International Journal of Wireless Networks and Broadband Technologies
Volume 5 • Issue 1 • January-June 2016

Equilibrate and Minimize the Energy Consumption in a Cluster for Routing Protocols in Wireless Sensor Network

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ABSTRACT

The Cluster Head is selected on the basis of maximum number of nodes connected, thus several sensor nodes cannot reach any CH, even though they are in the transmission range. These nodes are called the isolated nodes. To solve this problem, the proposed a sub_cluster protocol, its role is to reduce the sensor nodes which do not belong the cluster. The major novel contribution of the proposed work is the sub_cluster protocol which provides coverage of the whole network with a minimum number of isolated nodes and has a very high connectivity rates. The sub_cluster protocol allows firstly with great cluster can be grouped many sub_cluster protocol connected to major CH, each sub_cluster protocol, can be connected of the maximum nodes non CH.

KEYWORDS

Clustering, Connectivity, Coverage, Energy, Equilibrate, LEACH, Orphan Nodes, Routing, Sub-cluster, WSNs

1. INTRODUCTION

In recent years, the technology of wireless networks has been growing thanks to technological developments in various areas. In addition, with the emergence of Wireless Sensor Networks (WSN), new subject areas have been opened and new challenges have emerged to meet the needs of individuals and the requirements of several industrial applications, cultural and environmental. The routing in WSN must take into account two constraints. First, reassemble information quickly from one node to the base station via the shortest route. Second, reassemble again the information to the base station at a lower cost in terms of energy consumption.

In fact, despite the remarkable progress in this field, there are still many problems to solve. Thus, new protocols have been proposed to address routing in sensor networks. The control of energy consumption by sensor networks and the maximization of their life are still the most fundamental problems because the sensors are small components with low storage capacity, calculation and are powered by batteries whose capacity is very limited and are generally not rechargeable. This work aim to improve the LEACH (Heinzelman et al., 2000) protocol in order to build clusters and each cluster consists of SUB_CLUSTER protocol.

The wireless sensor network is the recent technology which provides innovative capabilities. Their use is currently increasing in many areas they are scientific, logistical, military or health. The sensor size is an important limitation, mainly in terms of energy independence and thus life because the battery needs to be very small, which is why many now work focuses on the management the

DOI: 10.4018/IJWNBT.2016010103

sensor consumed power, taking into account, the communication and data routing algorithms. For this purpose, an adaptive routing algorithm which is an improvement of LEACH routing protocol that is build in SUB_CLUSTER protocol in a cluster.

These improvements allow the maximum operated wireless sensor in a large scale. Energy consumption will be reduced and to maintain portability and lasted from network life. To confirm the improvements made by the proposed algorithm, this conduces to simulate the sensor network with MATLAB. In which the performance the proposed algorithm is evaluated and compared with existing clustering protocols LEACH used in sensor networks.

The paper is organized as follows. Section 2 describes the related work of clustering in WSN and CH selection methods. Section 3 explains the SUB_CLUSTER protocol model and design the algorithm. Sections 4 and 5 give major CH selection algorithm in detail along with its mathematical model. Section 6 gives the simulation results done in MATLAB and compares the results with existing methods. Section 7 concludes and proposes the work for future.

2. RELATED WORK ON ROUTING PROTOCOL

In WSN, the use of routing protocols designed for ad hoc networks Traditional is inappropriate. This is due to the characteristics by which to distinguish the two types of networks, hence the need to improve or develop new specific routing protocols for WSN.

LEACH is considered as the first hierarchical routing protocol. It is also one of the most popular hierarchical routing algorithms for WSN, proposed as part of the project. It combines the efficiency in energy consumption and quality of access to the media, and based on the division into groups, with a view to allow the use of the concept of data aggregation for better performance in lifetime of terms.

Hybrid, Energy-Efficient Distributed Clustering (HEED) (Younis et al., 2004) extends the basic scheme of LEACH by using residual energy and node degree or density as a metric for luster selection to achieve power balancing. It operates in multi-hop networks, using an adaptive transmission power in the inter-clustering communication

In Adaptive Periodic Threshold-sensitive Energy Efficient sensor Network protocol (APTEEN) (Manjeshwar et al., 2002), the cluster-heads broadcasts the following parameters Attributes, Thresholds, Schedule& Count Time. Once a node senses a value beyond hard threshold (HT), it transmits data only when the value of that attributes changes by an amount equal to or greater than the soft threshold (ST). If a node does not send data for a time period equal to the count time, it is forced to sense and retransmit the data.

Advantages APTEEN include its suitability for time critical sensing applications. At every cluster change time, fresh parameters are broadcast and so, the user can change them as required.

(Lindsey et al., 2002) proposed Power-Efficient Gathering in Sensor Information Systems (PEGASIS). PEGASIS allows a communication chain using a TSP (Traveling Sales Person) heuristic. Each node only communicates with two close neighbors along the communication chain. Only a single node supports data transmission and transmits the aggregated data to the sink node. PEGASIS allows each node only communicates with two close neighbors along the communication chain. Only a single designated node gathers data from other nodes and transmits the aggregated data to the sink node.

(Manjeshwar et al., 2001) proposed (TEEN) are similar to LEACH except that sensor nodes do not have data being transferred periodically. In TEEN, each sensor node decides to transmit their sensed data or not using a threshold value.

There is no guarantee that nodes selected as cluster head are evenly dispersed throughout the network because procedure to select cluster head is based on the random cluster formation method

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Ioan-Sorin Coma, Sijing Zhang, Mehmet Emin Aydin, Pierre Kuonen, Ramona Trestianand Gheorghi Ghinea (2021). *Research Anthology on Developing and Optimizing 5G Networks and the Impact on Society (pp. 151-186).*
www.irma-international.org/chapter/guaranteeing-user-rates-with-reinforcement-learning-in-5g-radio-access-networks/270191