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Exterior Bound Allotted Advanced Node Distribution for Energy Efficient Clustering (EBAN DEEC) Protocol in WSN

Ashish Prakash
Electronics and Communication Engg,
I.E.T., DRMLAU, Ayodhya, India
ashishprakash585@gmail.com

Ramesh Mishra
Electronics and Communication Engg,
I.E.T., DRMLAU, Ayodhya, India
rameshmishra1985@gmail.com

Astha Singh Kushwaha
Electronics and Communication Engg,
I.E.T., DRMLAU, Ayodhya, India
sastha75@gmail.com

Abstract*- In latest years, numerous guidance conventions have been proposed to enhance the lifetime, deployment of nodes, power performance, latency, robustness, fault tolerance, and reliability of Wireless Sensor Networks (WSN). The vitality necessities and drawing out the lifetime of the WSN is imperative a part of guidance conventions. Diverse bunch primarily based directing convention have proposed to enhance the normal conventions i.e. Direct transmission, multi-soar steering, static bunching and least transmission-power. Among all organization primarily based conventions, DEEC is the most conspicuous WSN conference. In this paper, we have got attempted to increase the DEEC by such as numerous components in DEEC for homogeneous and heterogeneous situations. We have proposed Hand DEEC Phase-1 by way of imparting successful institution head preference plan and specific transmitting pressure tiers for DEEC in homogeneous environment. Be that as it is able to, vitality sparing plan of homogeneous environment isn't always appropriate for heterogeneous surroundings. Stable Election Protocol (SEP) is the detail heterogeneous steerage conference. SEP depends on weighted choice chances of every hub to end up the bunch head as indicated through the final energy in every hub. We advise Hand DEEC Phase-2 by applying various techniques for correspondence (among CH to sink) for slicing part and regular hubs. By demonstrating activity, we show that Hand DEEC is extra vitality talented and has longer life of gadget than DEEC in homogeneous and heterogeneous situations.

Keywords-- Data aggregation, Dynamic cluster head rotation, Heterogeneous system, DEEC Protocol, WSN.

1. Introduction

DEEC, that is a WSN protocol for homogeneous structures, isn't always appropriate for heterogeneous systems. Putting few heterogeneous nodes in a Wireless Sensor Network is an powerful manner to increase the network's stability and lifelong. The electricity saving schemes used for homogeneous WSNs does not works effectively when used for heterogeneous WSNs. Thus, a brand new energy efficient clustering protocol need to be designed for them. Heterogeneous WSNs are very an awful lot useful in actual deployments due to the fact they may be more close to real existence situations.

We can divide heterogeneous WSN device especially in three components.
1) Computational heterogeneity
2) Link heterogeneity
3) Energy heterogeneity

1.1. Computational heterogeneity:

In this type of system, some of the nodes have more energy than the other normal nodes. The heterogeneous nodes can provide some benefits such as complex data processing and long term storage with the use powerful computational resources. We are going to use this approach in EBAN DEEC Phase 2.

1.2 Link heterogeneity:

Here, some of the heterogeneous nodes have higher bandwidth and longer distance network transceiver than the normal nodes. It can provide more reliable data transmission.

1.3 Energy heterogeneity:

This system has some of the heterogeneous nodes that are line powered or their batteries are replaceable.
For our protocol, Computational heterogeneity is the best suitable. Because in EBAN DEEC, we are trying to increase the lifetime of the network. By distributing powerful calculations to advance nodes, we can increase the network lifetime. Link heterogeneity is dealing with the quality and reliability of packets whereas; Energy heterogeneity can be implemented in practical situations. We are not considering Link and Energy heterogeneity from the algorithm point of view.

2 Heterogeneous SEP Protocol:

EBAN DEEC Phase 2 is dependent on SEP (A Stable Election Protocol for clustered Heterogeneous WSNs) protocol. SEP is based on weighted election probabilities of each node to become cluster head according to the remaining energy in each node. SEP tries to maximize the stability of the network. Stability can be increased by increasing the time of last node death. Clearly, larger the

stable and unstable regions are, better is the reliability of the clustering process.
On the other hand, there is a trade off between reliability and the lifetime of the system. Until the death of the last node, we still can have some feedback about the sensor field even though this feedback may not reliable. The unreliability of the feedback stems from the fact that there is no guarantee that there is at least one cluster head per round during the last rounds of the operation. In our model, the absence of a cluster head prevents reporting about the cluster to the sink at all. The throughput quantity captures the amount of such data reporting to the sink. In a heterogeneous WSN, DEEC doesn't work well as it is very sensitive to the heterogeneity.

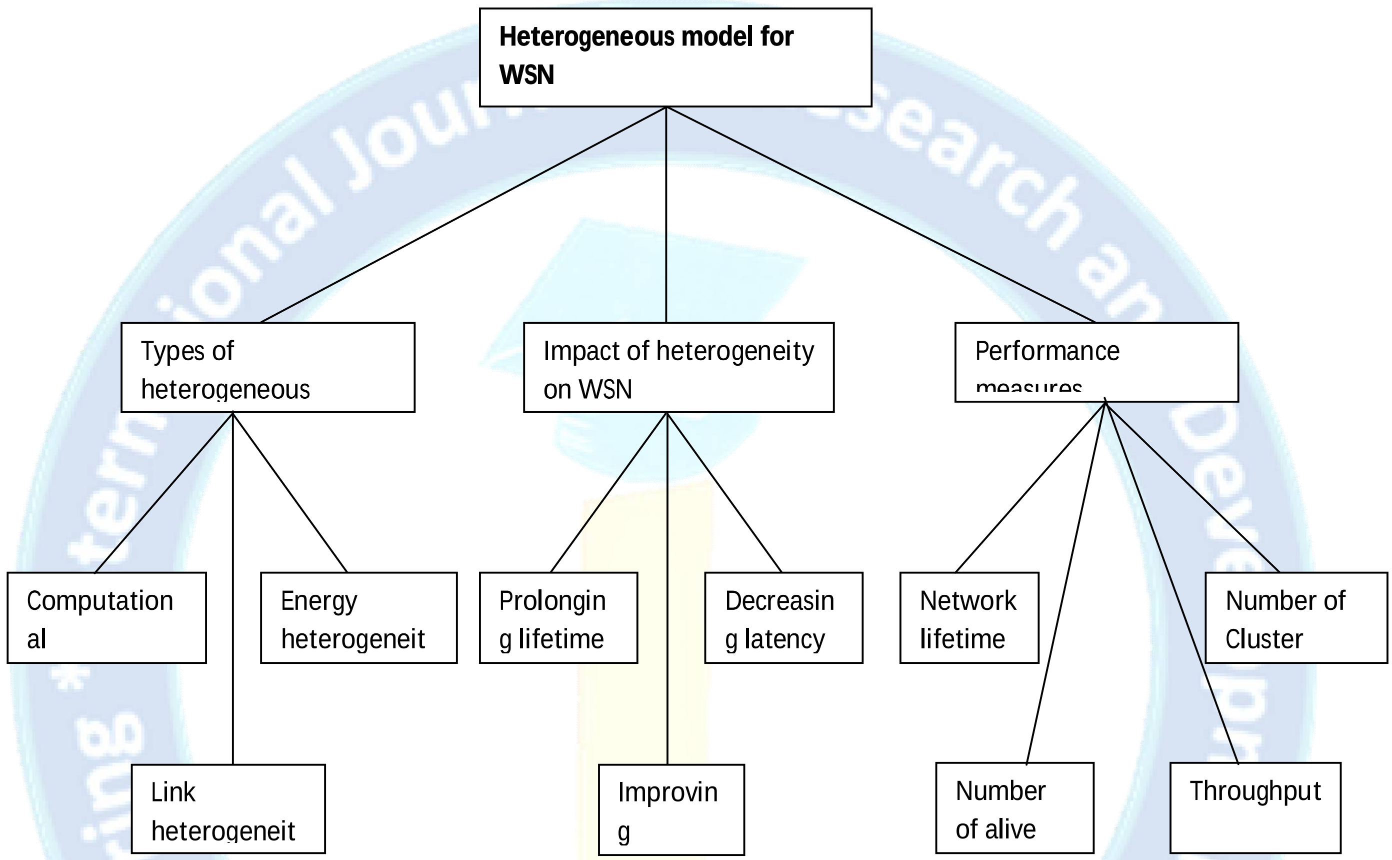

Fig. 1. Heterogeneous model for Wireless Sensor Network

3. Related Work:
Li Qing et.al. (2006) [3], The clustering Algorithm is a form of key method used to reduce electricity consumption. It can increase the scalability and lifelong of the community. Energy-efficient clustering protocols need to be designed for the feature of heterogeneous wi-fi sensor networks. We propose and evaluate a new disbursed energy-green clustering scheme for heterogeneous wi-fi sensor networks, which is called DEEC. In DEEC, the cluster-heads are elected with the aid of a chance based on the ratio between residual electricity of every node and the common electricity of the community. The epochs of being cluster-heads for nodes are exceptional according to their initial and residual energy. The nodes with high initial and residual energy could have more probabilities to be the cluster-heads than the nodes with low strength. Finally, the simulation consequences display that DEEC achieves longer lifetime and extra powerful messages than modern critical clustering protocols in heterogeneous environments.
They describe DEEC, an energy-conscious adaptive clustering protocol utilized in heterogeneous wi-fi sensor networks. In DEEC, every sensor node independently elects itself as a cluster-head based totally on its initial strength and residual electricity. To manipulate the energy expenditure of nodes by adaptive approach, DEEC use the average power of the network because the reference strength. Thus, DEEC does not require any global understanding of power at every election spherical. Unlike SEP and DEEC, DEEC can perform properly in multi-level heterogeneous wireless sensor networks.

There are styles of clustering schemes. The clustering algorithms carried out in homogeneous networks are referred to as homogeneous schemes, and the clustering algorithms implemented in heterogeneous networks are called heterogeneous clustering schemes. It is tough to plot an power-efficient heterogeneous clustering scheme due to the complicated electricity configure and network operation. Thus maximum of the present day clustering algorithms are homogeneous schemes, such as DEEC [10], PEGASIS [11], and HEED [12].

The cluster-heads must spend more electricity for aggregating facts and appearing lengthy-variety transmission to the distant base station. The DEEC protocol selects clusterheads periodically and drains strength uniformly by using position rotation. Each node comes to a decision itself whether or not or no longer a cluster-head distributed through a chance. Under the homogeneous community, DEEC plays nicely, however its performance come to be badly within the heterogeneous community as shown by means of [9]. In PEGASIS, nodes may be organized to shape a series, which may be computed by way of every node or by the bottom station. The requirement of global understanding of the network topology makes this approach tough to put into effect. HEED is a dispensed clustering algorithm, which selects the cluster-heads stochastically. The election opportunity of each node is correlative to the residual power. But in heterogeneous environments, the low-strength nodes should own larger election probability than the high-strength nodes in HEED. The heterogeneity of nodes in terms of their electricity is considered in our DEEC, that is designed for heterogeneous networks. At the equal time, DEEC keeps the merits of the dispensed clustering algorithms.

Estrin et al. [5] speak a hierarchical clustering approach with emphasis on localized conduct and the need for asymmetric conversation and strength conservation in sensor networks. They advocate the usage of the final electricity degree of a node for cluster-head choice. In [10], it is proposed to elect the cluster-heads in line with the strength left in every node. We call this clustering protocol DEEC-E.

The disadvantage of DEEC-E is that it calls for the assistance of routing protocol, which have to allow each node to realize the entire power of network. SEP [9] is advanced for the 2-stage heterogeneous networks, which consist of sorts of nodes according to the preliminary electricity, i.E., the improvement nodes and normal nodes. The rotating epoch and election probability is without delay correlated with the initial energy of nodes. SEP performs poorly in multi-stage heterogeneous networks and whilst heterogeneity is a result of operation of the sensor community. Our DEEC protocol assigns exceptional epoch of being a cluster-head to every node in step with the initial and residual electricity. In DEEC, a particular algorithm is used to estimate the community lifetime, consequently heading off the need of help through routing protocol.

Many DEEC-like algorithms are proposed to improve the overall performance of DEEC lately. In [13], the authors have studied multi-hop clustered networks, and use a randomized clustering scheme to prepare the sensors. They offer strategies to compute the greatest values of the set of rules parameters. Mhatre and Rosenberg [14] have a look at the case of multi-hop routing inside each cluster, that's referred to as M-DEEC. In M-DEEC, simplest effective nodes can emerge as the cluster-heads. EECS [15] elects the cluster- heads with more residual energy through neighborhood radio communication. In cluster formation phase, EECS considers the tradeoff of strength expenditure among nodes to the cluster-heads and the cluster-heads to the base station. But however, it increases the requirement of global expertise approximately the distances among the cluster-heads and the bottom station. In DEEC-B [16], a brand new adaptive approach is proposed to pick out cluster-heads and to differ their election frequency according to the dissipated power. The simulation outcomes show that the development obtained by way of DEEC-B is constrained.

For homogeneous wi-fi sensor networks Heinzelman, et. Al. [4] delivered a hierarchical clustering set of rules for sensor networks, known as Low Energy Adaptive Clustering Hierarchy (DEEC). DEEC is a cluster-primarily based protocol, which incorporates allotted cluster formation. DEEC randomly selects some sensor nodes as cluster heads (CHs) and rotates this position to lightly distribute the electricity load many of the sensors within the network [1]. PEGASIS [11] is a series primarily based protocol which avoids cluster formation and uses simplest one node in a series to transmit to the BS as opposed to the use of a couple of nodes.

Manjeshwar et. Al. Proposed Threshold sensitive Energy Efficient sensor Network protocol (TEEN) [7]. TEEN pursues a hierarchical method along with the usage of a information-centric mechanism. The cluster head publicizes two thresholds to the nodes. These thresholds are difficult and gentle thresholds for sensed attributes. TEEN isn't always exact for packages where periodic reviews are wanted because the user won't get any information at all if the thresholds are not reached.

Manjeshwar et. Al. The Adaptive Threshold touchy Energy Efficient sensor Network protocol (APTEEN) [8] pursuits at both capturing periodic records collections and reacting to time-vital occasions. The architecture is same as in TEEN. The major drawbacks of TEEN and APTEEN are the overhead and complexity of forming clusters in more than one degrees enforcing threshold primarily based capabilities and managing attribute-primarily based naming of queries.

Heinzelman, et. Al. [10] proposed DEEC centralized (DEEC-C), a protocol that uses a centralized clustering set of rules and the equal regular kingdom protocol as DEEC. SEP (Stable Election Protocol) [9] is proposed in which each sensor node in a heterogeneous -stage hierarchical community independently elects itself as a cluster head primarily based on its preliminary power relative to that of other nodes.

Li Qing et. Al. Proposed DEEC [6] (Distributed energy green Clustering) algorithm in which cluster head is chosen on the basis of probability of ratio of residual power and average electricity of the community. Simulations show that its overall performance is better than other protocols.

B. Elbhiri et al, proposed SBDEEC (Stochastic and Balanced Developed Distributed Energy-Efficient Clustering (SBDEEC) [2] SBDEEC introduces a balanced and dynamic method in which the cluster head election possibility is extra green. Moreover, it uses a stochastic scheme detection to extend the community lifetime. Simulation outcomes display that this protocol performs better than the Stable Election Protocol (SEP) and the Distributed Energy- Efficient Clustering (DEEC) in terms of network lifetime. Our E-DEEC (Enhanced Distributed Energy Efficient Clustering) scheme is primarily based on DEEC with addition of first-rate nodes. We have prolonged the DEEC to three-degree heterogeneity. Simulation results display that E-DEEC performs better than SEP that is too extended to a few-stage scheme.

4. Methodologies:

At the end of EBAN DEEC Phase 1, we assume that the nodes are placed randomly and with different amount of energies in all. So we can divide the nodes based on their energies: zone 0, Head zone 1, and Head zone 2.

We assume that the advance nodes are having fraction of more energy than the normal nodes. Total m numbers of nodes out of n are having α time more energy than normal nodes. We refer these nodes as advance nodes and *(1-m) ×n* are normal nodes.

Nodes in zone 0 have less energy and they are deployed near to the base station. These nodes will directly transmit the data to the sink. Nodes in Zone 1,2 have α times more energy than nodes in zone 0. Where o is Normal node, + is special energy activated node and x is BS

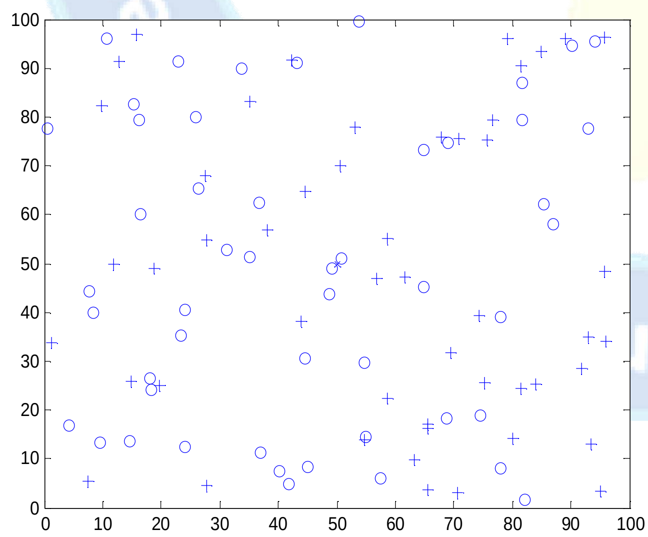

Fig. 2. Setup for the Advanced and normal node for EBAN DEEC phase 2

5. Result and Discussion:

In this section, simulation results are presented and analyzed. We simulated the improved DEEC protocols. The experiment region is a square area with the fixed size of 100 x 100 m^2. We deploy 100 sensor nodes randomly in the field. In figure 3, 100 nodes are deployed where "black circle" are advance node and "blue circle" are normal node and ''X'' shows the Base station.

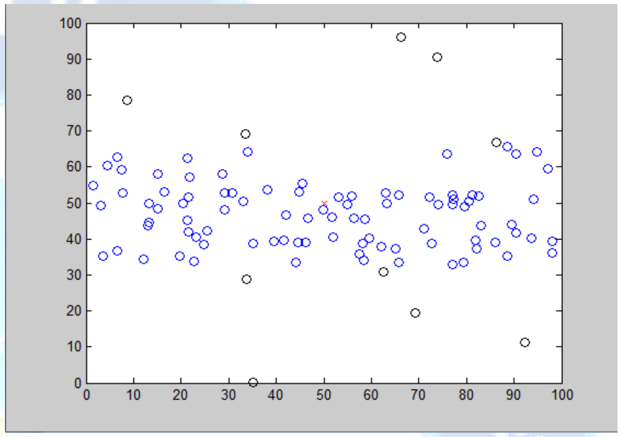

Fig 3: randomly deployment of nodes

In this paper we are developed an energy efficient wireless sensor network model having modified version of DEEC protocol having special energy activated sensor nodes called as EBAN DEEC. In this we have considered an area having randomly distributed wireless sensor network having equivalent initial energy some of the node having additional energy known as special node. We have taken m as the special node e. i m=0.1 then it mean that 10% node are special mode out of all the nodes the energy of these node is E_s=E(1+a).There E_s is energy special node. If a=0.5 then E_s=(1.5*E) that is energy of special node is 1.5 times of the normal node. For various combination of m and a we have run our algorithm to generate the different number of dead nodes at different rounds.

(a) m= 0.5,a=1.0

(b) m= 0.5,a=1.5

The plot of the result as shown by one and they are finally tabulated to described the performance of our purposed EBAN DEEC and compared with the normal DEEC algorithm.

a: As described in previous section this case m=0.5 and a=1 we have generated plots for number of alive nodes of difference round shown in figure 1a. Where y axis represented the number of alive nodes and x axis represented the number of rounds. There are two lines green and blue colour where green colour normal DEEC and blue colour EBAN DEEC. We can observed that in the DEEC alive nodes start decreasing from round 1097 while in EBAN DEEC alive nodes start decreasing from round 1529.

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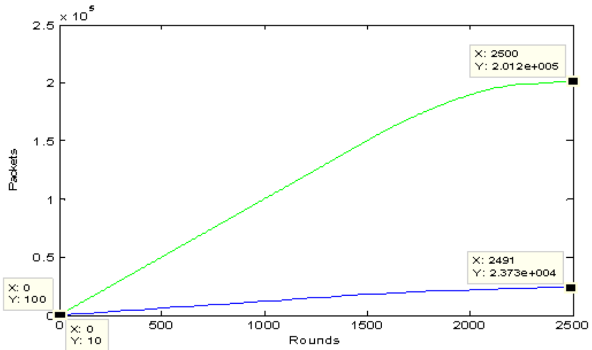

Fig 4a:Number of Packets Sent at different rounds (Blue: DEEC, Green: EBAN DEEC).

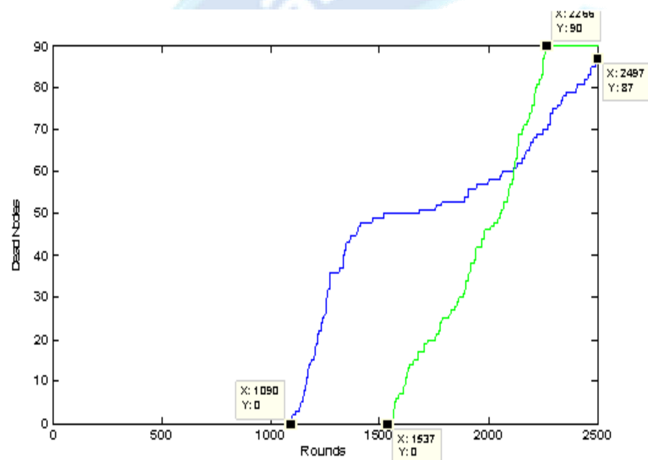

Fig 4b:No. of dead nodes at different rounds (Blue: DEEC, Green: EBAN DEEC).

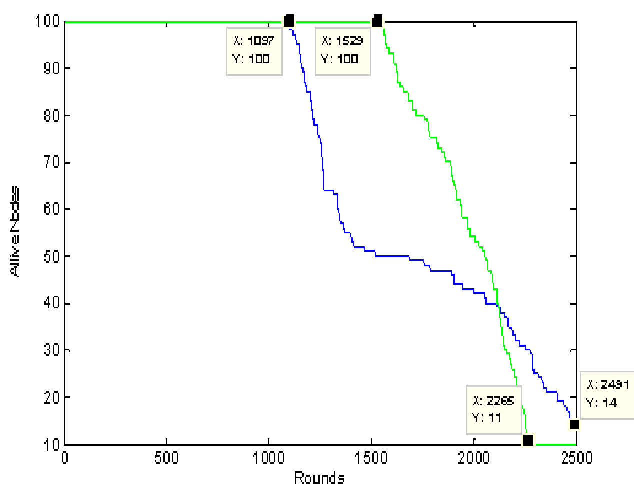

Fig 4c:No. of alive nodes at different rounds (Blue: DEEC, Green: EBAN DEEC).

b: As described in previous section this case m=0.5 and a=1.5 we have generated plots for number of alive nodes of difference round shown in figure 1a. Where y axis represented the number of alive nodes and x axis represented the number of rounds.There are two lines green and blue colour where green colour normal DEEC and blue colour EBAN DEEC. We can observed that in the DEEC alive nodes start decreasing from round 1092 while in EBAN DEEC alive nodes start decreasing from round 1529.

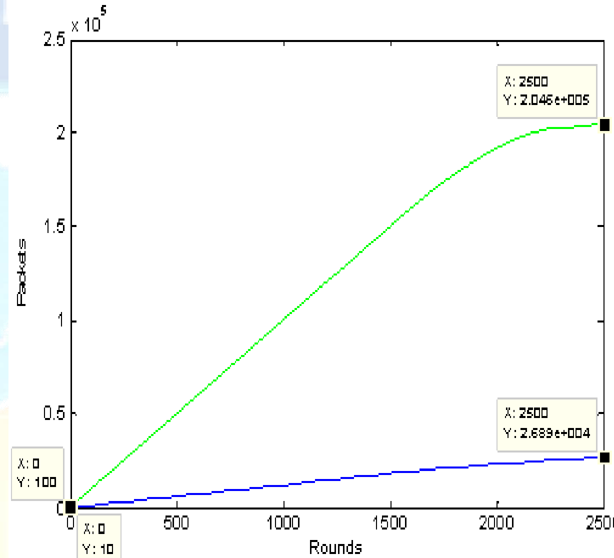

Fig 5a:Number of Packets Sent at different rounds (Blue: DEEC, Green: EBAN DEEC).

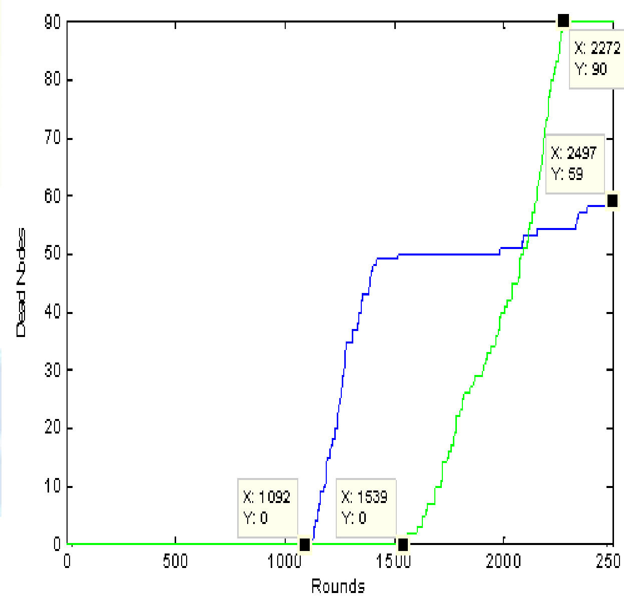

Fig 5b:No. of dead nodes at different rounds (Blue: DEEC, Green: EBAN DEEC).

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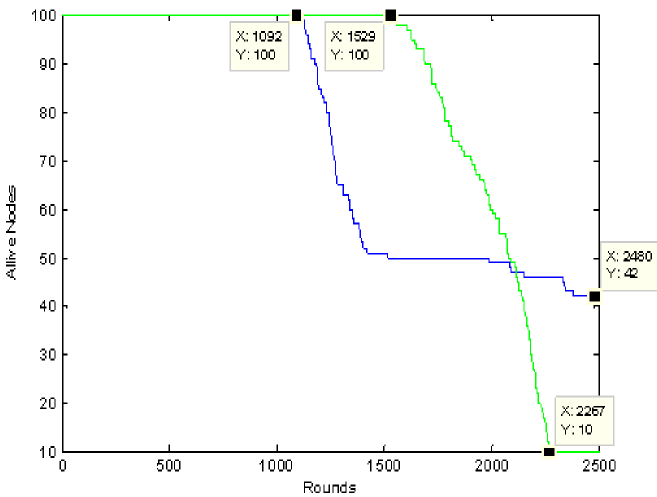

Fig 5c: No. of alive nodes at different rounds (Blue: DEEC, Green: EBAN DEEC).

6. Conclusion:

In our work we have briefly describe how cluster based routing protocol DEEC can be utilized in better way for homogeneous and heterogeneous environment. Our simulation shows EBAN DEEC gives better throughput of the system compare to DEEC. We can get better efficiency by including new CH replacement scheme and different transmission energy.

Results are generated for different number of special energy activated nodes out of total nodes for different probabilities of election of EBAN DEEC nodes as the cluster heads. It has been observed that in any combinations of m and a the EBAN DEEC sends higher number of packets as compared to normal DEEC. For minimum value of m=0.15 and a=1 the EBAN DEEC DEEC shows higher life time than the DEEC. Hence it can be concluded that even if we consider only 10 %cent nodes as EBAN DEEC nodes with energy 50% higher than other nodes we can significantly enhance the network life time and data transmission rate. Moreover, stability of EBAN DEEC can be improvised by using two different transmission techniques direct transmission and CH to sink transmission in heterogeneous. In future, EBAN DEEC can be improvised by adding more techniques for hierarchal transmissions between CH to Sink. Again it will be interesting to apply advanced node concept with Energy heterogeneity.

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