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A Review on Multiple Single Hop Clustering Based Data Transmission in Wireless Sensor Network

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Abstract: ***The most important objectives of wireless sensor network are to enhance or to increase the lifetime of the sensor network and also to use the energy of the network effectively. Many traditional approaches had been proposed in wireless sensor network (WSN) to achieve these objectives. But, they are not so efficient and reliable in terms of utilization of energy on the network nodes. However, nodes in network are typically considered to be homogeneous in nature since the researches in the field of wsn have been evolved but in real world, homogeneous sensor networks hardly been considered for research. Thus, we require a clustering technique which will work in heterogeneous environment which are more closely relates with real life environment. In this paper, there isreview of energy protocolswhich are used in wsn and also defined the keyfactors required for efficient data transmissioon or communication. Along with it this paper also include the improvement proposal in sensor network in energy conservation. This will consume less energy in long distance communication than previous single hop protocols which also help in lifetime enhancement.***

Keywords: -Clustering ,Leach, Matlab,Sep,WSN

1. INTRODUCTION

Recent advancement in micro-electronics technology facilitated sensor designers to develop low price, low power and small sized sensors. Thousand of sensor is deployed in order to achieve high quality network. Applications of WSN are Military surveillance, environment monitoring, border protection, health care monitoring, weather monitoring. These applications require data without delay and energy consumed by them should be small. WSNs are deployed in harsh environment. Since it is not possible to replace or charge battery of sensor nodes, so it is desirable to design communication protocols such that energy source is used effectively and the delay in the network in minimum. Sensor nodes senses the environment, gathers the data from its surrounding(computation) and communicates it to the base station(BS).Out of the three tasks communication takes large amount of battery power of a sensor node, so the major concern is the communication task. We have to minimize the communication cost in order to save battery power.

Wireless sensor networks [1] consist of a thousand of sensor nodes which are deployed randomly environment or space. In sensor network there is a BS (base station) which is located far away from the sensor eld. Sensor nodes send the sensed data to the BS. For sending the sensed data to BS directly a lot of energy is consumed. So it is desirable to develop some protocols to minimize this communication cost. Energy conservation and maximization of network lifetime are the key challenges in the design and implementation of WSNs.

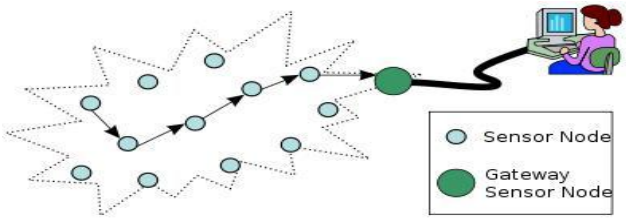

FIG 1:- WIRELESS COMMUNICATION IN CLUSTERED NETWORK

2. DESIGN ISSUES

1. **Network dynamics**- Most of the network architectures assume that sensor nodes are

stationary, because there are very few setups that utilize mobile sensors. It is sometimes necessary to support the mobility of sinks or cluster-heads. Route stability becomes an important optimization factor, in addition to energy, bandwidth etc. The routing messages from or to moving nodes is more challenging. So, the sensed event can be either dynamic or static depending on the application.

2. **Node deployment**- It is application dependant that affects the performance of the routing protocol. The deployment is either deterministic or self-organizing. In deterministic deployments, the sensors are placed manually and data is routed through a fixed-determined paths. On other hand, in self-organizing systems, the sensor nodes are scattered randomly creating an infrastructure in an adhoc manner.
3. **Energy Considerations**- During the creation of an infrastructure, the process of setting up the routes is greatly influenced by energy considerations. As the transmission power of a wireless radio is directly proportional to the distance squared or even higher order in the presence of obstacles, multi-hop routing will consume less energy than direct transmission. However, multi-hop routing incurs significant overhead for management in topology and medium access control. Direct routing would perform well enough if all the nodes were very close to the sink. Sensors are scattered randomly over an area of interest and multi hop routing becomes unavoidable.
4. **Data delivery models**- Data delivery models to the sink can be continuous, event driven, query-driven and hybrid, depending on the application of the sensor network.
5. **Node capabilities-** In a sensor network, different functionalities can be associated with the sensor nodes. Depending on the application, a node can be dedicated to a particular special function such as relaying, sensing and aggregation since engaging the three functionalities at the same time on a node might quickly drain the energy of that node
6. **Data aggregation/fusion-** Similar packets from multiple nodes can be aggregated to reduce the transmission. For this sensor nodes might generate significant redundant data. Data aggregation is the combination of data from different sources using functions such as suppression, min, max and average.

3. RELATED WORKS

1. W.R. Heinzelman, A.P. Chandrakasan and H. Balakrishnan introduced Low Energy Adaptive Clustering Hierarchy (LEACH) protocol in the year 2000 which is one of the most popular hierarchical clustering algorithms for sensor networks. The concept here is to make clusters of the sensor nodes depending upon the received signal strength and finally use local cluster heads as the routers to the sink. The energy is being saved by this method since the transmissions are done by cluster heads rather than all the sensor nodes. Optimally, the number of cluster heads is calculated to be .05 the total number of nodes. The activities like data fusion and aggregation are done locally to the cluster. To balance the energy consumption of nodes, cluster heads keep changing randomly over the time. This decision is done by the node through choosing a random number between 0 and 1. The particular node is considered as a cluster head for the current round if the number is less than the threshold value of that node.

2. S. Lindsey and C. Raghavendra [6] proposed Power Efficient Gathering in Sensor Information Systems (PEGASIS) protocol in the year 2002 which is an enhanced version of LEACH. Instead of forming clusters, the protocol is truly based on forming chains of sensor nodes. One node is responsible for routing the aggregated data to the sink which acts as the cluster head. Every other node aggregates the collected data with its own data, and then forwards the aggregated data to the next node in the ring. The only deference from the LEACH is to employ multi hop transmission and choosing only one node to transmit to the base station or the data sink. The advantage of this method is that it removes the overhead caused by dynamic cluster formation. As a result, PEGASIS outperforms the LEACH. However, there are some disadvantages as well i.e. excessive delay is introduced for distant nodes, especially for large networks.

3. A.Manjeshwar and D. P. Agrawal [25] introduced Threshold sensitive Energy Efficient sensor Network Protocol (TEEN) protocol in the year 2001. The idea is to form

clusters of the closer nodes with the cluster heads to transmit the collected data to its one upper layer. In forming the clusters, cluster heads announces two threshold values. First one is hard threshold which is the minimum possible value of an attribute to trigger a sensor node. Another is the hard threshold that makes the nodes transmit the event, if the event occurs in the interested areas. So, there is a significant reduction in the transmission delay occurs. The protocol is very much suitable for time-critical applications.

4. Smaragdakis, I. Matta and A. Bestavros [27] introduced Stable Election Protocol (SEP) protocol in the year 2004. This protocol is an increment version to the LEACH Protocol. The protocol is a heterogeneous aware protocol that is based on weighted election probabilities of each node in order to become cluster head as per their respective energy. This mechanism ensures to elect the cluster head randomly and distributed based on the fraction of energy of each node guaranteeing a uniform use of the nodes energy. Here, there are two types of nodes (two tier clustering or two level hierarchies) that are considered.

5. In the year 2005, M. Ye, C. Li, G. Chen and J. Wu proposed Energy Efficient Clustering Scheme (EECS) protocol. The protocol is a novel clustering scheme which is used for periodical data gathering applications in wireless sensor networks. The cluster heads election is done with more residual energy nodes through local radio communication. Here, a constant number of candidate nodes are elected and competes locally without iteration for cluster heads based on the residual energy. The protocol also ensures a uniform cluster heads distribution in the wireless sensor network. Further, to maintain the load balancing among cluster heads, a novel approach is introduced. But, the requirement of global

6. Q. Li, Z. Qingxin and W. Mingwen [28] in 2006, proposed Distributed Energy Efficient Clustering (DEEC) protocol which is a cluster based protocol for two level and multi level energy heterogeneous wireless sensor networks. In this method, the cluster heads selections are done through the probability which is based on the ratio of residual energy of each node and the average energy of the network. In this, those nodes with high initial energy and residual energy are having more chances to become cluster heads compared to nodes with low energy

7. In the year 2007, Xianghui Wang and Guoyin Zhang proposed Distributed Election Clustering protocol (DECP). The protocol is a heterogeneous aware clustering protocol that elongates the stable region of the wireless sensor network, which are based on remaining energy and communication cost to elect suitable cluster-head nodes. When there are imbalances energy available in the local area in the network, high energy node is considered first of all, to be the cluster head and when there are balanced energy, communication cost is considered next as the criteria to elect cluster head. This mechanism is very important for many applications where the sensor network feedback is reliable.

4. PROBLEMS WITH PREVIOUS WORK

As we know in WSN when sensor are deployed in unstructured environment sensor nodes are typically powered by irreplaceable batteries with a limited amount of energy supply then we generally want sensor network to work as long as possible. So to achieve this we have to perform transmission with less power or energy consumption.

As per previous work many algorithm for routing has been proposed as LEACH, HEED, PEGASIS, SEP etc. but all these algorithm are single hop routing protocols.

5. DISADVANTAGES OF SINGLE HOP ROUTING

Single hop routing can reduce communication overhead by selecting cluster head for data routing to main station but when communication distance that is distance between cluster head and main station increases single hop communication consume more energy.

6. PROPOSED METHODOLOGY

To over come above written prolems there is need for a system designing which will consume less energy in long distance communication. So in this paper a methodology is proposed which contains oncept of some additional nodes which lie between cluster heads and main station so will consume less energy than previous single hop protocols. This is

because the distance between cluster heads and base station is reduced by adding additional nodes between them. Also by reduction in distance the energy consumption by nodes for transmission decreases which finally leads to enhancement in lifetime.

7. CONCLUSION

The overall conclusion is that Energy consumption is the main design issue in routing of wireless Sensor Network. Literatur review concluded that energy consumed for single hop transmission is more than multi-node transmission for long distances. LEACH protocol consumes more energy and the network has shorter lifetime than proposed protocol which can be demonstrated by using this proposed work in real time. Finally, analysis results indicate that proposed protocol can more efficiently balance energy consumption of an entire network and thus extends the network lifetime.

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