Novel Algorithm of energy efficiency in WSN using LEACH and Genetic Algorithm

Monika Kumari [1], Sameeksha Chaudhary[2], Dushyant Singh[3]
[1]*M.Tech Scholar, Chandravati Group of Institute, Bharatpur, Rajasthan, India*
[2,3]*Assistant Professor, Chandravati Group of Institute, Bharatpur, Rajasthan, India*

Abstract- **In WSN there are several challenges. The core challenges are how to afford highest lifetime to network and how to offer a secure communication to network .As sensor network totally relay on battery power the main aim for maximizing lifetime of network is to conserve battery power or energy.**

In sensor network the energy is mainly consumed for three purposes: data transmission, signal processing and hardware operation .So for maximizing the network lifetime the process of data transmission should be optimized. Data transmission can be optimized by using efficient routing protocols and effective ways of data aggregation.

All nodes in network communicate with each other via wireless communication. Moreover the energy required to transmit the message is about to receive the message is about twice as great needed to receive the message .The routing objectives are tailored by the application require minimal network delay. While application performing statistical mechanism require maximized network lifetime ,hence different routing mechanism has been proposed for different application and different application and for increase the time period and reduces the energy consumption genetic algorithm concepts used in this.

The objective of this project is to use clustering in sensor network as an optimization technique for preserving energy and increasing the lifetime of network various algorithms are invented for this purpose. The objective here is to find a new approach for an energy efficient clustering algorithm which would satisfy the energy constraints of the network and prolong the network lifetime.

Index Terms- **WSN,LEACH ,Genetic, Clusters**

INTRODUCTION

A Wireless Sensor Network [1] or WSN should be comprised of expansive number of sensors and no less than one base station. The sensors are self-sufficient little gadget with a few imperatives like battery control, calculation limit, correspondence range and memory. They likewise are provided with handsets to assemble data from its condition and leave it on behind to a specific base station, where the deliberate parameters can be put away and accessible for the end client.

As another data obtaining and handling innovation, Wireless Sensor Network has an extensive variety of use in military, condition observing, keen furniture et cetera.

As a rule, the sensors framing these system are sent haphazardly and left unattended to and are relied upon to play out their main goal legitimately and proficiently. Because of this irregular arrangement, the WSN has generally shifting level of node thickness along its region. Sensor networks are likewise energy obliged since the individual sensors, which the system is shaped with, are to a great degree energy-compelled too. The specialized gadgets on these sensors are little and have restricted power and range. [2]

Some issues related to Wireless sensor networks are :

Energy: Sensors require control for different tasks. Energy [3,4] is expended in information accumulation, information preparing, and information communication; likewise, consistent tuning in to the medium for dedicated activity requests a lot of energy by node parts (CPU, radio, and so on.) regardless of whether they are sit out of gear. Batteries giving force should be changed or energized after they have been expended. Some of the time it ends up hard to revive or change the batteries on account of statistic conditions. The most urgent research challenge for the WSN analysts is to configuration, create and actualize energy effective equipment and programming conventions for WSNs.

Self Management: Wireless sensor networks once conveyed ought to have the capacity to work with no

human mediation. It ought to have the capacity to deal with the network design, adjustment, upkeep, and repair without anyone else's input [4,5].

Equipment and Software Issues: Sensor Networks comprises of a huge number of nodes. It is favored just if the node is shoddy. Streak memory is encouraged to be utilized as a part of sensor networks as it is economical. The focal handling unit of sensor node decides energy utilization and computational capacities of a node. Keeping in mind the end goal to give the adaptability to CPU execution, expansive number of miniaturized scale controller, chip and FPGAs (field programmable entryway clusters) are accessible. For sparing of energy, microcontroller ought to have three states-dynamic, rest, sit without moving. Facilitate energy utilization for FPGA can't be diminished; in addition isolate piece can't be made for it. Sending of FPGA to decrease control utilization is an extraordinary test. Along these lines, other than being savvy, different issues resemble the radio scope of one sensor node must be high going from 1 to 5 km. Radio range is basic for guaranteeing network availability and information accumulation in a network as the earth being checked might not have an introduced framework for communication. Programming in WSN ought to be equipment independent other than being light and less energy devouring. Calculations and conventions ought to be planned such that they ought to be less mind boggling and be useful in lessening energy utilization [4,5,6].

RELATED STUDY

Y. Chen, C. Shen, K. Zhang, H. Wang and Q. Gao, [7] Aiming at the problem of the network lifetime of wireless sensor network (WSN), this paper presents an optimization algorithm based on LEACH algorithm. In the optimization algorithm, some nodes in the vicinity of the base station connect to the base station directly, we extend the network life by increasing the energy consumption of the base station to share the energy consumption with the network; after the cluster is established, we elect secondary cluster head from the cluster, secondary cluster head collect information and pass the information to the cluster head, and the cluster head pass the information to the base station. Proved by simulation, this algorithm can extend approximately twice the life cycle compared with the traditional algorithm LEACH and DEEC.

A. Bomnale and S. Malgaonkar, [8] In recent technological trends, the cloud or the big data platform requires data gathered from multiple diverse networks especially for the visual analytics aspect. The nodes present in such networks always collect, process and transfer the essential data. So in such scenario power efficiency along with the bandwidth of the networks become the crucial factors as they both play an important role in maintaining the life and longevity of the networks; specifically that of the wireless networks.

The devices which don't have a constant power source, are mostly battery driven, they are commonly the IoT devices, mobile phones, sensor nodes, smartwatches etc. So the design and development of a power efficient data routing protocol is always in demand and this research work is always perpetual from industry as well as academics aspect. Such research work also contributes towards green computing. In this paper a short study on the various protocols specialized for such task has been carried out and also the TEEN protocol is investigated experimentally.

Mohammed Abo-Zahhad [9] publish a paper new energy efficient adaptive clusteringprotocol based genetic algorithm for improving network life time of WSN by finding the optimum number of cluster heads(CHs) and their location based on minimizing the energy consumption of the sensor nodes using genetic algorithm.

Sungju Lee, JangsooLee , [10] To balance energy consumption among CHs. DEU combines unevenclustering and multi-hop routing mechanism. Also, DEU protocol employs timer to select the nodes with high energy as CHs to save the energy of nodes in network. CHs consider candidate nodes' optimal hop count, residual energy, inter-cluster and intra-cluster communication cost to select relay nodes.

PREVIOUS APPROACH

LEACH protocol is the principal protocol of hierarchical routing which proposed data combination, it is of development essentialness in clustering routing protocol.

Numerous hierarchical routing protocol are enhanced ones based on LEACH Protocol [18]

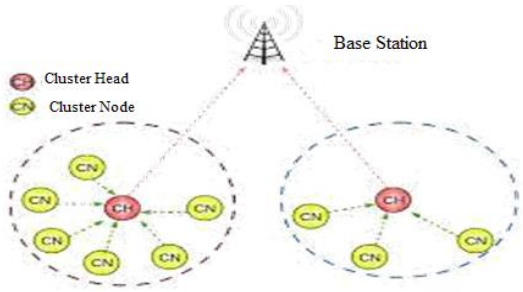

Fig.1 Clustering in LEACH protocol

LEACH utilizes irregular revolution of the nodes required to be the cluster heads to uniformly disseminate energy utilization in the network. LEACH Protocol is a normal illustrative of hierarchical Routing protocols. It is self-adaptive and self-organized.

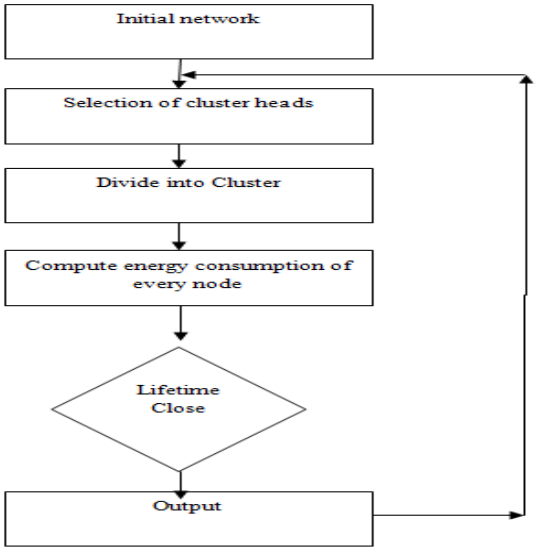

Fig 2. Flow chart of LEACH protocol

The working of LEACH protocol is helped out through different rounds, where one round made out of the following distinct stages:

Set-up: In this, any node is chosen as a cluster head haphazardly for a round.Every node in a network has the freedom to settle on its own whether it needs to be a CH or not. After the determination of CH, it informs the Neighboring nodes to form a cluster by transmitting a notice packet. Alternate nodes in the network get the commercial packet.

In LEACH location of the cluster head is on irregular premise. This is likewise for the quantity of cluster part in a cluster. An ideal answer for previously mentioned issue is constantly required. Set up control over location of cluster head and size of the cluster as far as number of individuals dependably has been considered as a challenge and solving this issue requires efficient clustering algorithm is energy utilization and network stack balancing. In the following segment another approach is recommended for the ideal determination of cluster head using hereditary algorithm. The approach is based on the thickness of the nodes in the network.

PROPOSED ALGORITHM

The dispersal energy in communication process is the main factors we have to minimize. Furthermore, the quantity of CHs can factor into the goal work. Less CHs result in more noteworthy energy proficiency and higher CHs expend more energy as CHs drain more power than non-cluster heads.

Stage 1: Initialize the parameter of the sensor field like transmission energy, reception energy, sink location.

Stage 2:Set the parameter of the genetic algorithm, for example, Ps, Pc, Pm, then set counter (r) to zero.

Stage 3: BS develops the sensors set by selecting sensors nodes that have residual energy equivalent or bigger than the normal energy of all live sensor nodes in the sensor field.

Stage 4: Apply GA by setting randomly Ps initial ( ) bits binary chromosomes and set the counter of ages (gen) to zero.

Stage 5: Calculate the target function F(X)for all CHs chromosomes.

Stage 6: Increase the counter of ages by one (gen=gen+1).

Stage 7: Select the best CHs chromosomes based on the fitness esteem (1/F(X)) using roulette wheel selection.

Stage 8: From each match of CHs guardians, take Nc children by crossover operation based on the crossover rate pc.

Stage 9: Apply the mutation to all qualities of every tyke created from stage 7 based on likelihood of mutation pm.

Stage 10: Calculate the goal function F(X)for new CHs chromosomes. Pool for the people to come.

Stage 11: Select the best Ps chromosome from guardians and youngsters to be population pool for the people to come.

Stage 12: Has stopping rule met? On the off chance that yes, at that point go to stage 13. Something else, return to stage 6 and continue through stage 16.

Stage 13: show the quantity of Chs and their
Stage 14: Assign the individuals nodes of each CH.
Stage 15: Steady state stage, when the detected data exchanges to CHs and gathers in frames; at that point these edges exchanges to the BS.
Stage 16: Has the energy of all nodes equivalent or under zeros? On the off chance that yes, at that point stop. Otherwise, increase number of rounds by one and come back to stage 3 and continue through stage 16.

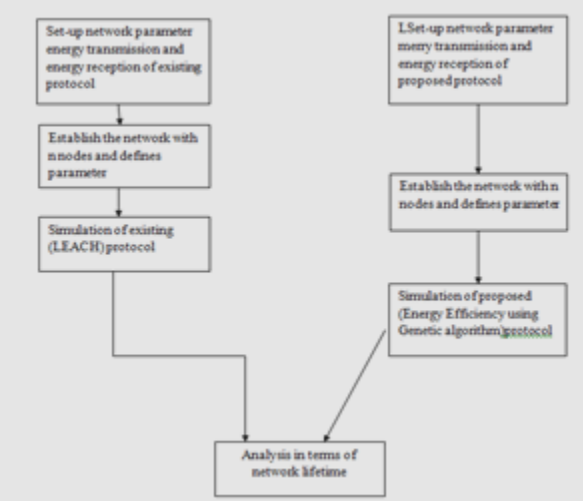

Fig 3. Flowchart Proposed Approach

IMPLEMENTATION AND TESTING

Simulations are conducted using MATLAB 7.8.0347 and to get precise plots, confidence interval is taken. Sensor nodes are deployed in random manner and made homogeneous wireless sensor network. The wireless channel is used because the nodes deployed in the network are communicating wirelessly based on their distance, transmission range etc. Simulations show the throughput, network lifetime, location of base station and initial energy of sensor nodes in LEACH protocol. MATLAB 7.8 has been used for the implementation of routing protocols. It provides the real time environment to the vehicular ad hoc network. We are using this version of MATLAB in our project for implementation.

The work done in this project in mentioned below steps:

(i) Deploy WSN by initializing the parameter.
(ii) After deploying the network, it is worth-noting to use appropriate topology for that network.
(iii) Selecting the cluster-head in the sensor network using LEACH protocol.
(iv) Initializing the communication by sending the data packets.
(v) Implementing LEACH, a routing protocol for homogeneous WSN to find the optimal solution.
(vi) Evaluating the performance and observing the analysis for different parameter.
(vii) Selecting the optimum cluster-head in the sensor network using Genetic Algorithm
(viii) Initializing the communication by sending the data packets.
(ix) Implementing proposed protocol, homogeneous WSN to find the optimal solution.
(x) .Evaluating the performance and observing the analysis for different parameter.

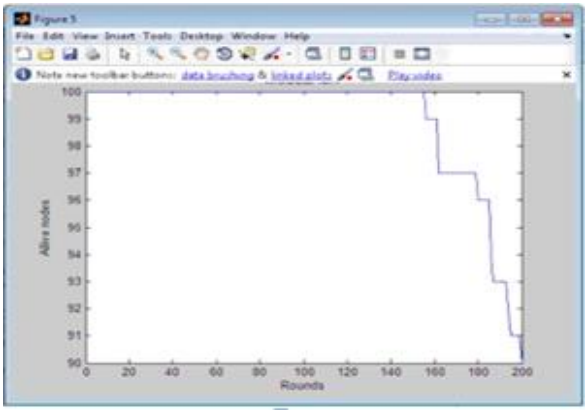

Fig 4. Base Approach Rounds V/s Alive Nodes

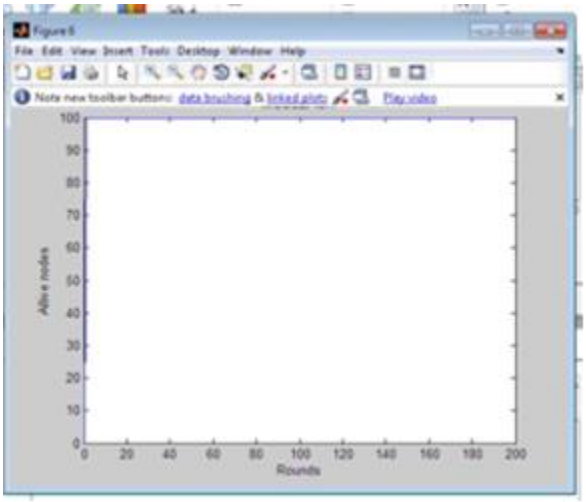

Fig 5. Proposed Approach Round V/S Alive Nodes

CONCLUSION

Our task work included the investigation of clustering, cluster head selection and other energy

efficient communication protocols for WSN, since it was prior recommended that clustering enhances the network lifetime. Keeping the routing polices in mind we proposed a genetic based approach for choosing clustering head and proposed another technique for cluster head selection having less computational multifaceted nature. In this approach different conditions are considered which would give a more exact result. In this proposed approach cluster head is chosen based on fitness esteem. Routing is a noteworthy issue in wireless sensor network.

In this thesis , a new approach energy efficiency protocol using genetic algorithm is proposed reduces energy consumption by using clustering technique therefore increases system lifetime .The performance evaluation in terms of network lifetime using MATLAB .This work proposed a genetic algorithm based new approach for clustering for wireless sensor network .Protocol consider proposed algorithm is for the homogeneous network which uses genetic algorithm for cluster-head selection and in this base station selects the cluster head from the candidate cluster head using genetic algorithm. The proposed technique has improved the performance in terms of network lifetime by comparing with LEACH.

In WSN, an exceptionally basic undertaking for clustering protocol is to choose the cluster head with the goal that minimum energy is devoured, and thus drag out the lifetime .In the introduced work, we mimic the LEACH algorithm. Tangle lab reproduction comes about demonstrated that the proposed protocol is more energy efficient .proposed work increase the energy effectiveness as far as network lifetime.

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