

Performance Evaluation of Beem Based Protocol

Harpreet kaur¹, Amandeep kaur²,

M.Tech Student, Department of ECE, Global Institutes of Management & Emerging Technologies, Batala Road, Asr,
India¹.

Head of Department of ECE, Global Institutes of Management & Emerging Technologies, Batala Road, Asr, India².

ABSTRACT: Network lifetime is crucial in Wireless Sensor Network (WSN) systems since recharging or exchanging the sensors is difficult and expensive. In this paper, a novel algorithm Balanced Energy-Efficiency Multihop (BEEM) clustering algorithm has been improved. The improvement in the BEEM has been done by using the reactive principle i.e. hard and soft thresholding to reduce the number of communications between the sink and cluster heads. Also to improve the load balancing further the inter-cluster data aggregation criteria has also been used. In BEEM a node might not become cluster head for a long time so will result in load misbalancing so it has been removed by using the inter-cluster data aggregation. The effect of increase in the number of nodes will also be considered to evaluate the improvement of the reactive waiting based BEEM over existing BEEM.

KEYWORDS: Wireless Sensor Network (WSN), Balanced Energy-Efficiency Multihop (BEEM), EESCM, LEACH, HEED.

I. INTRODUCTION

Wireless sensor system is often a propagate Wireless band of cable connections which usually really is a collection regarding unbiased units including sensor nodes, routers, trip in which every sensor node possessing connection to be able to sensor. Facts is transmitted in a very tossed means coming from commencing to remove these types of nodes along with keeping track of with the physical or even environmental predicament is completed coming from rural spot. Your nodes are usually within an unexpected means and look after hint wirelessly. A wireless sensor network consists of a large amount of sensor nodes which can be densely deployed either inside the environmental surroundings or near it. The positioning of sensor nodes will not need to be engineered or predetermined. This permits random deployment in inaccessible hazardous environments. A number of the most crucial application areas of sensor networks include military, natural calamities, health, and home. In comparison with traditional ad hoc networks, probably the most noticeable point about sensor networks is that, they're limited in power, computational capacities, and memory.

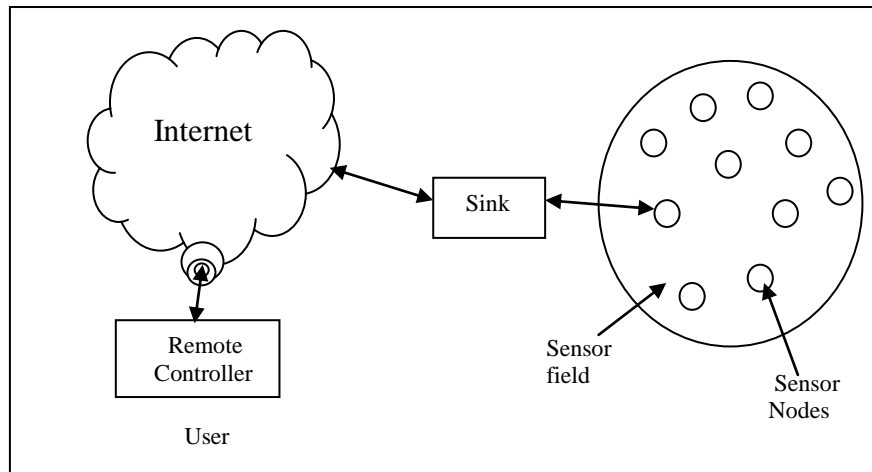
The WSN is built of "nodes" – from a few to hundreds, where each node is connected to one or several sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an External antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting. Traditional sensor networks are built with general purpose processors (GPPs) because processing power consumption is insignificant compared to radio power consumption sensor multilevel is made of a large number of sensor nodes which may be densely implemented either inside the surroundings or close to this. The actual setting regarding sensor nodes is not going to need to be made or fixed. That permits haphazard deployment with inaccessible dangerous situations. Many of the main program regions of sensor systems include military, organic disasters, well being, as well as residence. When compared with standard random systems, just about the most obvious point regarding sensor systems is which, they may be confined with electric power, computational drives, as well as storage.

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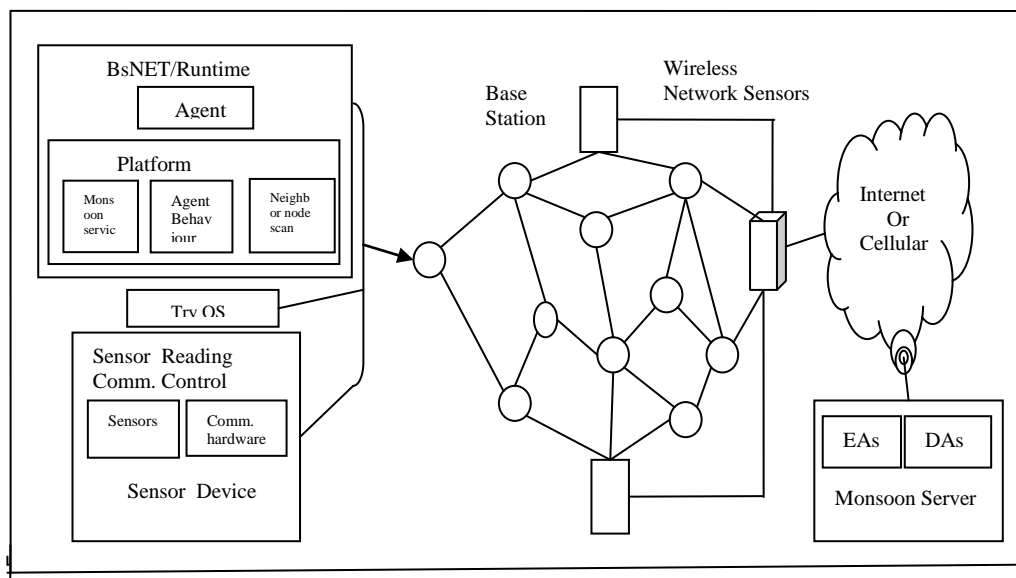
Figure 1: Architecture of wireless sensor network



The Clustered Architecture is explained as below:

The clustering algorithms that are made is dependant on homogeneity and heterogeneity involving nodes. Among the original function advising this method in WSNs is actually LEACH (Low Power Adaptive Clustering Hierarchy). Just lately, we have seen all clustering strategies which are mostly versions involving LEACH process together with bit of a progress and different request scenarios. DEEC (Design of distributed energy-efficient clustering), EDACH (Energy-Driven Adaptive Clustering Hierarchy) and EEUC (An Energy-Efficient Unequal Clustering) are all clustering strategies proposed with the aim involving lessening vitality use, whilst extending system life.

Figure 2: WSN in Monsoon



The Objectives in clustering are Maximizing network Life-time and fault tolerance. In maximizing network lifetime, most of the sensor nodes include little energy resource. As a result, energy effectiveness will still be of growing concern all of which will continue being one of the many design and style goals of WSN. As a way to

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Vol. 4, Issue 8, August 2015

overcome strength administration throughout WSN, clustering scheme has become pursued, to extend system life-time and aid alleviate the duty of each node transferring on to BALONEY as with regular practices like Primary Transmitting. Whenever some nodes that are acquiring a lesser amount of strength within the WSN and then the goal is usually to provide the strength to the next nodes previous to they will reported being thoroughly dead nodes. In Fault-tolerance, the clustering techniques are actually planned to deal with the challenge of node inability by utilizing proxy cluster-heads, in the case of inability in the 1st elected cluster-head or maybe possess little energy with regard to indication. A few other literatures possess used adaptive clustering scheme, to cope with node downfalls. In Load balancing, fill controlling technique may be one more design and style aim of clustering strategies. This can be essential to not more than burden the cluster-heads since this could wipe out the efforts quicker. Therefore, it is very important possess even submitting of nodes throughout each and every group.

II. RELATED WORK

Heinzelman et al. [1] Direct communication, multihop routing, and static clustering happen to be considerate extra effectual in sensor networks, So LEACH (Low-Energy Adaptive Clustering Hierarchy), a clustering-based protocol may be planned which have developed non randomized proposal for cluster-heads. Smaragdakis et al. [2] has proposed SEP (Stable Election Protocol) so every sensor node inside a heterogeneous two-level compared to that relating to other nodes. Guisheng Yin et al. [3] In this particular paper, A novel routing algorithm which mixes with hierarchical routing and geographical routing is proposed. Sun et al. [4] has proposed a method by which some operation has completed to basic LEACH, named as ILEACH. Yuhua Liu et al. [5]. This article analyses the cluster-heads generating algorithm among LEACH and presents improved approach that adjusting the nodes, Threshold function. Babied et al. [6] This technique optimized LEACH method, by adjusting threshold allowing for some factors. Bark and Lillian [7] A latest planned LEACH-SM (LEACH Spare Management) has modified the famous LEACH protocol by enhancing it by having an efficient organization of spares. Ma Chaw Mon et al. [8] proposed model to extended the LEACH's stochastic cluster-head selection algorithm by modifying the possibility of each node to become cluster-head centered on remaining energy level of sensor nodes for transmission. Melese and Gao [9] Extension in the LEACH formula has been done on the basis of a component which includes the consumed power of each and every sensor nodes of WSN, An raise in network life time has been observed. Peng et al. [10] a development has been shown in the network life time and the communication value by selecting the Cluster head in the region of proper sensor node mass. Vivek Katiyaret al. [11] here a new energy efficient clustering protocol (FZ-LEACH) has been analyzed that eliminates the above mentioned problem by forming Far-Zone. Reetika Munjal et al. [12] Here our main purpose is to choose a cluster head dependant on its current degree of energy and distance from the sink node. Shuo Shi et al. [13] An energy-efficiency Optimized LEACH-C. First, we select several cluster heads using LEACH-C. Next, taking retransmission and acknowledgment under consideration, a style of cluster head energy consumption has been developed. Thu Ngo Quynh et al. [14] In this paper, we propose a new hierarchical routing protocol (called EL-LEACH: Energy and Load balance LEACH) which achieves energy efficiency and load balance. M M Islam et al. [2012] [15] presented algorithm considers the sensor nodes are static and randomly distributed in the heterogeneous network, the coordinates of the sink and the dimensions of the sensor field are known. Lu et al. (2013) [16] NEWLEACH name protocol has been planned that has introduced a recently available concept named optimum factor by considering the residual power of sensor nodes, times of a sensor node to be selected as a cluster head sensor node and the distances among sensor nodes and sink. Heinzelman. et al [17] has planned a latest technique by which theory of Vice Cluster head has been taken out. Xu et al. (2014) [18] proposed a novel algorithm based on HEED, named the Balanced Energy-Efficiency (BEE) clustering algorithm. Hussain et al. [19] any genetic algorithm (GA) is needed to create vitality useful groups intended for course-plotting in wireless sensor networks. Hussain et al. [20] received suggested a power useful hierarchical cluster-based course-plotting process intended for steady mode concerns in WSN. A couple of chaos heads, head-set, intended for cluster-based course-plotting possesses launched. Nam et al. [21] A cluster-based course-plotting method is actually far more energy-efficient compared to a smooth course-plotting method as it may solely deliver certain facts intended for person specifications and mixture comparable facts simply by dividing any circle right into a neighborhood chaos Because vitality ingestion according to clustering depends in how many groups. Akyildiz et al. [22] wireless sensor networks possess blossomed to be critical technologies intended for next-generation wireless web 2.0. To be able to give a greater idea of the analysis problems connected with WMNs, expose study connected with

International Journal of Innovative Research in Science, Engineering and Technology

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Vol. 4, Issue 8, August 2015

existing state-of-the-art methodologies and algorithms intended for WMNs .Sohrabi et al. [23] System self-assembly and steady circle self-organization through the lifetime of this circle in the dependable, useful, and scalable approach are crucial intended for profitable deployment and operations connected with these kinds of networks. Gao et al. [24] received presented any system-level portrayal from the vitality ingestion intended for sensor circle application examples. Shanbehzadeh et al. [25] tried using get over the challenge of energy simply by optimizing this nodes' energy ingestion. Grams Daniel et al. [26] tried using to resolve the challenge connected with course-plotting scalability, this Hierarchical State Direction-finding system into a hierarchical multi layer environment continues to be expanded. Huang et al. [27] lengthen these disorders from the cluster-based course-plotting methodologies when it comes to common algorithm complexity connected with facts blend, common compressing percentage connected with facts blend, and circle area along with long distance corresponding these three common examination techniques to assess the vitality efficiency from the cluster-based course-plotting methodologies. Tashtarian et al. [28] looked at any clustering process intended for individual wireless sensor networks that will engages any cut-throat system intended for chaos head collection. EECS-M continues to be suggested that is the changed version for the renowned process EECS exactly where a few of the nodes come to be volunteers to become chaos heads by having an similar possibility. Ando et al. [29] Cluster enhancement and cluster head collection are essential difficulties in sensor circle apps and can greatly have an impact on this network's verbal exchanges vitality dissipation. To be able to manage this matter, a power reduction algorithm intended for sensor networks according to fuzzy common sense and variety of neighbor's nodes continues to be suggested.

III. LIMITATIONS IN EARLIER TECHNIQUES

There are following gaps has been shown in the literature survey.

1. The use of the hard and soft thresholding has been ignored by the most of the existing researchers.
2. In BEEM a node might not become cluster head for a long time so will result in load misbalancing
3. The effect of the nodes scalability has been ignored in the BEEM.

IV. PROPOSED ALGORITHM

Following are the various steps required to successfully simulate the proposed algorithm.

Step 1: First of all initialize WSN with their respective characteristics.

Step 2: For each node i repeats the following steps

Step 3: If given node has energy more than 0 that means it is alive node only then repeat upcoming steps else move back to step 2.

Step 4: Select node as a CH if it holds the properties of improved cluster head selection.

Step 5: Now association of the nodes will be done with their nearest CHs.

Step 6: Now evaluate the current value from the sensor field.

Step 7: If $CV > HT$ and $SV - CV < ST$ then inter-cluster data aggregation data communication will be required so move to step 8 else move to step 2.

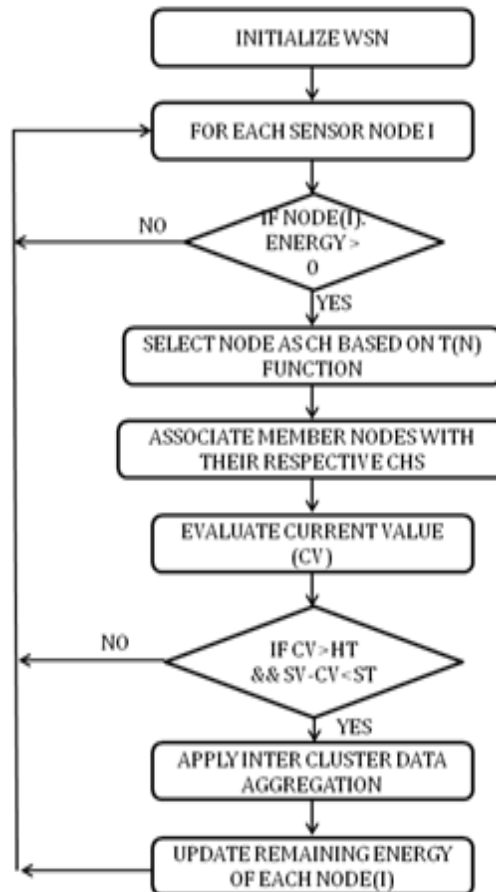
Step 8: Evaluate energy dissipation and move to step 2

International Journal of Innovative Research in Science, Engineering and Technology

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Vol. 4, Issue 8, August 2015

Figure 3: Flowchart of the proposed technique



V. RESULTS AND DISCUSSION

The proposed algorithm is tested on various parameters. The algorithm is applied using various performance indices First Dead Nodes, Half Dead Nodes and Last Dead nodes.

In order to implement the proposed algorithm, design and implementation has been done in MATLAB processing toolbox. We are comparing proposed approach using some performance metrics. Result shows that our proposed approach gives better results than the existing technique.

First Dead Node

Table 5.1 is showing the quantized analysis of the First Dead Node. In the below table it represents the various numbers of nodes and according these nodes different values of first dead nodes in existing and proposed technique respectively.

International Journal of Innovative Research in Science, Engineering and Technology

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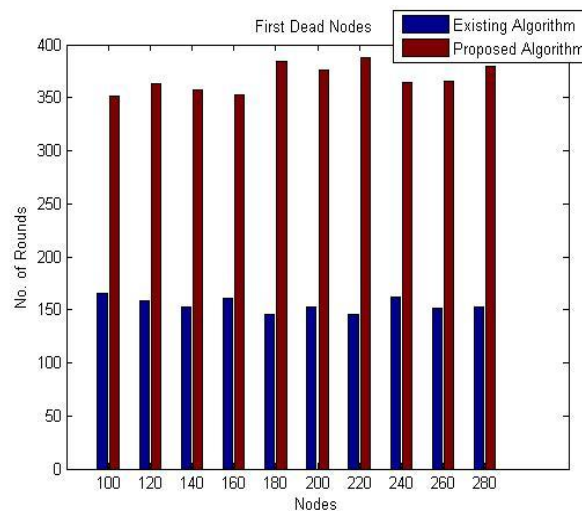
Vol. 4, Issue 8, August 2015

Table 5.1: First Dead Node

NO. OF NODES	EXISTING TECHNIQUE	PROPOSED TECHNIQUE
100	166	351
120	159	363
140	153	357
160	161	353
180	146	384
200	153	376
220	146	388
240	162	364
260	151	366
280	153	380

Figure 4. shows the comparison graph when first node dies in Existing and Proposed for the number of nodes from 100 to 280. Blue color in the graph represents the Existing and Red color represents the proposed algorithm. We can find that proposed algorithm performs much better than the Existing when first node dies as much later in Proposed than in Existing.

Figure 4: Comparison Graph when first node is dead in Existing and Proposed Algorithm



Half Dead Nodes

Table 5.2 is showing the comparative analysis of the half dead nodes. In the below table it represents the various numbers of nodes and according these nodes different values of existing and proposed technique respectively.

International Journal of Innovative Research in Science, Engineering and Technology

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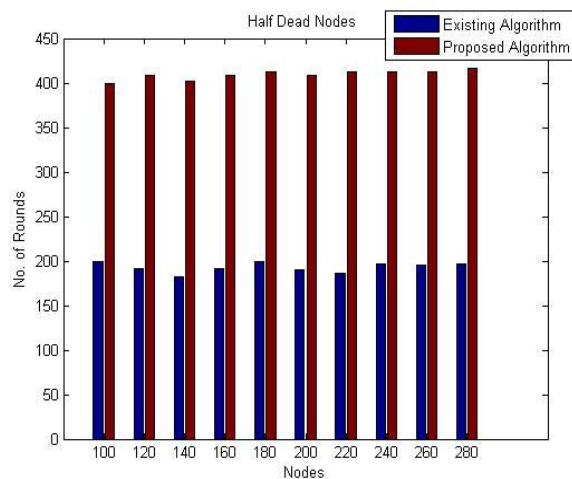
Vol. 4, Issue 8, August 2015

Table 5.2: Half Dead Nodes

No. of Nodes	EXISTING TECHNIQUE	PROPOSED TECHNIQUE
100	199	400
120	192	408
140	182	402
160	191	409
180	200	412
200	190	408
220	186	413
240	197	413
260	195	412
280	197	416

Figure5. shows the comparison graph when half node dies for Existing and Proposed for the number of nodes from 100 to 280. In the graph x-axis represents the number of nodes given and y-axis represents the number of rounds. Blue colour in the graph represents the Existing and red colour represents the Proposed.

Figure 5: Comparison Graph when half nodes are dead in Existing and Proposed algorithm



Last Dead Nodes

Table 5.3 is showing the quantized analysis of the Last Dead Nodes. In the below table it represents the various numbers of nodes and according these nodes different values of first dead nodes in existing and proposed technique respectively.

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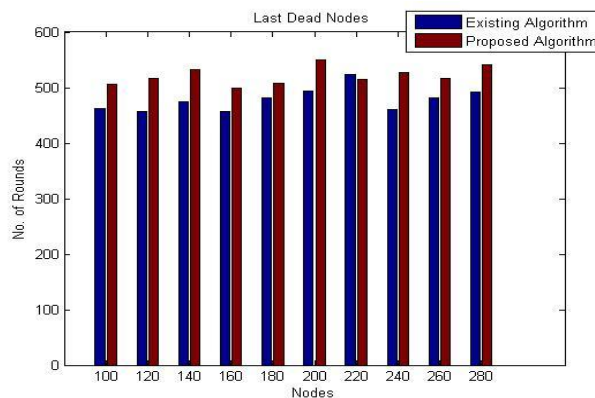
Vol. 4, Issue 8, August 2015

Table 5.3: Last Dead Nodes

No. of Nodes	EXISTING TECHNIQUE	PROPOSED TECHNIQUE
100	462	507
120	457	517
140	475	532
160	457	499
180	481	508
200	493	550
220	524	515
240	460	528
260	481	517
280	492	541

Figure 6. shows the comparison graph when all nodes are dead for Existing and Proposed algorithm for the number of nodes from 100 to 280 and x-axis represents number of nodes given and y-axis represents the number of rounds. Blue color in the graph represents the Existing and red color represents the proposed algorithm.

Figure 6: Comparison Graph when all nodes are dead in Existing and Proposed algorithm



VI. CONCLUSION

Wireless Sensor Network (WSN) systems since recharging or exchanging the sensors is difficult and expensive. In this paper, a novel algorithm Balanced Energy-Efficiency Multihop (BEEM) clustering algorithm has been improved. The improvement in the BEEM has been done by using the reactive principle i.e. hard and soft thresholding to reduce the number of communications between the sink and cluster heads. Also to improve the load balancing further the inter-cluster data aggregation criteria will also be used. In BEEM a node might not become cluster head for a long time so will result in load misbalancing so it will be removed by using the inter-cluster data aggregation. The effect of increase in the number of nodes will also be considered to evaluate the improvement of the reactive waiting based BEEM over existing BEEM.

This work has not considered the use of node deployment i.e. sensor field optimization to improve the outcomes of the proposed techniques further. The sensor node deployment has ability to place the sensors in such a way so that it will

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

result in improve network lifetime. Therefore, in near future evolutionary optimization based node deployment algorithms will also be considered.

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