was completed using the temporal feature of the perceptual data extracted by Gabor transform and fault knowledge established by SOM neural network. As a passive diagnosis method, the proposed method has light burdens in network communication.

In summary, this special issue provides a snapshot of the current status of WSNs for agriculture and forestry. Hopefully, this publication will be a useful reference and guidance for the real system studies in WSNs for agriculture and forestry.

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