

Adaptive Clustering Using Round Robin Technique in WSN

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Abstract Wireless Sensor Network is used in many applications like in military, environmental monitoring, traffic, security, industrial sensing, intelligent homes, context aware computing, power grid, infrastructure protection etc. In every application of wireless sensor network, energy is a scarce resource for nodes. Nodes deplete more energy in communication and computation. This energy can be saved by using clustering, in which group of nodes form clusters and Cluster head sends aggregated data to the base station. The selection of cluster head is an important task. In this paper round robin technique has proposed to elect CH from the sorted list of nodes based on distance from the reference point. The work is proposed for homogenous static nodes with adaptive nature.

Keywords Round Robin, Clustering, wireless Sensor Network, homogeneous.

Introduction

Wireless Sensor Network (WSN) is auto organized network [1]. It consists of tiny sovereign sensors to monitor the environmental and physical conditions like temperature, pressure, pollutants. And it passes data through the network to prime location [2]. Sensor nodes trust on battery power provide, sensor nodes communication ability and energy storage capacity are very confined, so how to make use of the energy of nodes efficiently, and how to balance network energy consumption and expand the network lifetime has become a main motive for wireless sensor network [3]. In the current researches, routing technology of clustering is most effective. Sensor Network consist major number of mini, low power, low cost sensor nodes with confined memory, with computational and communication resources and base station. These nodes continually monitor the environmental conditions. And pass the gathered data to the base station (BS). Base station is an entrance gate from sensor networks to the outward of the world. The Base Station has very big storage and big data processing abilities. It act as a transceiver that means it transmit as well as receive data from sensor nodes and make it available for end user. Sensor nodes are normally deployed near the area of the base station. Wireless Sensor Network has an advantage of being conducted unachievable in the environment where continuous human monitoring is hazardous, inoperative or impracticable. Sensor nodes uses the irremovable power with the confined capacity, the node's efficiency of computing and communicating storage is very confined, which requires the WSN protocols need to protect energy as the main motive of maximizing the network lifetime [4].

The energy can be minimized by using clustering. The first protocol that proposes clustering was LEACH. An energy-efficient communication protocol LEACH, has been introduced [5]. LEACH is TDMA-based MAC protocol it minimizes the energy consumption. LEACH is adaptive in nature and organizes nodes in local cluster. It randomly distributes the energy among different nodes in the network.

However, LEACH probably chooses too many cluster heads at a time or it randomly selects the cluster heads long distance from the BS without considering nodes' residual energy. As result, some cluster head deplete their energy early thus decreasing the lifespan of WSN. Each round of the cluster formation follows the two steps. Set-up phase and steady state phase.

(1) Set-Up Phase- it is used for CH selection. (2) Steady-State Phase- it is used for transmitting data b/w nodes and for maintaining cluster-head.

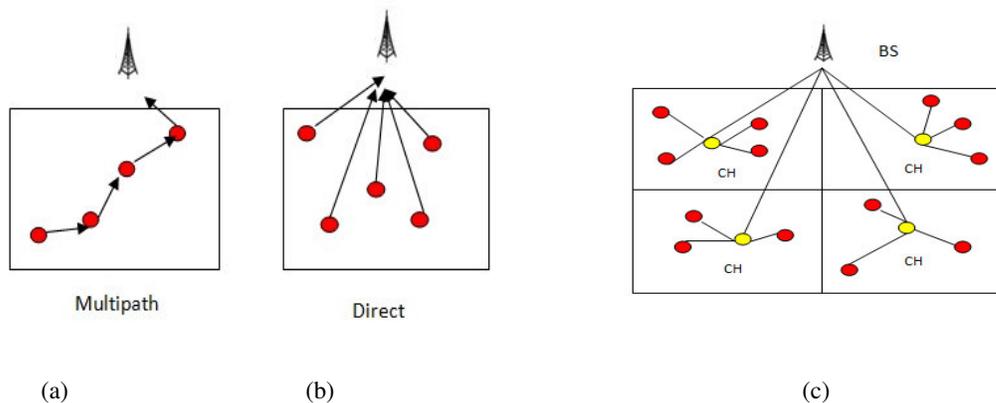


Figure 1. communication in (a) multipath (b) direct (c) LEACH

Literature Survey

Wendi Rabiner Heinzelman et.al [6] proposed LEACH (Low-Energy Adaptive Clustering Hierarchy) algorithm. This is an auto organizing protocol. It is adaptive clustering protocol that uses randomization to distribute the energy among the sensor nodes in the network. In this protocol the nodes organize themselves in to local clusters. The energy consumption is minimized by using clustering based on the probability. Each node in the field belongs to one cluster head. These CH nodes broad cast their location to other local nodes. After all the nodes organized in to the cluster it permits the radio components of each non-CH to collect all the data from the nodes. The aggregated data from the normal nodes is passed to the CH and then to the base station. LEACH uses two phases. Set-up phase and Steady state phase. In set-up phase of LEACH protocol cluster head are selected and each sensor nodes chooses a random b/w 0 and 1. If this is lower than the threshold for node n the sensor node becomes a cluster-head.

Chuan-Miang Liu et.al [7] proposed the distributed clustering algorithms for Mobile nodes. This algorithm minimizes the energy dissipation for data collecting in WMSN (wireless mobile sensor network). There are two steps in the clustering algorithm cluster-head election step and cluster formation step. First propose the two distributed algorithm for Cluster-head election. By considering the node mobility effect, they provided a mechanism for sensor nodes to select a cluster-head and to join for cluster formation. The results shows better performance energy consumption and improve the lifetime of the network. ACE-C and ACE-L algorithm is used.

Meenakshi Diwakar et.al [8] suggests Energy Efficient Level Based Clustering Routing protocol for wireless sensor networks. In this routing protocol network is partitioned in to circularly rings by using various levels of energy at base station and each rings having various sensor nodes. Also consider the remaining energy nodes and distance from the base station of nodes as the dominant of cluster-head selection. The mathematical formulae for election the cluster head is provided. The model developed is simulated in MATLAB. EELBCRP performance is better in terms of energy dissipation of cluster-head, number of clusters and improve lifetime of network compared with LEACH.

Priti Kumari et.al [9] suggests CH selection in mobile WSN. This paper is an important part of MWSN (mobile wireless sensor network) in this paper five clustering algorithms has discussed.

LEACH-M (Mobile) [10] this algorithm is based on TDMA (time division multiple access). LEACH Mobile setup phase is same as LEACH but LEACH Mobile steady phase is differ from LEACH. In LEACH-M sensor nodes are mobile nodes in nature. Mobile nodes are movable nodes. It is possible that after particular time interval it can be moved from the cluster. Therefore in steady state phase of LEACH-M before sending data to CH each node uses its first frame of time division multiple access schedule for sending request to CH and if node doesn't get response from CH in the particular time slot. After receiving join-ack message from CH on the basis of received signal strength node decides in which cluster it belongs.

LEACH-ME (mobile enhanced) [11] it is enhanced version of LEACH-M. LEACH-ME is based on new parameter called "mobility".

LUDC (location-unaware distributed clustering) [12], This algorithm is based on the concept of zone head with CH. Zone head act as a bridge b/w CH and base station. When anyone node want to join a Zone head. If the respective zone head is able to accommodate that node then it sends confirmation message to the node. Otherwise it checks if there is anyone connected node with low quality linked node to join other zone.

ACE-C (algorithm for cluster-head election with counting) [13]. In ACE-C algorithm if sensor nodes are total N number of nodes. An Id ranging 0 to N-1 assigned for each sensor node. This algorithm works on the basis of each node has to be cluster-head and for cluster-head selection round robin technique is used. If there is C number of CH in

each round then each node selected as cluster-head will again be selected after time t . This algorithm doesn't consider location or mobility.

ACE-L (algorithm for cluster-head election with location) [13] is designed for mobile nodes. In this protocol fixed reference point are taken. Main reference point (MRP) is also chosen which the closest reference point from sensor node. Delay time is calculated in b/w MRP and current location of the node. The nodes which have the shortest delay time are selected as a cluster head.

Sunil sainsi et.al [14] suggests Simulation of low hierarchy protocol for Wireless Sensor Network. In Sensor Network energy surveillance is a necessary attention. It is especially designed for wireless sensor networks. Most of term, given to hierarchal routing protocols it is based on clustering because of scalability. This paper analyzes the routing defiance and design problem associated in the sensor networks and the overall working of LEACH protocol and its SIMULATION. As result, it reveals and provides not only measures for performance calculation of wireless sensor networks but it have also have guideline while designing and evaluating a new protocol for wireless sensor networks.

Qian Liao et.al [15] suggests an improved clustering algorithm. This algorithm takes nodes remaining energy and location data in to account. It improves the selection method of threshold for electing cluster-head, improves optimum cluster-head selection strategic that is normal nodes select the optimal cluster-head based on the cost function. Simulation results show that improved protocols are better than LEACH in balancing nodes energy dissipation improving the efficiency of data transmission and extending the network life.

Problem Formulation

In Wireless Sensor Network, Clustering needs to be performed more frequently. Hence, more loss of energy. In WSN each node has limited energy. However efficient algorithm for clustering in WSN exists there, though energy need to be saved at each level of communication and processing. The main problems in WSN are if base station is far from the cluster-head nodes it takes more energy to transfer the data, as a result CH dies frequently and it will affect the lifetime of the network. The setup phase in clustering is non deterministic, due to this set up phase is elongated. Height of antenna is also an important factor. These are some more problems like who become cluster head, failure of nodes, security. The selection of capable cluster head a fine clustering algorithm needs to cover the issue of optimal cluster head. As, discussing above, this paper is presented a grid based approach to appropriate the method of cluster-head selection based on homogeneous energy of nodes.

Proposed Work

The proposed approach is made for selecting CH on a different basis so that energy can be saved for more rounds. Here, the overall area is divided in to grids. The grids will act as a cluster. In each grid a reference point (RP) in the middle is marked. In each cluster we will have CH. The distance of nodes is calculated from reference point. The nodes will be arranged in increasing order in an array, based on the distance from the RP. Now, the CH will be selected on the basis of round robin technique. The nodes which will have minimum distance from the RP will be selected as CH first, for one iteration and then for second iteration the next node will be picked up from the sorted array of nodes based on distance. The iteration can be taken as some number of rounds. In case when two nodes have same distance then that node will be picked up which have more degree.ie direct connectivity. Whenever the energy of nodes decreases below the threshold value new CH is selected.

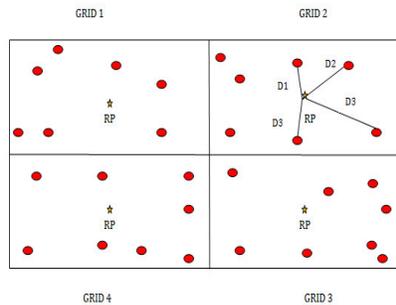


Figure 2. Proposed technique architecture

For example- consider grid 2 suppose we have 4 nodes whose distance from CH is $D1=1m$, $D2=1.5m$, $D3=3m$, $D4=2m$, $D5=3m$. so, first we take lowest distance $D1$ as a CH. Then we take $D4$ as a CH. Now we will see the distance of $D3$ and $D5$ is same. So, we will see the degree and whose degree is more we will make it cluster head first.

Conclusion

This paper proposes an approach of adaptive clustering using Round Robin technique for a homogeneous network using grid size. It will help to select cluster head in a better way and improve network performance. Proficiency of the network is tried to increase energy using round robin technique. It will provide better performance in energy efficiency and it will increase the lifetime of the network.

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