A Review on Robust Strategy for Scale Free in Wireless Sensor Network

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ABSTRACT
Sharing the infrastructure of wireless sensor networks (WSNs) for achieving concurrent requests becomes a trend nowadays, where a relatively complex request should be satisfied through aggregating complementary functionalities provided by contiguous sensor nodes contained in a certain network region. A key issue in wireless sensor network applications is how to accurately detect anomalies in an unstable environment and determine whether an event has occurred. This instability includes the harsh environment, node energy insufficiency, hardware and software breakdown, etc. In this paper we presents the literature survey for the robust wireless sensor networks.

Keywords: Wireless sensor networks, Internet of Things, Fault detection, Distributed fault detection, Mobile ad-hoc networks.

INTRODUCTION
As the revolution of information perception and collection mechanism and one of the important enabling technologies of wireless sensor networks (WSNs) has been rapidly developed and widely applied for supporting the applications in domains including defense, military, environmental monitoring, health care, manufacturing and many others [9]. Wireless sensor networks (WSNs) consist of a large number of sensor nodes, which are small and low-cost. WSNs are used to sense physical conditions, collect and process information about the objects in the coverage area, and send information to the observer for further processing and analysis. To date, WSNs have been widely used in many critical fields, such as environmental surveillance, emergency navigation, traffic monitoring, and industrial control. Because of the limited computing capacity and energy of wireless meteorological sensor network nodes as well as the complex characteristics and real-time data of meteorological information, unexpected faults appear in nodes after long run times. Therefore, detecting sensor nodes with faulty readings, which can greatly improve the performance of the wireless sensor network, is necessary [4].

In this study, in particular the robustness of one type of network topology, the scale-free topology, for WSNs was investigated. The scale-free topology belongs to the field of complex network theory [1], which has broad applications in the real world, such as in global transportation networks, cooperation networks, social networks, and mobile networks, In complex network theory, small world topology and scale-free topology are two classic models.

Sensor Networks (WSNs), as key components of the Internet of Things (IoT), have a wide range of military and civilian applications. WSNs are generally deployed in different scenarios, such as homes, buildings, forests, mountains, etc. Node deployment is one of the most critical issues in WSNs. The basic requirement of node placement is to achieve desired coverage and connectivity properties, where coverage is to guarantee that every point of interest (PoI) or region of interest

(RoI) is monitored by enough sensors, and connectivity is to ensure sufficient routing paths [2].

In event detection applications, nodes are responsible for determining whether specific events of interest occur within their sensing ranges. Theoretically, all sensor nodes in the event area should report the sensed information to the base station or sink node. In fact, due to environmental interference or hardware failure, sensor readings may be unreliable and may produce some erroneous sensor readings. Sensors may cause false alarms or missing reports, which will reduce the detection quality. One way to improve the event detection capability is to use fault-tolerant event detection schemes [3].

In scale-free networks, a small number of nodes have very high degrees, which renders these networks vulnerable to malicious attacks. When a node with high degree fails, the large number of edges incident on it are removed at the same time. The entire network topology is thus quickly fragmented. Therefore, the main purpose of this study was to improve the robustness of scale-free networks in WSNs against malicious attacks. The addition of edges or relay nodes can directly solve or alleviate this problem. However, additional edges destroy the original scale-free property and consume additional energy. Therefore, the optimizing process of network robustness against malicious attacks cannot change the degree distribution of the initial network topology. The first consideration of routing design in WSNs is to improve energy efficiency and enhance network lifetime. Although wireless power transfer is a potential solution to lengthen the system lifetime of WSNs, and the benefits of using battery charging by harvesting environmental have been well recognized frequent battery recharging is apt to cause difficulties in creating and collecting production information, and in making instant cyber-physical decisions in the current industry framework [6].

A WSN consisting of sensor nodes with complementary functionalities can be shared by multiple users, and this network can be adopted for supporting various requests of diverse domain applications in a concurrent fashion. Most traditional techniques aim to fulfill the request of a single application at a certain time duration, and to optimize the factors like energy efficiency. This means that requests are mostly handled independently. In fact, common sub-requests should be identified, and they can be executed once for fulfilling partial of these concurrent requests. This strategy should be more energy and network usage efficient, especially when common sub-requests account for the majority of these requests [9].

The rest of this paper is organized as follows in the first section we describe an introduction of about the wireless sensor network. In section II we discuss about the rich literature for the robust and scale free wireless sensor networks. In section III we discuss about the distributed fault detection, finally in section IV we conclude the about our paper which is based on the literature survey and specify the future scope.

II RELATED WORK

Different from traditional Web services which are usually hosted by servers with plentiful capacities, WSN services are deployed on sensor nodes which are mostly resource-hungry. Besides, the characteristic of WSNs imposes spatial and temporal constraints, and energy efficiency consideration, upon WSN services. In this section we discuss about the literature survey for the wireless sensor network using various algorithm and for number of applications.

[1] In this paper author first presents a new modeling strategy to generate scale-free network topologies, which considers the constraints in WSNs, such as the communication range and the threshold on the maximum node degree. Then, ROSE, a novel robustness enhancing algorithm for scale free WSNs, is proposed. Given a scale-free topology, ROSE exploits the position and degree information of nodes to rearrange the edges to resemble an onion-like structure, which has been proven to be robust against malicious attacks. Meanwhile, ROSE keeps the degree of each node in the topology unchanged such that the resulting topology remains scale-free. The extensive experimental results verify that our new modeling

strategy indeed generates scale-free network topologies for WSNs, and ROSE can significantly improve the robustness of the network topologies generated by our modeling strategy.

[2] In this letter, we propose a node deployment scheme to settle the above-mentioned thorny issues. The core idea is to construct extra paths to the sink and achieve data diversion. Specifically, the places with relatively large transmission hops to the sink and also comparatively small distance away from it are selected as the starting points of the extra paths. This selection mechanism contributes to alleviating the energy holes and reducing the transmission delay. Finally, experimental simulations show the effectiveness and superiority of our deployment scheme.

[3] In this paper, a fault-tolerant anomaly detection method (FTAD) is proposed based on the spatial-temporal correlation of sensor networks. This method divides the sensor network into a fault neighborhood, event and fault mixed neighborhood, event boundary neighborhood and other regions for anomaly detection, respectively, to achieve fault tolerance. The results of experiment show that under the condition that 45% of sensor nodes are failing, the hit rate of event detection remains at about 97% and the false negative rate of events is above 92%.

[4] In this paper, they modeled and analyzed a fault diagnosis mechanism based on support vector machine regression among sensor observations in wireless sensor networks according to the redundant information of meteorological elements collected by multi sensors. The fault prediction model is built using a support vector regression algorithm to achieve residual sequences. The proposed algorithm outperforms previous DFD in terms of faulty sensor detection accuracy and false alarm rates. The fault detection algorithm achieves high detection accuracy and low false alarm rates, which are more suitable for sparse WSNs, even when the failure rate is very high.

[5] In this article, we propose to detect object boundary region through applying mobile sensors. The network is divided by planar algorithms at first. An estimated object boundary is derived through applying the interpolation algorithm. To examine whether the boundary reflects that fact, candidate sensing locations are discovered and traversed by mobile nodes for gathering sensing data. The heuristic algorithm (i.e., ACO) is applied to generate optimal paths for mobile. Experimental results show that the proposed mechanism can get a precise object boundary region and can balance the energy consumption and time consumption for mobile sensors.

[6] This paper makes a first attempt to provide a comprehensive review on ACO-based routing protocols in WSNs. First, we offer a classification of these routing algorithms. Second, the most representative ACO-based routing protocols are described, discussed, and qualitatively compared. Finally, they put forward some open issues concerning the design of WSNs. This survey aims to provide useful guidance for system designers on how to evaluate and select appropriate routing schemes for specific applications.

[7] They introduce the concept of health factor a to describe whether the system is healthy or not. This method can greatly improve the performance of the algorithm in the health system. Extensive simulation results show that using RADM algorithm to perform anomaly detection in MTS can achieve better result than just in UTS. Furthermore, it will remarkably improve the performance of real-time anomaly detection in many domains. Their future work will include optimizing our algorithm further and improving the detection accuracy. They also attempt to build stronger correlations between multiple variables using other models and apply our algorithms to other areas.

[8] In this paper, they focus on selecting a bunch of monitoring nodes and propose a cross-layer security monitoring selection algorithm based on traffic prediction (CLSM-TP). Instead of repeatedly detection for each node, they select the monitoring node whose idle degree is relatively high by predicting the node's traffic based on a cross-layer vehicular ad hoc network. Moreover, the proposed algorithm leverages the mutual information and residual energy to optimize the node selection through social network analysis.

The noteworthy contributions are that CLSM-TP can balance the resource consumption among all nodes and prolong the lifetime of vehicular ad hoc network to some extent. Our experimental results show that, the monitoring nodes selected by the algorithm proposed in this paper with higher idle degree perform good enough to monitor the whole vehicular ad hoc network.

[9] In this paper author proposes a multi-requests cooperative-integrating mechanism leveraging service-oriented WSNs. Specifically, a sensor node is encapsulated with one or multiple WSN services, which capture various functionalities provided by this sensor node. These WSN services can be categorized into service classes, where their functionalities are the main concern. Candidate service class chains are generated independently with respect to concurrent requests represented in plain text. The selection of candidate WSN services for the instantiation of certain service classes can be reduced to a multi-objective and multi-constraints optimization problem, where the spatial- and temporal-constraints, and energy efficiency of the network, are the factors to be considered. This combinational optimization problem is solved through adopting heuristic algorithms. Experimental results show that this technique improves the share ability of WSN services among concurrent requests, and reduces the energy consumption of the network significantly, especially when the spatial, temporal, and functional overlap between concurrent requests is relatively large.

III DISTRIBUTED FAULT DETECTION

The distributed fault detection algorithm mainly adopts the idea of local decision-making [4]. The node compares the local collected weather information and the information collected from neighboring nodes; the algorithm finally determines whether have a fault. The distributed fault detection method does not need to send all of the information to the central node. Instead, each node in the sensor network completes the fault detection task in the network either independently or partially. In the distributed fault detection algorithm, the node can perform more decisions locally, thus further reducing the amount of traffic generated by the data sent to the central node. This also balances the amount of message interaction in the network and reduces both the energy consumption and network congestion; furthermore, the life of the entire network is extended. Distributed fault detection is applicable to most meteorological sensor networks and is the future trend of fault detection. The DFD algorithm computes the similarity of the data sensed by neighboring nodes concurrently to determine the initial state of the node. The state and neighbor nodes test each other to determine whether a node is faulty and spreads the diagnosed result to its neighboring nodes, but the DFD method must cause the node to communicate with neighboring node three times and then determine the state of the node, resulting in a large amount of data communication; therefore, the DFD algorithm must consume large amounts of energy.

IV CONCLUSIONS AND FUTURE SCOPE

Wireless sensor networks (WSNs) are composed of a large number of sensor nodes with limited energy capabilities that are located randomly or determinedly on a specific environment. WSNs are the foundation, key components, and important technologies of the Internet of Things (IoT) and Cyber-Physical Systems. WSN services deployed on sensor nodes are abstracted into service classes according to their functionalities. A service network is constructed for capturing the invocation possibility between service classes. Given concurrent requests represented in plain text, candidate service class chains are generated independently with respect to these requests. In this paper we discuss about the various application and algorithm used in a wireless sensor network in future we focus how to resolve some issues and show comparative experimental study.

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