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A BRIEF STUDY OF LEACH BASED ROUTING PROTOCOL IN WIRELESS SENSOR NETWORKS

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Abstract- *The most essential objective of the remote sensor arranges directing convention execution is adjusting system vitality utilization and expanding the whole system lifetime. Micro sensor nodes in wireless sensor networks have confined energy. Verbal exchange stops when these nodes lose their vigour absolutely. Remote sensor systems are made out of minimal effort and to a great degree control obliged sensor hub. In numerous applications of remote sensor organizes, a sensor hub detects the condition to get information and conveys them to the sink by means of a solitary bounce or multi-jump way. In remote sensor systems, due to constrained battery energy of sensor hubs, one of the key test is to accomplish least vitality utilization with a specific end goal to expand arrange lifetime. Low Energy Adaptive Clustering Hierarchy (LEACH) is an outstanding routing protocol in WSN. It is a Grouping based convention which helps in enhancing the lifetime of remote sensor network. This paper surveys various routing protocols and concluded that the round robin schedule can be used to improve the clustering in routing protocols in WSN.*

Key Words: **LEACH, Remote Sensor Systems, WSN, Routing,**

1.INTRODUCTION

In the field of wireless communications and miniature electronics have allowed the development of low-power, low-cost, multifunctional and tiny sensor nodes. These nodes are composed of equipment's that are responsible for sensing, data-processing and communicating. A collection of such sensor nodes, when scattered in one area, gathers data from their proximate environments and coordinate it to execute a certain task. Thus, this collection of sensor nodes can be referred to as a wireless sensor network (WSN) [1] [2].

1.1 The basic goals of a WSN are:

- To determine the values of physical variables at a given location like temperature of storage room.
- To detect the occurrence of events like how many time temperatures drops below 30 degrees.
- To estimate parameters of the detected event or events what's the current temperature
- To classify a detected object
- To track an object.

Sensor nodes are used in a wide variety of applications which requires constant surveillance of particular events. Smart sensor nodes can be built into daily use appliances such as ovens, microwaves, refrigerators which enable them to interact with each and be remote controlled [6]. This type of WSN application proved us a smart environment which adapt according to the user preferences. Military applications include 24 hours' surveillance, guidance system for missiles and provide security assistance from mass destruction. A patient can be monitored remotely by a doctor using WSN [7]. This is more convenient for the patient; it allows the doctor to have better understanding about the patient's current condition. Sensor networks can also be used for detecting foreign chemical agents in the air and the water. They help in identifying the type of object, concentration and location of pollutants. The wireless sensor networks will provide the end user with intelligence and a better understanding of the environment [8].

Routing techniques in WSNs have to deal with different challenges and design issues. Despite advancement in field of information technology, limited battery power, bandwidth limitation, inadequate processing power and limited memory are some restrictions faced by networks having wireless sensors. [9] Due to these reasons, routing protocols should be highly adaptive and more aware about resources. This paper aims to provide effective protocol to minimize the energy consumption in the network and increase the network stability.

1.2 Applications of Wireless Sensor Networks are as follows:

- **Military operations:** Error tolerant, self-configuration and brisk exploitation asset fallout in major use of wireless sensor networks in applications used for military purposes. Sensor networks can be used for battle field surveillance, trailing and supervising gracious strength, exposure of biological, chemical and

nuclear hits. Consequently wireless sensor networks are occupied in military guidelines, manage, figuring, communication, intellect and surveillance.

- **Surveillance**: Imagine that multiple networked sensors (e.g., audio, seismic and video) are likely to spread all through in a region such as a combat zone.A surveillance interface can be projected on the above of this sensor network to provide data to an end-user about the environment. In such a network, if data is computed locally, traffic marks can vary from unprocessed sensor data to a lofty level representation of what is rousing in the background. The application will have several Qualities of service (QoS) supplies from the sensor network, such as obliging a slightest proportion sensor.

- **Home Applications**:-Wireless sensor networks are used in home automation systems. Sensor nodes can be established in home appliances such as microwave ovens, refrigerators and vacuum cleaners. Using wireless interface, devices can correspond with each other and sensor network permits the consumer to handle home devices distantly and locally.

- **Health Applications**: Wireless sensor networks are budding in utilizing health applications for patient examining, remedy organization and tele-screening.

- **Environmental Applications**: Wireless sensor networks can be worn to sense forest fires and floods, tracking and supervising of animals, earth supervising and terrestrial discovery.

- **Other Commercial Applications**: Wireless sensor networks can be recognized for observing product superiority, monitoring material exhaustion, creating smart office places, vehicle tracking and exposure, robot control, managing inventory, factory course organizing and automation. To execute vehicle tracking thousands of energy-controlled elements are speckled over a present section [6]. Seeing as communication outlay more than such outsized distance is energy-draining, transmission to the base station need to be steer clear of except enormously crucial.

2. RELATED WORK

Wireless Sensor networks have arisen as an effective solution for a wide range of applications. Wireless sensor network consists of large number of nodes positioned randomly or deterministically in the area of interest to sense the event. Various clustering algorithm have been proposed in the literature to increase the lifetime of the WSN. Some of them have been examined and presented here:

O. Younis and S. Fahmy proposed Hybrid Energy Efficient Distributed Clustering Protocol (HEED) [3][4] protocol in 2004. It extends the basic scheme of LEACH by using residual energy as primary parameter and network topology features (e.g. node degree, distances to neighbors) are only used as secondary parameters to break tie between candidate cluster heads, as a metric for cluster selection to achieve power balancing.

S. Lindsey and C. Raghavendra introduced Power Efficient Gathering in Sensor Information Systems (PEGASIS) [5] protocol. It is an improved version of LEACH. Instead of forming clusters, it is based on forming chains of sensor nodes. One node is responsible for routing the aggregated data to the sink. Each node aggregates the collected data with its own data, and then passes the aggregated data to the next ring. The difference from LEACH is to employ multi hop transmission and selecting only one node to transmit to the sink or base station. Since the overhead caused by dynamic cluster formation is eliminated, multi hop transmission and data aggregation is employed, PEGASIS outperforms the LEACH.

S Kumar et.al [11] introduced a protocol that is efficient for saving energy in networks where nodes are having dissimilar nature i.e. heterogeneous WSNs. Paper proposes a distributed protocol which uses heterogeneous WSN to improve the network lifespan. The technique proposed in this paper includes a flowchart based on various clustering equations that proves that the work achieves prolonged lifespan with enhanced QOS measures. End-Users use statistics and figures for making accurate and optimum decisions or for healthy business using internet.

Femi A. et.al. [14] utilizes a simplified approach which minimizes computational overhead-cost to self-organize the sensor network. Our simulation result shows a better performance with respect to energy consumption. which is reflected in the network lifetime in both homogeneous and heterogeneous settings when compared with the existing protocols. It is worthy of note that our approach approximates an ideal solution for balanced energy consumption in hierarchical wireless sensor networks.

Amrira Ruperee et.al [15], proposed in this paper decreases the packet length by processing the data using Delta Modulation technique at the node itself. In this method, output is dependent on the comparison between the present and previous values of data. If current value is greater than previous one, then output will be HIGH else LOW. It minimizes the length of packet and therefore the power dissipation. This technique is used for both clusters having even and uneven sizes. The system stability in this method is less thus reducing the network throughput.

F. A. Aderohunmu et.al [16], discloses a probabilistic model to handle use of vitality in WSNs. Principle objective of this convention is to utilize worldwide data and actualities to amplify the without taking the nearby information into the record i.e. the remaining force of every hub. The negative part of such methods is (i) no confirmation that the required

amount of bunch heads (CHs) will be chosen (ii) the chose group head will have adequate energy to go about as a pioneer and performs its operations.

A.B Samer et.al [17], clarifies a versatile TDMA planning and bunch based directing convention which depends on round free groups. In this convention information is gotten by CH in given timeslot and different hubs that simply enter the group when it has an available time period. This convention controls booking as per the progressions happened in movement and portability circumstances in the system. It can significantly decrease the loss of parcels contrasted with the LEACH-versatile convention. Both systems concentrate on expanding the most extreme bundle conveyance rate yet confront overhead because of the transmission of control messages.

D.S Kim et.al [18] proposed the low-vitality versatile bunching chain of command portable (LEACH-versatile) convention that backings the portability of a sensor hub. It includes the partner announcement that approves the passage of new hub in a group amid unfaltering state stage. On the off chance that a hub does not get a solicitation from its CH in two continuous edges, it implies that it has moved out of the group. It will then join another group by sending a bunch joint solicitation. Hence, at the expense of more noteworthy overhead, this convention enhances the parcel conveyance rate.

D. Kumar et.al [19] projected the protocol that work efficiently in dissimilar kind of in which leaders of clusters are selected using criteria of weighted probability of energy a node is having at the origin. All the nodes in the cluster directly interact with the leader of the cluster and Base Station. Therefore, during routing operation when data is routed towards different paths to reach the cluster head, a great amount of energy is wasted.

SK Singh et.al [20] introduced the important issues in WSN in the inherent limited battery power with in network sensor's nodes. The battery power is crucial parameter in the algorithm design to increase life span of nodes in the network. The main objective of the algorithm to maximizing lifespan of sensor's nodes and the overall network performance

3. BACKGROUND STUDY

The existing work [21] aims at improving the lifetime of the wireless sensor network by using the clustering scheme. The scheme is a modification to the LEACH clustering protocol. Likewise, LEACH this is also divided into set up phase and steady phase. However, the authors have the sleep awake approach. In each round the cluster heads decide which of the cluster members have lesser energies, and upon finding them those nodes must be put to sleep mode. So they won't consume much of the energies and thus can work for duration of time. The formula for the threshold value that decides whether the node would be elected as cluster head or not, is also modified by considering the residual energy of the nodes into the account.

Nonetheless, the network does not make any changes in the clustering phase or set up phase. This phase involves a lot of messages that are required to be broadcasted to form the clusters. For instance, first the cluster heads send the advertisement messages to all the nodes asking them to join their cluster. Then, each non-cluster head sends join message to the cluster head and again a third-time cluster heads sends the message to the members informing which nodes must be out to the sleep node. So, every time, the round changes this process gets repeated leading to so many messages being broadcasted thus leading to higher energy consumption. This method can be replaced by the round robin schedule where the cluster heads for the subsequent rounds are decided in the initial phase itself.

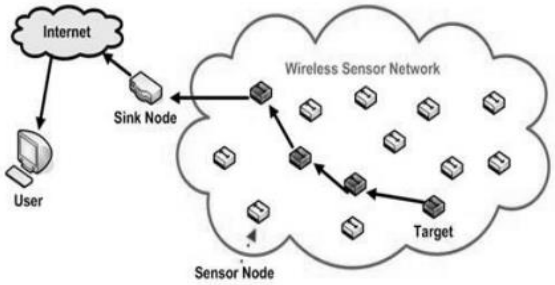

Fig. 1 Architecture of WSN

4. CONCLUSIONS

The key goal of this paper is to fabricate an arrangement of principles that can give a superior and solid remote sensors organize administrations utilizing stable system having hubs with delayed lifetime. In the past approach In each round the cluster heads decide which of the cluster members have lesser energies, and upon finding them those nodes must be put to sleep mode. So they won't consume much of the energies and thus can work for duration of time Here, every time, the round changes this process gets repeated leading to so many messages being broadcasted thus leading to higher energy consumption. In future this work can be extended using round robin schedule where the cluster heads for each round is decided initially i.e. in the initial phase. The main focus of the protocol should be to minimize the usage of energy within the WSN and increase the lifespan of the network**.** Moreover, it is also expected that the throughput of the WSN will increase due to fall in energy consumption in network. This results in greater network stability and prolonged network lifetime.

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