Region Refinement Technique In MGEAR Protocol To Enhancing Sensor Node Life Time

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Abstract— There are number of energy efficient techniques used to enhance the network life time one of them is gateway based energy-efficient routing protocol (M-GEAR) this protocol is based on the node which is rechargeable and divides network into four logical regions on the basis of the location from the Sink. In this paper we use the Enhanced gateway based energy-efficient technique which works on the basis of multilevel multihop technique with CHs and gateway nodes in region 2 and region 3 and the selection of the cluster heads in these region is based on the energy concept, which improves the network life time by minimizing the data loss and cluster failure.

Keywords—Sensors, Gateway Node, TDMA, Homogeneous Network

I.   INTRODUCTION

The gateway based energy-efficient routing protocol (M-GEAR) for Wireless Sensor Networks (WSNs) divides the sensor nodes into four logical regions on the basis of their location in the sensing area and location from the Sink. The gateway node which is a rechargeable node and is placed at the centre of the sensing area in between region 2 and region 3[1]. The communication between the nodes and the base station is based on the predefined distance threshold, If the distance of a sensor node from BS or gateway is less than predefined distance threshold, then such node communicates direct with the base station otherwise it divide the rest of nodes into two equal regions whose distance is beyond the threshold distance. The communication between region 2 and region 3 with BS is done by selecting the cluster heads. These CHs are selected on the basis of a probability. This probability based selection does not focus on the energy of the node which is to be selected as CH, the CH selected may be have less energy and there is no concept of distance base selection, this paper presents all the energy efficient techniques used for (M-GEAR).

In this work we propose a homogeneous model with N sensors deployed randomly in a network area and the use an enhanced gateway based energy-efficient technique.

The main objective s of the work are:

1. To design the gate-way based energy efficient topology for multilevel multihop technique with CHs and gateway nodes.

2. To implement the energy based and distance based cluster head selection.

3. To minimize the path loss and enhance the network life time.

II.   LITERTURE SURVEY

The research paper titled "M-GEAR: Gateway-Based Energy-Aware Multi-Hop Routing Protocol for WSNs" by M. B. Rasheed et focused on gateway based energy-efficient routing protocol (M-GEAR) and divides the sensor nodes into four logical regions on the basis of their location in the sensing area and location from the Sink. The Base Station (BS) is installed out of the sensing area and a gateway node which is a rechargeable node at the centre of the sensing area. If the distance of a sensor node from BS or gateway is less than predefined distance threshold, then such node communicates direct with the base station otherwise it divide the rest of nodes into two equal regions whose distance is beyond the threshold distance. Then the cluster heads (CHs) selection in each region are independent of the other region which is based on the probability. The paper uses a network model and works in phases[1] as: Initial Phase: The sensor nodes are deployed randomly in homogeneous network area and the location of BS, sensor nodes is calculated with distance and is saved in data table. Setup Phase: This phase divides the network into regions based on the location of the nodes and BS divides the nodes into four regions, CH Selection: The selection of CHs in each region separately based on the probability. Scheduling: When all the sensor nodes are structured into clusters, each

CH creates TDMA based time slots for its member nodes. All the associated nodes transmit their sensed data to CH in its own scheduled time slot. Otherwise nodes switch to idle mode. Steady-State Phase: then all sensor nodes transmit their sensed data to CH. The CH collects data from their member nodes, aggregates and forwards to gateway node. Gateway node receives data from CHs, aggregates and forwards to BS.

During cluster head selection phase , the selection is based on the probability that means the CH which is selected during the round mayor may not have much energy that it can survive longer as there is no concept of energy of the nodes. If we use the energy efficient concept for the selection of CHs then the selected CH will be one which have more energy than other nodes. Similarly in steady state phase each region uses direct communication between nodes and CHs, between CHs and gateway node, if we use a multilevel multihop technique with CHs and gateway nodes in region2 and region 3 we can minimize the data loss.

III. METHODOLOGY

Let n number of nodes are deployed in a homogeneous network with certain distance d_i as shown in figure 1.

Base Station Is deployed away from the network at a fixed location, and Gateway node which is rechargeable node and is placed at the centre of the network. Each node in the network have a distinctive identifier and is placed in a data table during initial phase.

The network model works in phases:

Deployment phase: In this phase we deploy n sensor nodes in a field with a distinctive identifier to each node and Base station BS away from the field. During this phase BS calculates distance of each node and maintains a data table. The gateway node is placed at the centre of the field.

Setup Phase: In this phase the network is divided into four different regions according to the distance from the BS. The region 1 contains the set of node which are nearer to the BS and communicates directly to the BS. The region 1 and region 4 sends their data direct to the BS and Gateway node respectively as these node nearer and there is no need of any clustering technique. These regions are called non cluster regions. The region 2 and region 3 are called cluster region as they are away from BS and Gateway node. The communication in these regions is based on clustering.
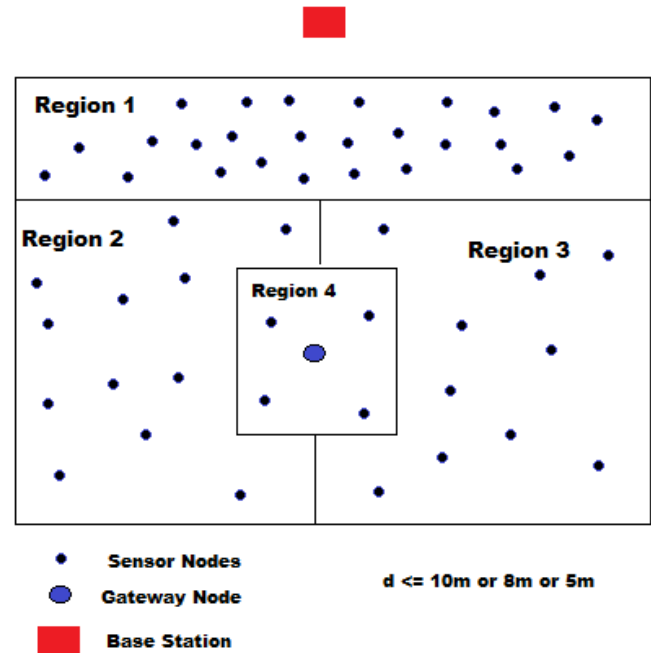

Figure 1. Network Layout Model

CH Selection and Communication Phase: In this phase the CHs are selected in each round and the selection is based on the energy, the node having the maximum energy is selected as cluster head. The CH forwards message 'I am CH' upto d range, the other nodes receives message and behaves as normal node and sends message ' I am your normal node'. Then each CH uses TDMA technique for their nearer nodes or other CHs in that Region. In this phase the multilevel multihop technique with CHs and gateway nodes is implement to forward the collected data by CHs from Normal nodes to gateway node in certain manner as: let one CH wants to sends its received data to gateway node it checks weather other CH is nearer to me or Gateway node, if other CH is nearer to it as compared to Gateway node then it send its data to other CH rather than gateway node. Similarly CHs forward data to Gateway node and Gateway node send its aggregated data to BS.

IV. RESULTS AND DISCUSSION

The testing and the implementation of this proposed work to achieve the desired objective is done in MATLAB. The network is designed with 100 nodes in 100m X 100m field. The maximum number of rounds 3000 with packet size 4000 bits are used. The performance of the proposed model is calculated by throughput of the network, remaining residual energy of the nodes and life time of the network by dead nodes and alive nodes.

Figure 2 and figure 3 defines the network life time by showing the values of number of dead nodes in each round

and number of alive nodes at each round compared with MGEAR protocol.
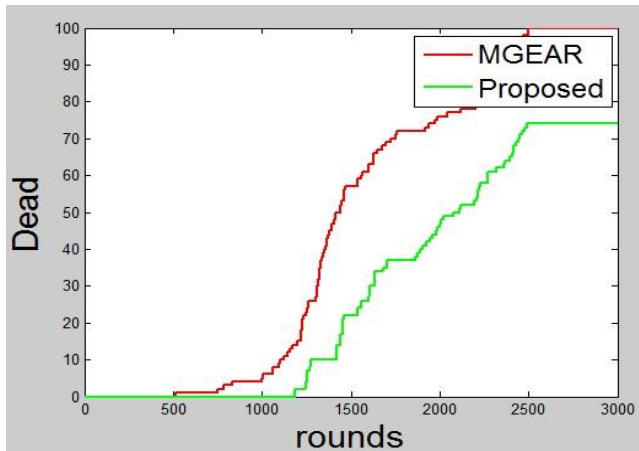

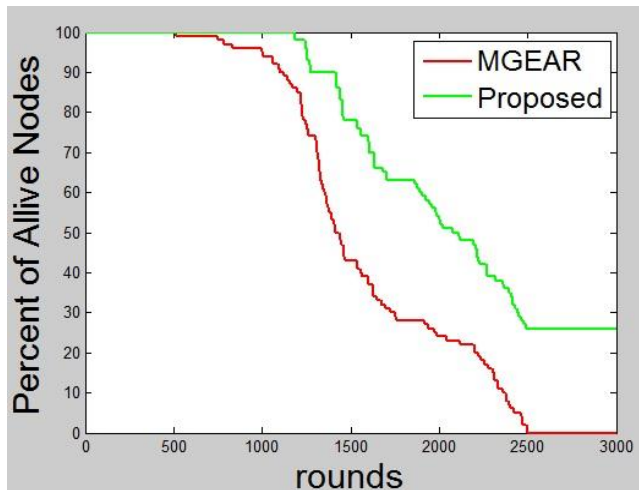Figure 2. Analysis of Network Lifetime using Dead nodes

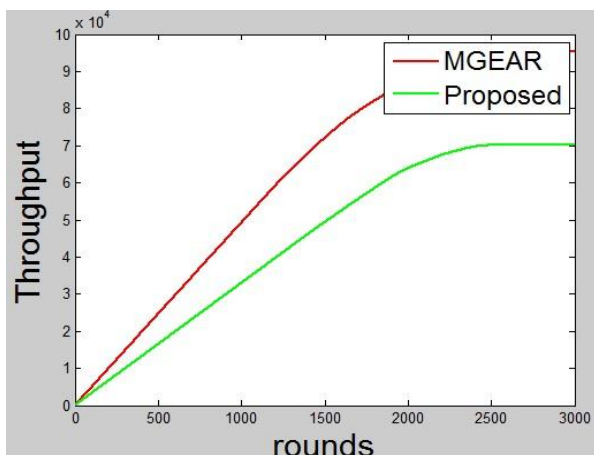Figure 3. Analysis of Network Lifetime using Dead nodes

Figure 4. Analysis of Throughput

Figure 4 represents the throughput of the network and figure 5 shows the shows average residual energy of network per round..
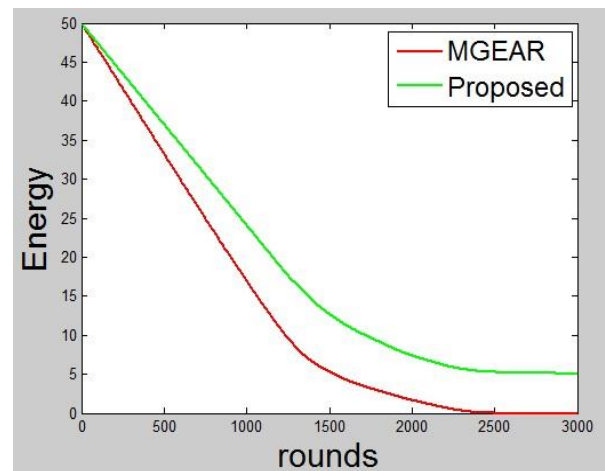

Figure 5. Analysis of Remaining Energy

V.   CONCLUSION and Future Scope

By using the energy base selection and multilevel multihop technique with CHs and gateway nodes in MGEAR minimizes the energy consumption per round and minimizes the data loss. It enhances the node life time and achieves the optimal path selection by CH in region 2 and region 3. In future work the region 1 can also be stretched along axis from 0-100 where the CH selection can be to improve network.

ACKNOWLEDGMENT

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Authors Profile

Mrs. Preeti Jamwal is pursuing M Tech in computer science from Punjab Technical University. She is working on Wireless sensor networks and her main focus is to impliment her work to improve the stability of network and a sensor node by using gateway node in the network.

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