International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

An Energy Efficient Hybrid Clustering Algorithm for WSNS to Increase Network Lifetime – A Review

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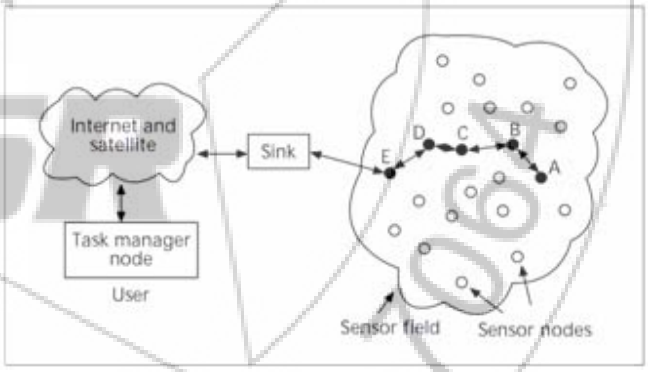
Abstract: ***The Wireless sensor networks are used in various types of environments, where the data recording becomes the prime factor. The WSNs are famous among healthcare monitoring, weather prediction (by metrological departments), army practices, etc. The WSNs suffers from a major problem of energy efficiency and clustering overhead. These two factors are considered as the major problems in the WSNs. The WSN nodes are battery running devices, hence carry limited running time. The practices which can enhance their lifetime and reduce overhead (routing overhead, clustering overhead, buffering overhead, etc) are useful to improve their performance. In this paper, we are proposing a solution to address the problem of energy efficiency. The proposed solution is based on a previous research on wireless sensor network energy efficiency using k-means clustering algorithm. The existing algorithm has many shortcomings, which includes its non-compatibility with the heterogeneous wireless sensor networks (the most adaptable WSN paradigm), cluster head selection method without calculating cluster overhead areas, etc. In the proposed model, we are going to remove such shortcomings by using cluster overhead calculation and cluster head selection based on cluster overhead. The proposed algorithm will use means clustering algorithm for the purpose of clustering. The cluster created by means algorithm would be further used with LEACH protocol, which will manage the best route for inter-nodal communication in the cluster. This will definitely enhance the lifetime of the WSN up to a significant amount. The proposed algorithm will also be capable of reducing the routing and clustering overhead from the wireless sensor nodes.***

Keywords: WSN, clustering, cluster head selection, energy efficient WSNs

1. Introduction

Over last some decades, the evolution in computers has been happened at a large in the case of processing power and at the same time decreased in term of size and also in price. In our society's daily activities the computers would participates abundant role. From past few years, computers are becoming so small and so cheap, in both economically and theoretical point of view, this is the one of the great revolution has been done. Wireless sensor network are beginning to become a reality and receiving a great amount of attention recently so it plays an important role to improve our lives in every field of aspect and also an important area of research. They help us to expand our knowledge in research to get the things accurately monitor, study, and control objects and environmental factors such as geological surveys, security surveillance and many more. In wireless sensor networks large no. of sensor nodes in a field connected with a sink node to transmit information about events to satellite. Sensor nodes can sense data, store data, route data and processes data, so sensor nodes is also perform an important role in wireless sensor network



In wireless communication the sensor nodes send and receive the information to the system so the use of WSNs in many environments (likes border protection, disaster areas, intelligent house control, health related areas and many mores) to detect and monitoring sensitive information. Wireless sensor networks are able to detect weather forecasting, track the tanks in battlefield, measures the traffic percentage on road, monitor environmental pollutants, for the power detection WSNs id helpful in tracking Sunrays. In WSNs the sensor collects the solar energy which is cable of produce electricity

Wireless sensor networks consist of hundreds of tiny sensor nodes each sensor nodes forma group to detect data and retrieve data within the system so that the WSNs become more scalable and also improve the energy efficient, that groups which receive and retrieve data is basically form a cluster, in simple words when the large sensor nodes

network is divided in two small units nodes then that unit node is known as 'Cluster'. Every cluster is managed by node cluster head (CH) and other nodes are referred as cluster nodes. Cluster nodes do not communicate directly with the sink node. Cluster head will aggregate the data, received from cluster nodes and transmits it to the base station, which minimizes the energy consumption and number of messages communicated to base station

a) **Sensor Node:** Sensor node is the important component of WSN because of its multiple role features. It senses data, stores data, routes data and processes data.
b) **Clusters:** Clusters are small manageable units which simplify tasks such a communication.
c) **Cluster heads:** Cluster heads are the leader who organizes cluster activities. It collects data from several sensor nodes and then aggregates those data and also organizes the schedule of a cluster for communication with BS.
d) **Base Station:** Base station is a central component which collects data from several nodes distributed at different locations. The deployment of base station is also a critical issue of WSN. It acts as an intermediate between the network and end-user.
e) **End User:** The data in a sensor network can be used for a wide-range of applications. Therefore, a particular application may make use of the network data over the internet, using a PDA, or even a desktop computer. In a queried sensor network (where the required data is gathered from a query sent through the network). This query is generated by the end user. The clustering phenomenon, plays an important role in not just organization of the network, but can dramatically affect network performance.

2. Literature Survey

Geon Yong Park and Heeseong Kim have developeda new algorithm based on k-means for the purposed of clustering in the WSNs. The new algorithm has been capable of selecting the efficient cluster head. The authors have proved that their algorithm is better than the LEACH algorithm. Sonam Palden Barfunga and Prativa Rai have developed a new routing protocol which is based on clustering mechanism. The aim of the new algorithm is to make the WSNs energy efficient. The proposed protocol has been made capable of performing in the various situations using the dynamic topology based operations. John M. Shea, Joseph P. Macker have worked on an algorithm to evaluate the number of cluster automatically. The Relative Eigen value Quality method has been used by the authors to create the proposed algorithm. In this paper, the authors have developed the algorithm based on spectral graph theory to achieve the cluster number evaluation.Wang Hong-chuan et. al. has evaluated an algorithm using theoretical and principal analysis methods. The algorithm under evaluation is used for key management in WSN. In this paper, Abdellah Ezzati et. al. have worked on the development of a new clustering protocol. The proposed clustering protocol is called HABRP (Hierarchical Adaptive Balanced energy efficient Routing Protocol). The aim of this research is to minimize the probability of node failure. The authors have developed the new protocol to enhance the wireless sensor network lifetime. Raymond Wagner and Shriram Sarvotham have performed a distributed and multi-scale data analysis and processing for WSNs. The two major aims has been targeted by the authors behind the research project. The first aim is to make the multi-scale data algorithms regularly spaced using the Haar wavelet. Also, the shortcoming of overhead due to multi-scale algorithms has been evaluated and solved.

3. Problem Formulation

Wireless Sensor Networks (WSNs) consist of hundreds of small and cost effective sensor nodes. Sensor nodes are used to sense the physiological or environmental parameters (e.g. temperature, pressure, etc.). For the connectivity of the sensor nodes, they use wireless transceiver to send and receive the inter-node signals. Sensor nodes, because connect their selves wirelessly, use routing process to route the packet to make them reach from source to destination. These sensor nodes run on batteries and they carry a limited battery life. Clustering is the process of creating virtual sub-groups of the sensor nodes, which helps the sensor nodes to lower routing computations and to lower the size routing data. There is a wide space available for the research on energy efficient clustering algorithms for the WSNs. LEACH, PEGASIS and HEED are the popular energy efficient clustering protocols for WSNs. In this research, we are working on the development of a hybrid model using LEACH based energy efficient and K-means based quick clustering algorithms to produce a new cluster scheme for WSNs with dynamic selection of the number of the clusters automatically.

4. Proposed Model

The energy efficiency and response time are the major wireless sensor network issues. In this paper, a hybrid energy efficient quick k-means and LEACH based clustering algorithm using automatic cluster number selection is being developed. The proposed algorithm will be hierarchical clustering based segmentation mechanism. The performance of the proposed protocol will be compared with that of existing k-means and LEACH through simulation experiments. The proposed protocol would be created with flexible functioning to deal with large number of nodes. The functional mechanism to decide the number of clusters dynamically will be developed to empower the proposed algorithm. The proposed protocol will produce better scalability to the protocol for dealing with very large wireless sensor networks.

5. Objectives

a) To study the literature on energy efficient WSN clustering protocols
b) To review the design of the new algorithm for proposed clustering protocol
c) To implement the WSN clustering protocol in MATLAB or NS2
d) To obtain and analyze the results

6. Methodology

At first, the literature on the WSN clustering protocols and WSN processes would be studied in detail. Then the algorithm flow would be reviewed and refined in case any changes are required. Afterwards, the algorithm would be programmed in NS2. The experiment results would be thoroughly analyzed and compared with the existing algorithm results.

7. Conclusion

The proposed algorithm would be capable of reducing the energy consumption by the wireless sensor network (WSN) clusters. The proposed algorithm will also reduce the routing and clustering overhead from the nodes by reducing the size of the clusters, as well as by creating the best and shortest inter-nodal paths within in the cluster. The cluster head selection method is because based on the node density in the cluster. The node density is the key factor, which influence the routing overhead on the nodes. The cluster overhead and node density based cluster head selection methods force the clusters to run longer as its nodes need to work less than the usual scenarios.

8. Future Work

The authors are working on the implementation of the proposed model/algorithm in the NS-2. In the future, the proposed algorithm can be enhanced to work with MANETs or VANETs. Also, the proposed algorithm can be enhanced to work better than its now-a-days performance.

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