A Comparative Analysis of Beenish and Ebeenish in WSN

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***Abstract*:** *Wireless sensor networks are made up of several sensor nodes that gather the information from their surroundings and then retransmit to the end user. In wireless sensor networks, the main issue is the battery. The Network lifetime of each WSN is depending upon the sensor's communication. Various techniques and methods are used to enhance the network lifetime. In balanced energy efficient network integrated super heterogeneous protocol has four energy levels of nodes. In clustering, cluster head selection is the main paradigm in wireless sensor network. Cluster head selection is done through the three parameters like node degree, average energy and the path loss factors makes the network more stable and enhance the overall network lifetime. The simulation results show that the new protocol outperforms than the BEENISH protocol.*

Keywords*: Wireless sensor network, battery, Network lifetime, clustering, node degree, average energy, minimum path loss factor.*

[1] INTRODUCTION

A Wireless Sensor Network is a self-organizing and self-reconfiguring network of a small sensor nodes communicating among each other using radio signals, and deployed these to sense, monitor and understand the physical world. A sensor network consists of multiple detection stations is called sensor nodes, each of which is small, lightweight and portable. Sensing nodes in WSN have many uses like monitoring physical or environmental conditions, such as sound, humidity, temperature, and motion etc. Wireless Sensor Networks (WSNs) permit us to use these small sensor nodes for various applications like military applications; area monitoring, manufacturing, end user applications, and under deep water monitoring, etc. Node consume more energy for transmission purpose, with this network lifetime of WSN will decreased so the nodes are dies quickly in the network. Wireless Sensor Networks (WSNs) have become popular in variety of applications such as military surveillance, environmental, transportation traffic, temperature, pressure and vibration monitoring. To achieve fault tolerance. WSNs consist of hundreds or even thousands of sensors randomly distributed with in the region. All the nodes report sensed data to Base Station (BS) often called sink. Nodes in WSNs are power constrained due to limited battery resource, and they might be placed where they cannot be accessed, so, impossible to recharge or replace. To save energy, regular and long distance communication should be avoided to prolong network lifetime. Sensor nodes take self-decisions to accomplish sensing tasks, constructing network topology and routing policy. Therefore, it become important to design energy efficient algorithm[3][6][7] for enhancing robustness against node failures and extending lifetime of WSNs. Efficiently Grouping sensor nodes in form of clusters is beneficial in minimizing the energy utilization. Numerous energy efficient protocols are made based on clustering structure . In clustering, nodes assemble themselves in form of clusters with one node acting as the Cluster Head (CH). All cluster member nodes transmit sensed data

to their CH, while the CH aggregate data received and forward it to the remote BS. Clustering can be formed in two kind of networks i.e., homogenous and heterogeneous. WSNs having nodes of same energy level are called homogenous WSNs. Low Energy Adaptive Clustering Hierarchy (LEACH), Power Efficient Gathering in Sensor Information Systems (PEGASIS) and Hybrid Energy-Efficient[4]5 Distributed Clustering (HEED) are examples of cluster based protocols which are designed for homogenous WSNs. These algorithms poorly perform in heterogeneous regions. Nodes have less energy will expire faster than high energy nodes because these homogenous clustering based algorithms are incapable to treat every node with respect to energy. In heterogeneous WSNs, nodes are deployed with different initial energy levels. Heterogeneity in WSN may be the result of re-energizing of WSN in order to extend the network lifetime. Stable Election Protocol (SEP), Distributed Energy Efficient Clustering (DEEC)[1], Developed DEEC (DDEEC), Enhanced DEEC (EDEEC) are protocols for heterogeneous WSNs. Wireless sensor networks depend on source restraint sensor nodes to repossess data from physical world. Energy is obsessive in two conducts: useful consumption and wastage consumption. In useful consumption, energy is exploiting in transmitting and receiving course throughout data transmission. Energy obsessed in Query request and Queries are exchanged in between neighbors use. Whereas energy is wastage in: Idle listening; Retransmission; Overhearing and Over-emitting. In idle listening, energy is shattered as nodes sit idle, awake and wait for their call upon for specific application[8][9][10].

[2] CLUSTERING

The key intention of graded routing or cluster primarily based routing is to aptly maintain the energy usage of device nodes by connecting them in multi-hop communication among a exacting cluster. Cluster construction is often supported the energy reserve of sensors and sensors closeness to the Cluster Head (CHs). Agglomeration plays a key role for power saves in WSNs. By clustering, the sensor nodes are divided into groups known as division cluster. Each cluster has a cluster head that aggregates data from the nodes in the cluster and forwards the data to the sink directly or step by step using other clusters' heads (chain communication).

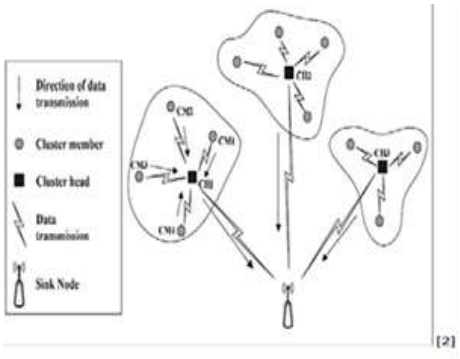

Fig. 1 shows the technique of Clustering

There are two types of communication which is used in wireless sensor network.

Inter cluster communication-communication with other cluster heads.

Intra cluster communication- communication of regular nodes with cluster head.

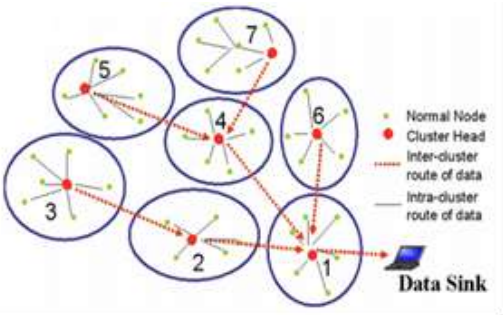

Fig 2.shows how clustering communication done.

[3] BEENISH Protocol

Balanced Energy Efficient Network Integrated Super Heterogeneous Protocol for Wireless Sensor Networks BEENISH [2][5]worked on four types of heterogeneous nodes as normal nodes, advanced nodes, super nodes and ultra-super nodes. In BEENISH CH are selected based on ratio of residual energy of a node and average energy in the network fields. BEENISH prolongs network lifetime, longer stability period and increased number of messages sent to base station as compared to DEEC, DDEEC, and E-DEEC. The probability for four types of nodes is given below.

P_i=

for ultra super nodes

[4] QoS Strategy

In the QoS approach [10], the cluster head selection is based upon three factors. They are node degree, average energy and the minimum path loss factor. The following factors are considered during the cluster head selection. Firstly, calculate the neighbors of each node in the network. The nodes must be in its transmission range. The distance should be calculate using the Euclidean distance formula.

$$\text{distance} = \sqrt{((x_1 - x_2)^2 + (y_1 - y_2)^2)}$$

In the node degree, the maximum node degree is having total number of neighbors. For each node, calculate the sum of distances with all of its neighbors. Distance between nodes calculated via Euclidean distance which help in determining the total loss. The average energy of each node can be calculated as

$$EAVG = \frac{1}{N} \sum_{v \in N_v} E_v$$

Where, E_v is the residual energy of all the neighbor nodes. The position factor POS is calculated using following equation

$$POS_v = \alpha.N_V + \beta.EAVG + \mu.(1/P_V)$$

Where, α+β+μ=1

α, β andμ are the weighting factor for the given parameters. Always choose the highest POS as the cluster head.

[5] Experimental Setup

The paragraph discusses the simulations results and comparative study of the performance. So as to implement the planned style and implementation has been done. Table 1 has shown a spread of constants and variables needed to simulate this work. These parameters square measure customary values used as benchmark for WSNs. In this simulation environment, the 100 sensor nodes are deployed in the area of 100*100 meter. The MATLAB simulator is used for the given experiment. The parameters are listed below in the given table. The metrics used for the simulation are:-

- Remaining Energy
- Packet send to base station
- Packet send to cluster head
- Dead nodes

Table:1. Simulation Parameters

Parameters	Value
Area(x,y)	100,100
Base Station(x,y)	50,50
Number of nodes	100
Probability	0.1
Initial Energy	0.5J
Transmitter Energy	50 nJ/bit
Receiver Energy	50nJ/bit
Free space Energy (amplifier)	1.0nJ/bit/m^2
Multipath Energy	0.0013nJ/bit/m^2
a	3
b	2

Number of rounds	10,000
Message Size	4000bits

1. Simulation Scenario and Results

This is the environment where area is 100*100 meter. Here, the environment of simulation is at the mid, where all the blue triangle are nodes and Red triangle nodes are dead and star shaped is the base station

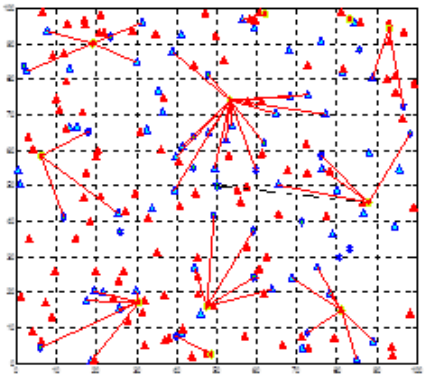

Figure: 3. Simulation Enviornment

Here, the graph shows the simulation when all the nodes are dead. So all the nodes are in the red triangle shape and again star shaped is the base station.

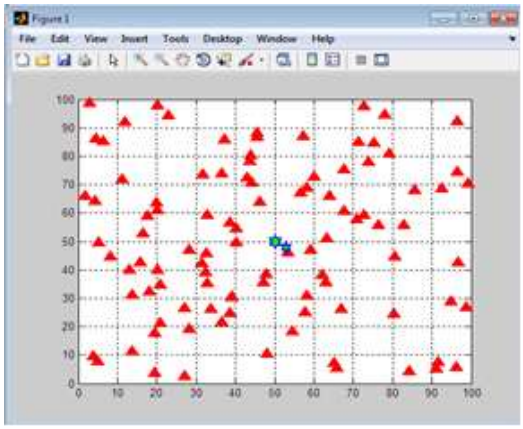

Figure:3. Simulation Enviornment at the end

Remaining Energy:-This is the graph of remaining energy, which shows how much energy is left after the simulation. X axis shows the number of rounds .Here we have implemented the BEENISH and EBEENISH . In the case of the BEENISH energy ends at the 8000 rounds and on the other hand, in EBEENISH the energy dies at 10000 rounds. So EBEENISH is more effective than the BEENISH.

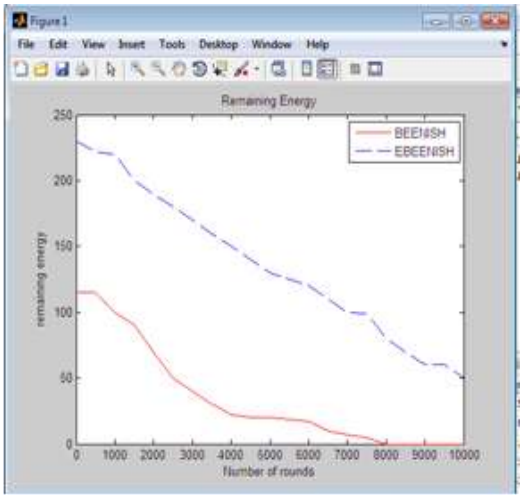

Figure:4. Remaining energy Vs Rounds

Dead Nodes: - This is the graph of dead nodes in BEENISH and EBEENISH protocol.The network lifetime can be evaluated by using the number of dead nodes. It has been found that the number of nodes die earlier in BEENISH protocol. Here, we can see from the graph that the nodes are die at the round of 1100 in case of BEENISH and 4000 in case of EBEENISH.

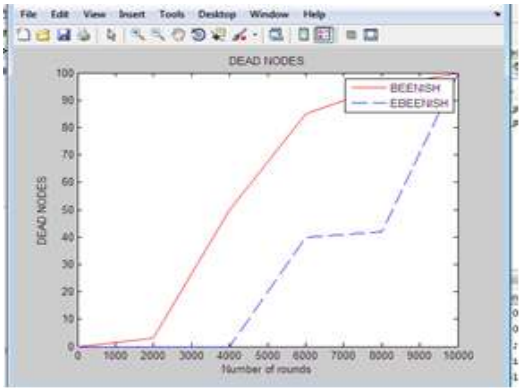

Figure: 5. Dead nodes Vs Rounds

Packets Send to Cluster Head:-This is the graph of Packet send to cluster head after simulation. This graph shows the total number of packets send to the cluster head by the sensor nodes. At the round of 10,000, the total number

of packets send to cluster head in the case of BEENISH protocol is 5*105 and in case of EBEENISH ,the packets send to cluster head is 8*105.

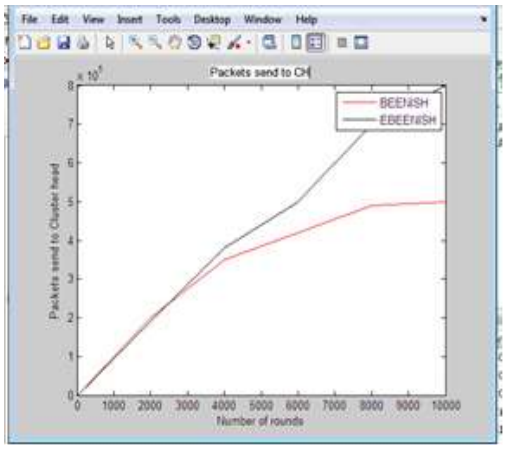

Figure: 6. packet send to CH Vs Rounds

Packets Send to Base Station:-This is the graph of Packet send to base station after simulation. This graph shows the total number of packets send to the base station by the sensor nodes. At the round of 10,000, the total number of packets send to base station in the case of BEENISH protocol is 2*105 and in case of EBEENISH ,the packets send to cluster head is 2.4*105.

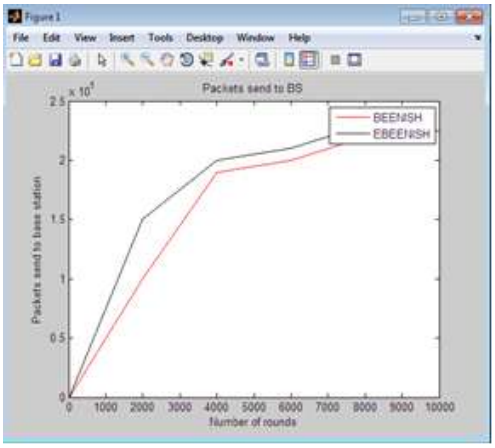

Figure:7. packet send to BS Vs Rounds

[6] Conclusion and future scope

In this paper, we have proposed the EBEENISH which is an efficient technique. This protocol adopts the selection of cluster head using the three parameters like node degree, average energy and the path loss factors which outperforms BEENISH. The proposed protocol shows the better improvement over existing protocol. But this work has not taken into account the utilization of 3D WSNs, which are becoming major area of research in these days. Therefore in near future work we will extend the planned technique for 3D WSNs environment.

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