Optimizing Routing Technique For Genetic Algorithm Using Clustering Approach

Priyanka U[1], Dr. Siddaraju B[2]
[1]Dept of Computer science and Engineering
[2]Head of the Dept, Dept of Computer science and Engineering
[1, 2] Dr.Ambedkar Institute of Technology, Bengaluru

Abstract- *The project is to study the routing algorithm namely LEACH belonging to a hierarchical network. LEACH algorithm is simulated and future the LEACH algorithm is improved by measuring the various parameters namely overhead, number of dead nodes, number of alive nodes, total energy consumption, number of hops, end to end delays. In the proposed approach the genetic algorithm is used for the collection to which the cluster heads will direct the information and then the data is send to the destination base station. The genetic algorithm applies a sequence of operation namely chromosomes, population formulation and fitness function to determine the cluster head. Once the routing is finished it makes use of crossover and mutation to recover the dead nodes in the network*

Keywords- LEACH, Genetic Algorithm, WSN, Clustering, Chromosomes.

I. INTRODUCTION

A wireless sensor network will contain hundreds or thousands of sensor nodes used for sensing, computing, and communication devices such as short range communication devices over wireless channels. These nodes may be distributed over a large area, e.g., WSNs can do area monitoring for some phenomenon of interest. In such an application, the main goal of the wireless sensor networks is to collect data from environment and send it to a sink node. This size limitation introduces challenges for the design and management of wireless sensor networks; in particular, restrictions in memory, power and communication capacity need to be considered in order to improve the longevity of the needs.

Leach is a known algorithm for the wireless sensor networks because it considers transmission of data and groups of cluster heads. The cluster heads are selected in round randomly. Leach algorithm data transmission is the major consumer of power, so it is important to have power-efficient protocols. In order to reduce the total power consumption in the network leach users cluster heads in rounds for transmissions to long distances. Hence an algorithm is needed which is more efficient than leach which as better energy efficiency and less power consumption.

Disadvantages of LEACH

1. The cluster head selection method of LEACH elects the cluster head randomly at each round because of which there is huge probability that a node which has lowest battery level becomes a cluster head and the packets are seized from transmission.

2. The Cluster head in LEACH maintains local topology i.e. nodes which belong to the cluster because of which there is back and forth communication between normal node and base station which exponentially increases the energy consumption of nodes and end to end delay.

3. The LEACH algorithm does not take into consideration the presence of obstacles while transmitting the data packets because of which the packets can move back and forth and get blocked in the network.

II. BACKGROUND

In the paper titled “Energy-Efficient communication protocol for wireless Micro-Sensor networks” the author as explained that wireless distributed micro-sensor systems it will be used for civil and military application for reliable monitoring of a variety of environments. Energy dissipation of the network that takes place by using communication protocols. We propose leach low-energy adaptive clustering a clustering based protocol that is used to energy load among the sensors in the network and randomized rotation of local cluster based station it also uses localized network to enable scalability and robustness for dynamic network.

In the paper titled “Minimum Energy Mobile Wireless Network” the author described that distributed position-based network protocol optimized for minimum energy consumption in mobile wireless networks that supports

peer to peer communications we can illustrate a simple local optimization scheme at each node which will guarantee strong connectivity of entire network to attend the global minimum energy for given number of random solution for stationary network. When applied to mobile network the localized nature of the protocols will be self-configuring and stay close to the minimum energy.

In the paper titled "Adaptive protocols for information dissemination of wireless sensor networks" the author described a family of adaptive protocols called SPIN (Sensor protocols for Information via Negotiation), that will disseminates the information in an energy-constrained sensors. SPIN communication protocols running the nodes using high level data called metadata. To eliminate the transmission of redundant data we use metadata negotiations throughout the network. SPIN nodes can have communications decision upon resource of knowledge. It will allow limited energy supply for the sensor to efficiently distribute data. They are two specific SPIN protocols we can compare and simulate the performance with other approaches it will deliver 60% of more data for conventional approach.

In the paper titled "Directed Diffusion: A scalable robust paradigm for sensor network" the author described that advances in processor, memory and radio technology will enable small and cheap nodes capable of sensing, computation and communication. In the paper, explore coordination of directed diffusion paradigm. Directed diffusion is named for data centric communication for a directed diffusion all nodes are application dependent. Directed diffusion will enable diffusion for caching and processing data we can evaluate and explore the use of simple remote-surveillance sensor network.

III. PROPOSED SYSTEM

Figure shows the system architecture diagram for the Requisite Trust Based routing algorithm.

1. Node Deployment Algorithm

For Deployment of nodes this algorithm is used in a particular area.

2. Cluster Formation Algorithm

Cluster formation algorithm divides the entire area into multiple zones. Each zone has set of nodes in its area. This is cluster formation algorithm which is responsible for deploying the nodes. The entire area is divided into zones with each zone bounded with the limits with some xmin and xmax. The y region is limited inside the boundaries ymin and ymax .Each zone is assigned a set of nodes.

3. Cluster Head Election-LEACH

The algorithm will take a set of nodes and it will compute the random probability. The node which as highest precedence will act as cluster head.

4. Route Discovery using Leach

This algorithm is used to find route from source node to destination node using an existing leach protocol. In this algorithm we will first find whether the source node and destination node is in same zone. If the nodes are in the same zone they will compute directly. If the source node and destination node are in different cluster then source head will communicate with base station. The base station scans all the remaining cluster is reached .

5. Route Discovery using Genetic

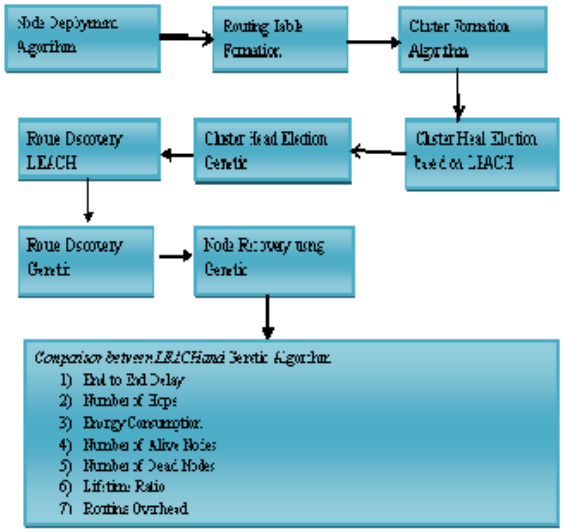

figure: system architecture

6. Route Discovery using Leach

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7. Route Discovery using Genetic

8. Node Recovery using Genetic

This is the process in which the nodes will perform two kinds of operations namely Crossover and Mutation and recover the dead nodes in the network.

9. End to end delay

End to end delay is the time taken for the RREQ to go from the source node to destination node and then send back the RRPLY from destination node to source node.

$$E2E_{delay} = t_{stop} - t_{start}$$

10. Number of hops

The count of number of intermediate links between the source node and destination node.

11. Total Energy Consumed

The total energy consumption can be computed using the following equation

$$TE_c = \sum_{i=1}^{l} Ec_i$$

Where ,

l = Number of links

Ec_i = Energy consumed for the i^{th} link

12. Number of alive nodes

The count of number of nodes will be greater than B/4 where B is the initial battery.

13. Number of dead nodes

The count of number of nodes whose remaining energy is less than B/4 where B is the initial energy.

14. Routing overhead

The routing overhead is defined as

$$Routing\ Overhead = \frac{Number\ of\ control\ packets}{Number\ of\ Data\ packets}$$

15. Lifetime Ratio

The Lifetime Ratio would be computed by using the following equation

$$LifetimeRatio = \frac{Number\ of\ Alive\ Nodes}{Number\ of\ Dead\ Nodes}$$

16. Throughput

The Throughput would be computed by using the following equation

$$Throuput = \frac{Number\ of\ Packets}{Unit\ Time}$$

IV. DETAILED DESIGN

A. Cluster Formation Algorithm

The cluster formation algorithm is used to divide the entire area into zone and each zone constitutes set of nodes.

1. Number of zones, number of zones, number of nodes in each zone and angular end point list is entered.

2. For all the zones, generate the zone ID, extract the end points of a region and give these as input to node deployment algorithm.

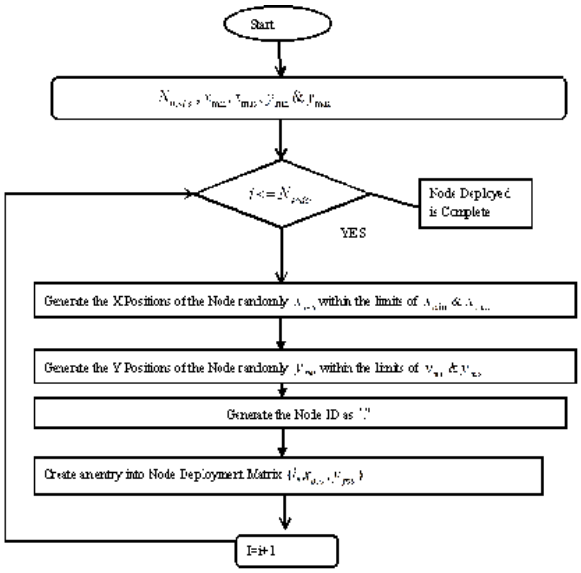


Fig: Cluster formation algorithm

B. Leach Algorithm Process

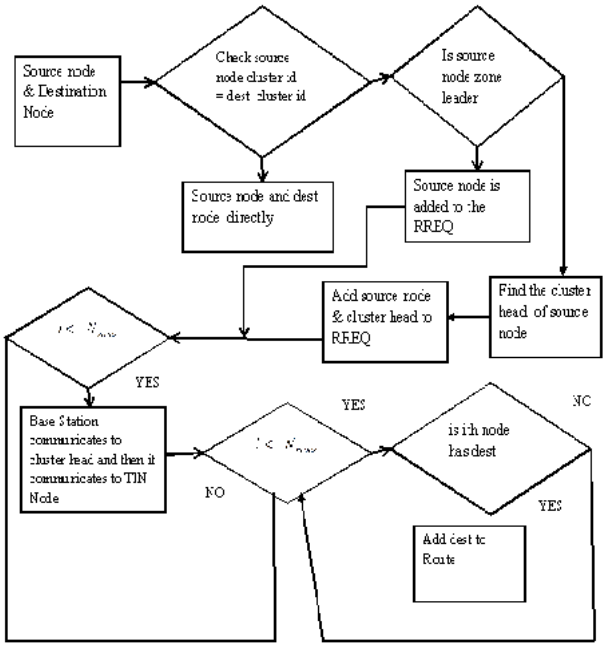


Fig: LEACH Algorithm Process

This will be used to discover single route from source node to destination node.

Step for Leach algorithm

1. Source node, destination node, base station id and its location is entered.
2. If both the source node and destination node are in the same region then communication happens conventional.
3. First we should check whether the source node is cluster head. If it is not cluster head source node will be added to the route and then cluster head of the source node will be found out and it will be added to the route.
4. The source node or source node cluster head communicates with the base station.
5. Cluster head will be with all cluster heads.
6. The cluster heads find the Temporary Intermediate Nodes (TIN) nodes and then search for destination
7. If destination is reached then stop otherwise repeat step 6 process until destination is reached

C. Genetic Route Discovery Process

1. Source node and destination node will acts as the input.
2. Check whether the source node and destination node belong to same cluster.
3. If it is yes we can communicate directly.
4. If it is no then we should find the cluster head is source node. If the source node is not the cluster head then discovery the cluster head of source node.
5. Check whether the destination node is cluster head. If the destination node is cluster head then add the route and stop.
6. If the destination node is not the cluster head then discovery the corporative nodes whose energy is high and obtain the multiple paths.
7. Compute the fitness for multiple path
8. Pick the path which has the highest fitness factor of selection.

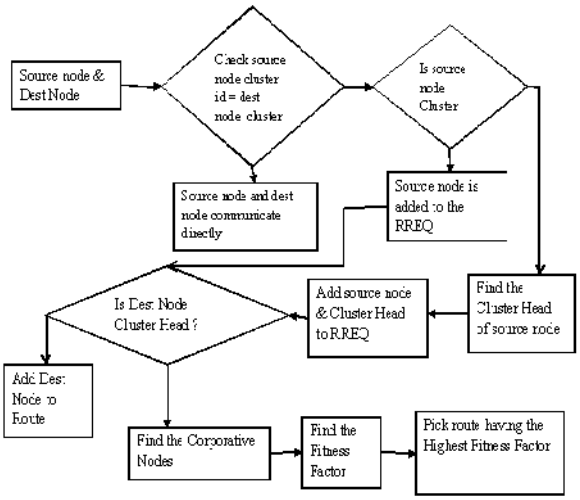


Fig: Genetic Based Algorithm

D. Crossover and mutation function

Genetic algorithm is for fault node recovery. So algorithm must run for each data transmission and genetic algorithm must run after every 30 data transmission.

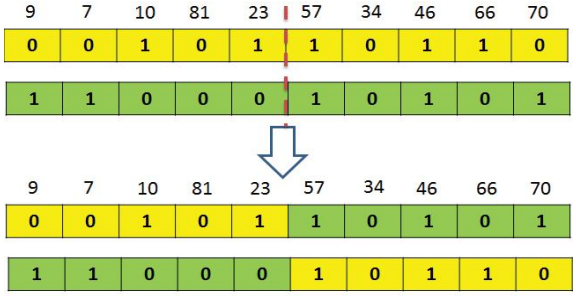
1. Check the faulty nodes and total number of nodes in the network.
2. If the numbers of fault nodes greater than 1 then precede else stop
3. Get the IDs of all the fault nodes and form four chromosomes. Chromosome length must be equal to number of faulty nodes.

9	7	10	81	23	57	34	46	66	70
0	0	1	0	1	1	0	1	1	0

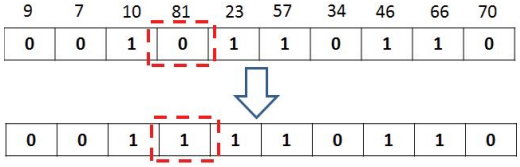
Here 9,7,10,81… etc. are the IDs of all the fault nodes in the network.

4. Assign randomly 1 or 0 to the faulty nodes in the chromosome.

5. Here the nodes with binary 0 must be replaced and nodes assigned with 1 need not to be replaced.
6. Form four chromosomes by assigning 1 and 0 randomly.
7. Now choose two chromosomes which replace more number of lesser grade nodes. (If a chromosome replaces grade1 node then it must be preferred to the one that replaces grade2 node) .
8. Carry cross over operation between the two chromosomes.



9. Now randomly flip any one of the gene in the chromosome.



10. Now replace the nodes whose value is 1 to increase the lifetime of the network.

V. EXPERIMENTAL RESULTS AND DISCUSSIONS

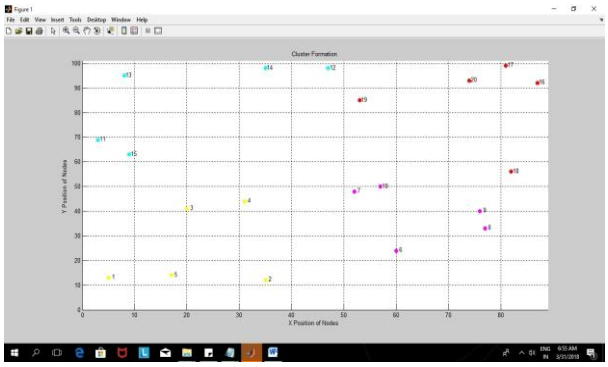


Fig. 1 shows X axis as X Position o Nodes and Y axis as Y position of Nodes

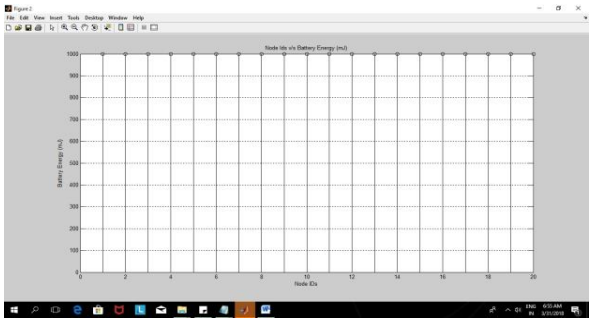


Fig. 2 shows x axis as Node IDs and Y axis as Battery Energy

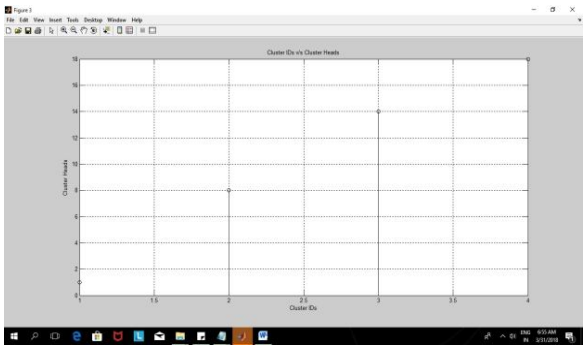


Fig.3 shows X axis as Cluster ID's and Y axis as Cluster head

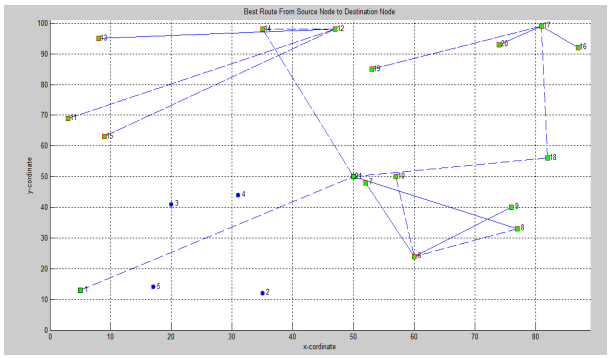


Fig.4 shows X-axis as X-coordinate and Y-axis as Y-coordinate and the route discovered using leach algorithm

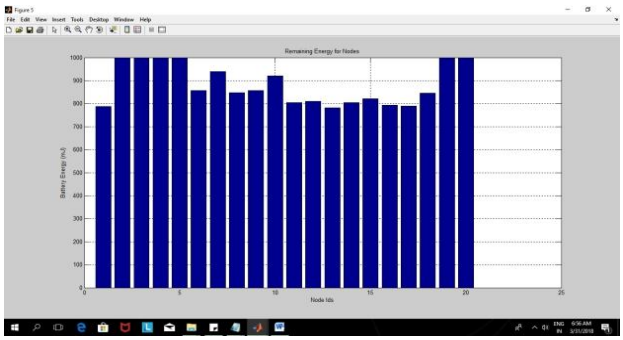


Fig.5 shows X axis Node Ids and Y axis as Battery Energy

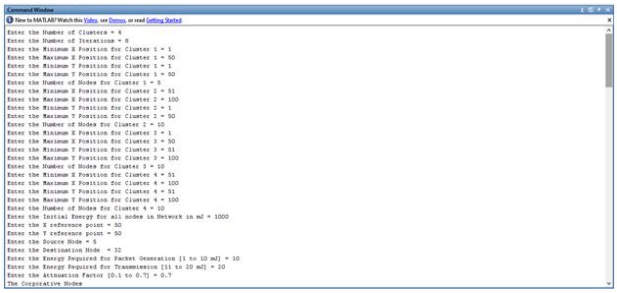


Fig 6.LEACH Genetic Results

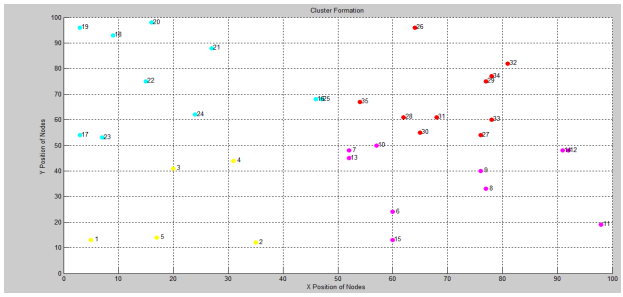


Fig 7. Shows X axis as X position of Nodes and Y axis as Y position of Nodes

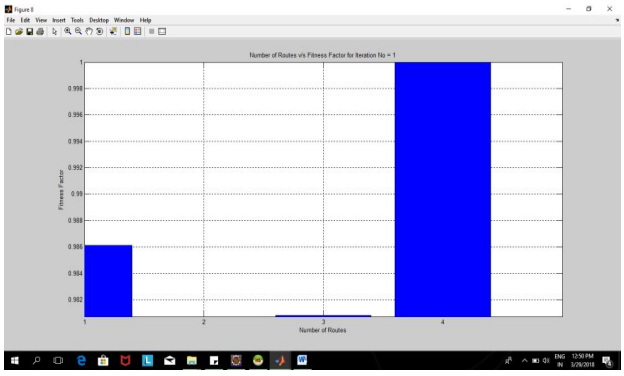


Fig 8. Shows X axis as number of routes and Y axis as Fitness Factor

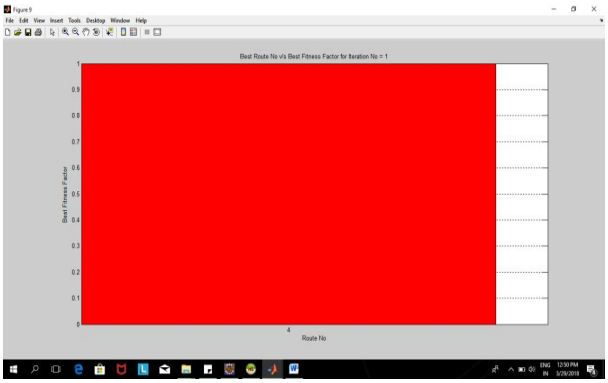


fig9.showsX-axis as Route no and Y axis as Best Fitness factor

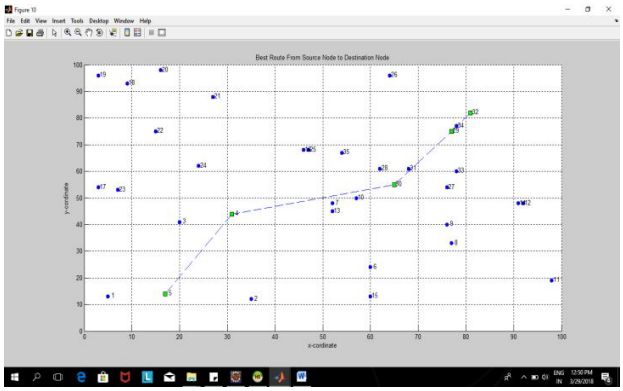


Fig.10 shows X-axis as X-coordinate and Y-axis as Y-coordinate

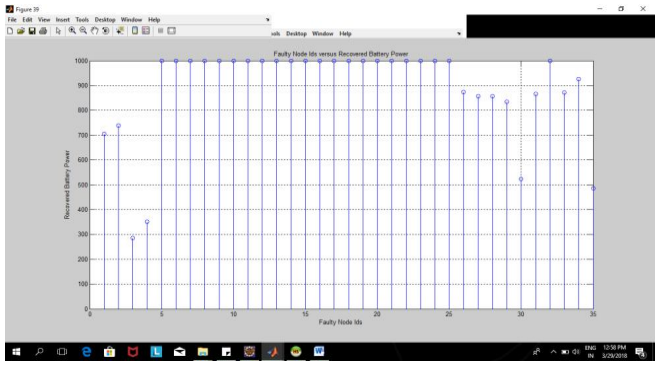


Fig 11. Shows the result of the LEACH

VI. CONCLUSION

Network formation of the cluster has been discussed. The network is globally divided into hierarchical network and non-hierarchical network. Leach will discover the route between the source nodes to destination node with base station which will be involved in communication with back and forth transmissions in case of inter cluster communication. Leach algorithm in future is used to simulate the parameters like end to end delay, number of hops, energy consumption, number of alive nodes, number of dead nodes, lifetime ratio and routing overhead.

VII. FUTURE SCOPE

In the future approach the Obstacle Aware Approach can be used in order to find alternative paths if there are any blockages in the clusters.

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