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"IMPROVING CLUSTERING METHOD FOR WIRELESS SENSOR NETWORK USING E-LEACH PROTOCOL"

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Abstract - *The Wireless Sensor Network helps to monitor the various types of environment by sensing a visual object. The Wireless Sensor Network helps to monitor the various types of environment by sensing a visual object. Our main focus is on increasing network life so that the battery does not need to be charged soon. Clustering sensor nodes are an effective way to achieve this goal. In this work, we introduce an energy efficient clustering algorithm for sensor networks based on the E-LEACH protocol. E- LEACH (Low Energy Adaptive Clustering Hierarchy) is one of the most popular architectural designs, widely promoted in wireless sensor networks. The proposed protocol E- LEACH-I (Improved E- LEACH algorithm) has aided facility that it reduces the consumption of the network resource as compare to E- LEACH algorithm in each round. The proposed protocol is simulated and the result shows a significant reduction in network energy consumption as compared to E- LEACH. Our main focus is based on node-degree expansion defined as the number of live nodes within the given range of a given node compared to the E-LEACH algorithm.*

***Key Words*: Wireless sensor network (WSN), Cluster Head (CH), LEACH (Low Energy Adaptive Clustering Hierarchy), E-LEACH**

1. INTRODUCTION

A wireless sensor network is a network of small areas with sensory energy sensors with limited memory. WSN contains a variety of self-regulatory environments that they use to access and exchange data remotely from Base Station (BS) or the following recipient node. Often hundreds or thousands of sensors of small effort are used in the Wireless sensor network [1]. These sensory nodes are used to monitor physical or environmental conditions such as heat, sound, vibration, pressure, movement or pollution. Each network has at least one single channel where these sensory nodes send the data they collect by hearing. The base station or channel acts as a visual link between users and the network. The detected data and totaled information conveyance is fundamental for productive correspondence between sensor nodes. One can retrieve required information from the network by injecting queries and gathering results from the sink [2]. As we all know that WSN consists of small detector nodes that are equipped with restricted energy [3]. The lifetime of a WSN depends on how fast the energy of the sensor nodes is consumed. Research is being done to control the utilization of energy by the network. In group of sensor nodes sense the information from environment and send it to the sink or base station where the data is collected and aggregated and through internet the information is made available to the user [1].

The information is routed from the root node to the Base station either directly or through other sensor nodes. The BS is either a fixed or a mobile node which is capable of connecting the network to the internet where user can access and process the data. Routing in WSN is incredibly difficult thanks to the inherent characteristics that distinguish this network from alternative wireless networks or cellular networks. The most vital constraint on WSN is that the restricted battery power or sensing element nodes. The needed lower energy consumption restricts the sensor to use the limited resources akin to less memory capacity, low transmit power, and fewer process computations.

Traditional routing protocols in WSNs consume more energy for multi-tasking sensor networks because of the inflexibility. Therefore, supported the below architecture, we have a tendency to propose a brand new energy-efficient routing formula for software system outlined wireless device networks. At first routing protocols in WSNs consume a lot of energy for multi-tasking sensor networks owing to the inflexibility. The management server selects the control nodes of every cluster, and therefore the control nodes instruct the intra-cluster nodes to finish completely different tasks.

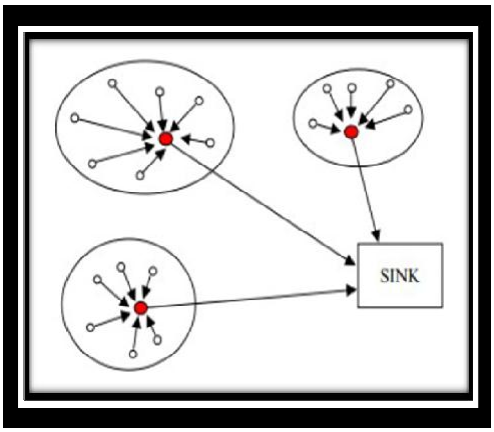
In this project, we are motivated to investigate how to minimize the energy consumption if reprogramming by considering the control nodes' selection and multicasting routing [1]. Our main contributions are summarized as follows:

- We propose an energy-efficient routing algorithm for the multi-tasking wireless sensor network.
- The choice of management nodes is developed as associate NP-hard problem, taking into consideration the residual energy of the nodes and therefore the transmission distance; and to tackle the NP-hard problem, we have a tendency to propose an

economical particle swarm optimization (PSO) rule to unravel it.

LEACH PROTOCOL

Low Energy adaptive Clustering Hierarchy (LEACH) by Heinzelman [4] is that the most notable clustering protocol that had been a basis for several more clustering protocols. The foremost vital goal of LEACH is to possess Cluster Heads to cut back the energy price of transmission information from traditional nodes to a remote Base Station [3]. In LEACH, nodes organize themselves into native clusters with one node acting as cluster head. All non-cluster head nodes (normal nodes) transmit their data to the cluster heads. Cluster head nodes do some data aggregation and/or data fusion perform on which ought to be transmitted to Base Station. The cluster heads modification at random over a amount of your time to balance the nodes energy dissipation.



The operation of LEACH is split into 2 phases: Set up Phase and steady state phase. Every spherical begins with a set-up (clustering) phase once clusters are organized, followed by a steady- state (transmission) introduce that knowledge packets are transferred from traditional nodes to cluster heads. Once data aggregation, cluster heads can transmit the messages to the Base Station

Set up Phase:

During this section every node decides whether or not or to not become a cluster head for the present spherical. The election of cluster head is completed with a chance function: each node selects a random number between zero and one and if the quantity is a smaller amount than T(n) , the node is elective as a cluster head for current round:

$$T(n) = \begin{cases} \frac{p}{1-p\left(r \bmod \frac{1}{p}\right)} & if\ n \in G \\ 0 & Otherwise \end{cases}$$

Where, P is that the cluster head probability, r is the number of current round and G is the set of nodes that haven't been cluster-heads in last 1 p rounds. Once this CH election, each cluster head prepares a TDMA schedule and transmits to any or all the cluster nodes in this individual cluster. This completes the created section of LEACH.

Steady State Phase:

In this part nodes send their collected data to CH promptly per frame allotted to them. This assumes that the node continuously contains a data to transmit. The node goes to sleep mode when this transmission till next allocated transmission slot, to save lots of the energy. The CH should keep its receiver on all the time to receive the info from cluster nodes. When reception of all the data, CH aggregates that data and transmits it to the bottom station. The strength of E-LEACH is in its CH rotation mechanism and data aggregation. However one vital drawback with LEACH is that it offers no guarantee concerning placement and/or range of cluster head nodes in each spherical [3] [6]. Thus employing a centralized agglomeration rule would turn out higher results. LEACH- Centralized (LEACH-C) may be a Base Station cluster formation algorithm. It uses constant steady state protocol as LEACH.

2. LITERATURE REVIEW

The past work in field of clustering is specified in this area. These works are additionally proficient and gives data about the work is as of now done in field of energy efficiency.

1. Jain and Trivedi (2012) proposed a calculation for vitality proficient grouping and multi-jump directing in WSN. The sensor arranges is developed as a roundabout zone with the base station. A versatile bunch choice system which chooses the Cluster Heads (CHs) based on lingering vitality, as well as on the separation from the base station. A key purpose of the calculation is that CH choice is done after each round and on numerous occasions inside the equivalent round. This is done since the CH close to the BS is associated with the vast majority of the correspondences and thus it might get depleted early [5].

2. Yoon and Chang (2011) proposed another group based steering convention utilizing message achievement rate. To determine the hub fixation issue and plan another CH choice calculation dependent on hub network and devise bunch upkeep calculations. Besides, to ensure unwavering quality of information correspondence, message achievement rate is a prevalent measure for information correspondence dependability, is utilized with the end goal to choose a directing way. At long last, to decrease information correspondence overhead, just data of neighboring hubs amid both bunch head determination and group development stages were utilized. Through the execution investigation, it demonstrated that proposed convention outflanked the current plans as far as correspondence unwavering quality and vitality productivity [4].

3. Zhang et al (2012) proposed the situation of CH as an imperative factor for the system lifetime. In view of this Surbhi Saraf et al, International Journal of Advanced

Research in Computer Science, 9 (5), Sept-Oct 2018,74-80 © 2015-19, IJARCS All Rights Reserved 78 perception, a non-arbitrary CH choice plan dependent on the idea of the focal point of mass in material science was proposed. The issue of intensity utilization in sensor information gathering in a WSN was considered. Since sensor hubs work on batteries, control effectiveness is a pivotal issue in planning the system. The geographic organization of sensor hubs is arbitrary, with a sporadic system topology. In the current bunching based conventions for the WSN, the CHs are typically chosen indiscriminately, which may result in higher power utilization and shorter system lifetime. The motivation behind proposed plot was to utilize insignificant power during the time spent information accumulation. It was demonstrated that proposed plan could set aside to half of intensity utilization [7].

4. Wang et al (2009) proposed a refined convention named LEACH-H (half breed group head determination LEACH) with the end goal to drag out the WSN's lifetime. In the initial round of LEACH-H, the base-station picked a CH set through getting Simulated Annealing (SA) computation; in the rounds, the 46 CHs along these lines would pick new CHs in their very own gathering. This won't just take care of the issue that the CHs were unevenly disseminated in LEACH, yet in addition keep up the attributes of appropriation. The vitality utilization of the system is chopped down and the live time of WSN is reached out in LEACH-H [8].

5. Kuila and Jana (2012) introduced a circulated grouping and steering calculation for WSN called Cost-based Energy Balanced Clustering and Routing Algorithm (CEBCRA). The calculation contained three stages, specifically CH choice, bunch setup and information steering. The CHs were chosen in a dispersed way dependent on remaining vitality and the neighbor cardinality. In the setup stage, each non-CH sensor hub joined a CH inside its correspondence go dependent on the cost estimation of the CHs. In information steering stage, CEBCRA originally utilized single-jump correspondence inside each group and afterward performed multi-bounce correspondence between the bunches. For inter cluster directing, a CH estimated the expense of every way from itself towards base station while choosing other CH as a transfer hub for information sending on those ways. The test results demonstrated productivity of the proposed calculation regardi ng vitality utilization and number of live sensor hubs. The outcomes were contrasted with two existing systems with demonstrate the viability of the algorithm [10].

6. Y. He, Y. Zhang et al (2010) proposed to handle the strict constraint of vitality supplication in vast scale progressive structure of WSN. The proposed choice methodology in CH choice system thinks about distinguished flag quality, a hub's remaining vitality and separation between group head and sink hub. A versatile strategy dependent on assignment necessity in bunch part determination was proposed in regards to group run setting. This technique obliges group size and vitality utilization of intra-bunch correspondence is lessened. Recreation demonstrated that the new convention saved vitality and delayed WSN life uncommonly when sink hub is a long way from the system. Considering the character of correspondence extent of hub in bunch, there exists zones of excess place between joined groups. To give an exact number of CH, proficient inclusion is utilized, rather than full inclusion of group to compute the ideal number of CH per round, as per characters of one and two request fractional subsidiary capacities [9].

7. Peng et al (2011) was proposed A LEACH calculation based vitality compelling directing convention to meet key QoS prerequisites. Vitality productivity is a critical WSN issue. System layer directing innovation is basic to decrease WSN vitality utilization. Be that as it may, dependability and information hostility should likewise be investigated. The new convention concentrated on customary LEACH absconds and enhanced vitality effectiveness and QoS parameters by barring hubs with ill-advised geographic area to be CHs. Ideal estimating scope of head hubs is intended to be a CH determination paradigm and each CHs can be chosen by hub thickness limit in estimating region, affirmed by hub dispersion circumstance and correspondence needs. Recreations assessed the new convention in correlation with customary LEACH calculation. The execution of new convention was confirmed to diminish vitality utilization and certification correspondence quality particularly in uneven conveyance situations [11].

3. METHODOLOGY

In our proposed algorithm, proposer tries to overcome one of the major limitations of all varieties of LEACH. In traditional LEACH and balanced LEACH, cluster head is being changed after every round and if a node becomes cluster head for a round then it can never Be CH for (1/P) rounds. Where p is the cluster head probability, after selection of CH for each round whole process of cluster head creation being enacted. So it has been tried to improve the selection of cluster head and add scheme that improves the power consumption of a network.

Cluster Head Selection Formation Algorithm

Step-1: Build up wireless sensor architecture.
Step-2: Assign initial energy to sensor nodes.

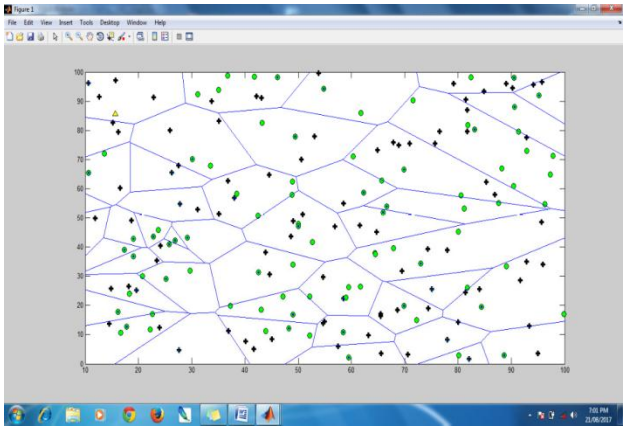
Step-3: Sort the hubs dependent on the separation from Base station utilizing Selection Sort in expanding request. To ascertain hub separate from Base-Station the given recipe is utilized Node distance (I)

Step-4: For round=1 allocate bunch heads dependent on least separation from the base-station No of Cluster Heads for cycle 1= (p*n). Lessening the vitality of the hubs picked as group head.
Step-5: For the next round Calculate node-degree of the chosen nominee for cluster heads
Step-6: calculate the energy of node if (S(i).E = 0) then Dead=I //ith node dies n=n-dead //n: decrease no of alive nodes
Step-7: Goto step-5
Step-8: End

4. RESULTS AND DISCUSSION

After simulation of algorithm over MATLAB, results were taken based on some metrics like network lifetime, balance energy, count of CH and energy consumption and Results are discussed in following sections.

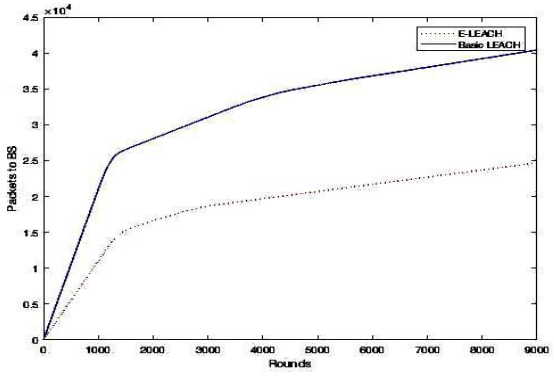
Parameters for simulation

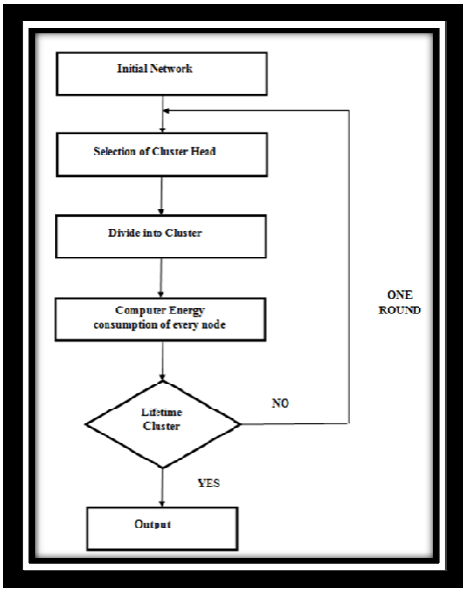


Parameters	Value
Initial energy for eachsensornode	0.1J
Packetsize	4000bits
Energy inidle state	50nJ/bit
Aggregationenergy	5nJ/bit
Inter cluster Energywhend>=do	E1=10pJ/bit/m2
Inter cluster energy whend<=do	E2=0.0013pJ/bit/m2
Intra cluster energywhend>=d1	E11=E1/10
Intra Cluster energywhend<=d1	E22=E2/10

LocationofBS	X=100;Y=100
Total numberofnodes	200
Total number Rounds	2000

$$\text{Node distance } (I) = \sqrt{(S(i).xd - (sink.x))^2 + (S(i).yd - (sink.y))^2}$$





Energy(J /node)	Protocol	Rounds For First Node	Rounds For Last Node Dies
0.25 J	Basic LEACH	580	1469
	E-LEACH	1165	3545
0.50 J	Basic LEACH	1295	3083
	E- LEACH	1325	3158
1 J	Basic LEACH	1170	3290
	E- LEACH	2485	6302

5. CONCLUSION AND FUTURE SCOPE

Demand of electricity green protocols are usually in for wi-fi sensor networks. A set of electricity green protocols (LEACH and its variety) has been studied and locate gaps amongst them. After locating gaps an set of rules has been proposed which is known as as power- LEACH. The development is because of locating a not unusual place hole i.e. choice of CH in each round. During simulation of E LEACH with the prevailing variations i.e. balanced LEACH and fundamental LEACH, E% and 47.19% over fundamental LEACH and balanced LEACH respectively. It is understood that better the electricity consumption, worst the set of rules is. E LEACH suggests vast development of 20 LEACH suggests full-size development over them. The community existence is calculated via way of means of the quantity of rounds the nodes with inside the networks are alive. After simulation of E LEACH its suggests an development of 51.95% and 10% over fundamental and balanced LEACH. For measuring an set of rules is right or not, researchers calculate the residual electricity. If the quantity of residual electricity is high, then life of community is likewise high. About 47.82% and 39.13% of development is recorded over fundamental and balanced LEACH. 92.4% and 92.5% development is recorded for intra cluster communiqué in E LEACH over different two versions.

The proposed set of rules suggests pretty desirable effects over fundamental LEACH and balanced LEACH. But it nonetheless doesn't display any development in the course of inter cluster statistics transmission whilst as compared with balanced LEACH. It can be because of too many cluster divisions in community at the same time as strolling E LEACH over it. This may be progressed via way of means of in addition amendment in cluster head department set of rules. This may be carried out via way of means of placing a counter which comes to a decision the quantity of clusters with inside the community. If this small development is embedded with inside the proposed set of rules, then it suggests desirable effects.

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