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Methods to Secure Computer Networks

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Abstract
A single-tier network can make the entry over-burden with the development in sensors thickness. Such over-burden may cause latency in communication and deficient after of events. What's more, the single-tier configuration isn't adaptable for a greater course of action of sensors covering a more broad zone of interest in light of the fact that the sensors are commonly not ready to do extended length communication.
Wireless Sensor Network (WSN) contains incalculable ease sensors which talk with each other by methods for wireless channel. WSN has been proposed for a wide variety of employments, for instance, target following, security, condition checking. A critical utilization of WSN is to check nature boundaries and send the sensor readings to remote server. Since adjoining sensors may distinguish the standard marvel, there is high reiteration in their rough data and it is inefficient to communicate each unrefined datum to remote server.
Keywords: *Clustering, Network, Node, Data*

I. Introduction

Clustering has been extensively used in wireless sensor networks (WSNs) to grow versatility, improve energy capability and give QoS guarantees. With clustering, sensor nodes are created into groups and a channel head (CH) node is picked for each pack according to specific norms, while various nodes go about as people in the bunches. In pack based data gathering, data accumulated by bunch people are first shipped off CHs, which along these lines pass on the data to the data sink either by direct communication or through transfers on transitional CHs. While clustering is from the start familiar with achieve energy capability, it can similarly help keep up low pack inaction in deferral fragile data gathering. This is because that bundles from different people can be merged as added up to parcels at CHs to decrease the transmission overhead of package headers and control parcels (e.g., ACK bundles), prompting condensed transmission delay. Moreover, clustering simplifies the directing from the source node to the sink and more limited steering ways decline network traffic as well.

Sensor nodes assemble data from their condition and send it to the Base Station. Heterogeneous sensor network contains high energy sensor nodes similarly as low energy nodes. The gathering head aggregates and sends the data to the Base Station.

Various leveled clustering is particularly useful for applications that anticipate that adaptability should hundreds or thousands of nodes. Flexibility right now the prerequisite for load changing and compelling asset use. All nodes in a network can be figured out in various leveled structures called groups. Each gathering contains a bundle head and a couple of part nodes. The part nodes assemble data and send it to their gathering heads.

The energy usage of gathering heads is higher than that for part nodes. Clustering estimations are required which can capably utilize the energy of nodes with the objective that existence of network can be extended. Here we are proposing Fuzzy Logic based clustering for homogenous sensor networks.

II. Related Work

Ajay Jangra et al. [1] present a novel security S-Drain framework which is the enlargement of Filter directing protocol used for recognizing the Sybil attack. The framework is intended to begin the Sybil attack whose disclosure is moved on RSSI (a pointer of sign quality) when the amount of pack heads in WSN is over the cutoff. The security framework is requested by the prosperity of the stage and energy usage through a movement of assessments.

Deng Zhejiang et al. [2] performed; as a result of the obstacle of power and memory size for WSN, the directing protocol for wireless sensor networks should keep up small steering data and abatement the power use whatever amount as could be considered typical. Drain protocol and PEGASIS protocol are taken apart at first at the present time. Use for reference of the musings used in both of the two protocols of diminishing power dispersing, a three-layered steering protocol for WSN reliant on LEACH(TL-Drain) is given.

Fan Xiangning et al. [3] considers Filter protocol, and advances energy-Drain and multihop-Drain protocols. Energy–Drain Protocol improves the choice system for the gathering head, makes a couple of nodes which have progressively leftover energy as pack heads in the accompanying round. Multihop-Filter Protocol

improves communication mode structure single leap to multihop between bunch head and sink. Entertainment results show that Energy-Drain and Multihop-Filter Protocols have ideal execution over Filter Protocols. Fuzhe Zhao, You Xu, Ru Li, Wei Zhang et al. [4] propose another method for picking bunch heads with lessens trivial use of energy spent on enlisting of each node during each round. To make the energy pass on even more even in the network, the prospect of the unique distinction in sensor nodes energy will be introduced during the decision of CHs.

Fuzhe Zhao et al. [5] proposes another method for picking bunch heads which decreases unnecessary use of energy spent on preparing of each node all through each round. Since the conventional decision condition neglect to the distinction in nodes' energy will make the nodes going about as gathering heads (CHs) excessively astounding inferable from eat up more energy.

Haosong Gou et al. [6] this paper proposes an improved (Drain C) computation called bundle based Filter (pLEACH), which first thing sections the network into ideal number of parts, and a while later picks the node with the most raised energy as the head for each portion, using the consolidated figurings. The idea behind Drain is to shape bunches of the sensor nodes depending upon the got signal quality and use close by bunch heads as changes to course data to the base station and the contrasting groups.

Heewook Shin et al. [7] proposed another energy beneficial clustering plan. He communicated that in Filter, regardless, extra energy and time are exhausted to change bunches at the arrangement time of each round. This manifestation is terrible as the amount of groups increases. This paper present a novel energy-beneficial clustering intend to remove bunch imitating measure needed at each round after the first round, which is called Beds (Clustering with One Time Arrangement). The proposed Bunks permit that the work of gathering head is rotated among people in a pack without bundle changing cycle. Thusly through and through extras the energy considering the way that the gathering changing strategy isn't needed, achieving extended network future.

Hu Bouncing et al. [8] played out a wireless sensor network includes hundreds or thousands of little energy-obliged sensors that are thickly passed on in a tremendous geological locale. It has been indicated that Low-Energy Versatile Clustering Chain of importance is an energy-profitable directing figuring for Wireless Sensor Networks.

Jun YUE, Weiming ZHANG, Weidong XIAO, Daquan TANG, Jiuyang TANG et al. [9] presents a novel conflicting pack based data aggregation protocol is proposed. It parcels the network into specific frameworks with conflicting sizes, and completes bundle head upheaval in each cross section separately. It can change energy dispersal by setting real sizes of frameworks to change the amount of nodes that look into bunch head turn in different networks.

Y. Yang et al. [10] played out a work, considering the assessment on the distortion in Drain including the difference in the amount of gathering heads and the deadness of the node's lingering energy, this paper presents a novel protocol called Filter B (Filter Changed). At each round, after best option of gathering head as demonstrated by Filter protocol, an ensuing decision is familiar with change the amount of shine head in regards to nodes leftover energy. Subsequently the amount of gathering head is consistent and near ideal per round.

Muhamnmad Omer Farooq et al. [11] presents a multi-hop steering with low energy versatile clustering order protocol.MR-Drain adheres to the focal standard of multi-ricochet directing from bunch heads to a Base station to direct energy, as opposed to the filter protocol. In MR-drain they bundle the network into different layers of bunches. Where Gathering heads in each layer cooperates with the nearby layers to Send sensor's data to the base station. Standard nodes Join bundle heads subject to the got signal quality pointer (RSSI).

In year 2010, Muhammad Omer Farooq et al [12] played out a work.In this paper, we present a Multi-bounce Steering with Low Energy Versatile Clustering Progression (MR-Filter) protocol. To haul out the lifetime of Wireless Sensor Network, MR-Drain distributes network into different layers of groups. Gathering heads in each layer collaborates with the contiguous layers to send sensors data to the base station. Standard sensor nodes join bunch heads reliant on the Got Signal Quality Pointer (RSSI).

Nandini. S. Patil, Prof. P. R. Patil et al. [13] presented a data assortment framework on wireless sensor networks is presented. The construction fills in as a middleware for collecting data assessed by different nodes inside a network. They consider the presentation of TAG(Tiny Assortment) to the extent energy efficiency in connection with and without data absolute in wireless sensor networks and to assess the fittingness of the protocol in a circumstance where assets are compelled.

Wei Bo Hu Han et al. [14] played out a work; Conventional Filter joins passed on pack advancement, neighborhood dealing with to lessen overall communication, and randomized turn of the gathering heads. The new protocol uses multi-hop steering rather than 2-ricochet directing in Drain, and related estimation is proposed. Reenactment results show that improved protocol is more energy-capable that normal Filter.

III. Proposed Protocol

Proposed work actualizes Fuzzy Logic based clustering which in upgraded type of weight based clustering in wireless sensor networks. Weight based clustering protocol has the disadvantage that it chooses superfluously additional bunch head. In some cases Nodes with high residual energy were not allowed to become group head.

This disadvantage is overwhelmed by Fuzzy Logic based clustering calculation. All nodes with comparative energy are given same opportunities to become group head.

Additionally a node with high residual energy regardless of whether it is lying in bondage of another group head will be chosen as a bunch head. The proposed clustering procedure is an improvement our Weight based clustering. The all-encompassing objective of our methodology is to drag out network lifetime. Hence, bunch head determination is fundamentally founded on the residual energy of every node. Estimating this residual energy isn't fundamental, since the energy devoured per bit for detecting, handling, and communication is normally known, and thus residual energy can be assessed. Fuzzy logic is utilized for discovering bunch head which consistently picks ideal number of group heads. The utilization of fuzzy logic is suitable, at whatever point it is unimaginable to expect to utilize a scientific model for the framework. Additionally, fuzzy can lessen the multifaceted nature of the model; computational exertion and memory's get setting data from nodes as info and changes over into fuzzy phonetic variable information.

First order radio energy is used for performing radio analysis. It takes the following form

Einit=0.5 in joules

Eelec=50*0.000000001

EMP=0.0013*0.000000000001

Eda=5*0.000000001

Where Einit is initial energy, Eelec is electrical energy, EMP is amplification energy, Eda is data aggregation energy.

The Pseudo code

The Pseudo code of Proposed Model is as Follows:

Step1: Start

Step 2: Create a Network

Step 3: Create Clusters from network using:

a. A CH is selected from the SNs by considering a multiple metrics i.e. residual energy and a distance from non-CH to CH using the concept of Fuzzy logic and Cluster is created.

b. Based on last step, Non-CHs select the best CH based on distance matrices to become its member.

Step 4: Stop

IV. Performance Evaluation

This part presents the simulation and results of the presented model.

Simulation Scenario

Initially there is a network in which nodes are distributed randomly as shown in figure 1.

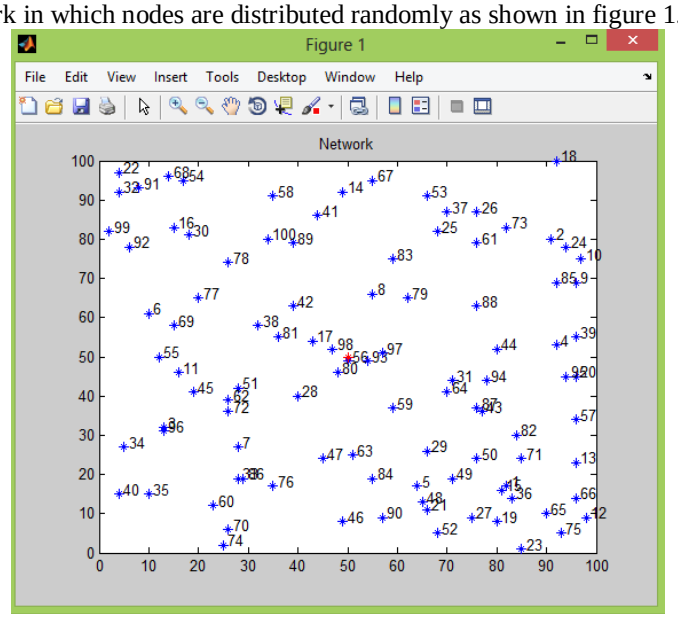

Figure 1: Network creation using 100 Nodes.

In figure 2 new scheme is implemented in which cluster head are elected based on the given logic of presented model. These cluster head are shown by star shape in blue color (*).Red stars are dead nodes.

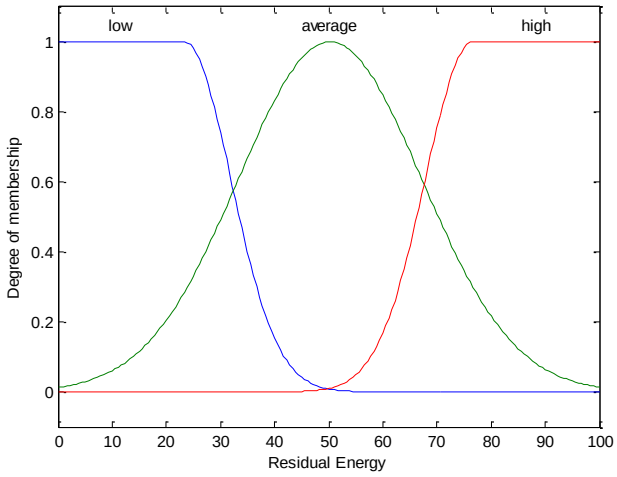

Figure 2: Cluster Formation

Each Normal node will elect its cluster head based on Probability which can be calculated Fuzzy Logic System using the two input variables "distance between the node & cluster head" and "Residual Energy".
Figure 3 and figure 4 show both inputs and their corresponding graphical representation in fuzzy system.

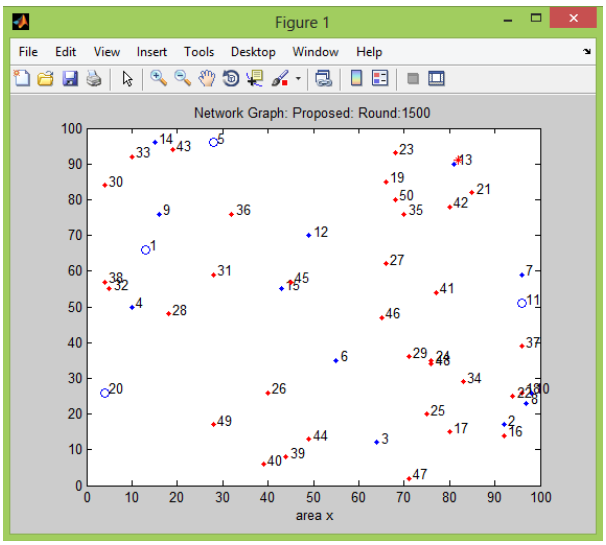

Figure 3: Degree of membership for Residual energy as first input for fuzzy system.

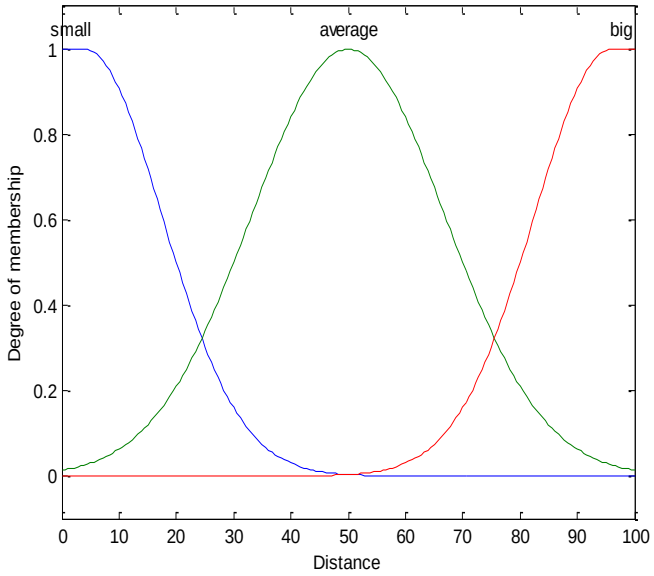

Figure 4: Degree of membership for Distance as second input for fuzzy system.

Correlation between Residual energy and Distance for Fuzzy system is shown in figure 5.

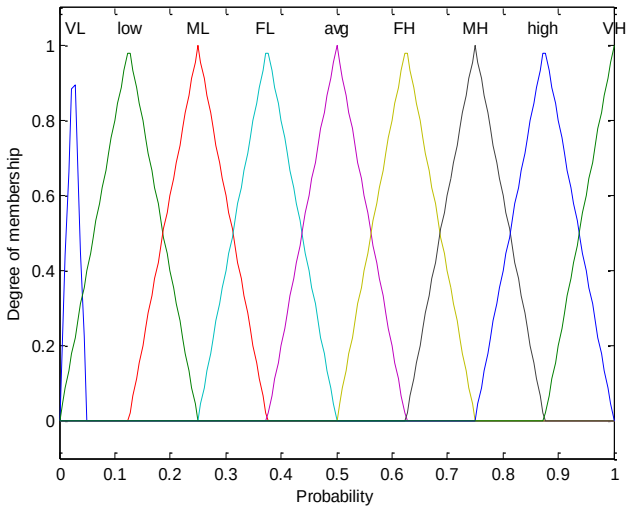

Figure 5: Correlation between Residual energy and Distance for Fuzzy system

Finally figure 6 shows the surface graph for probability calculation for cluster formation.

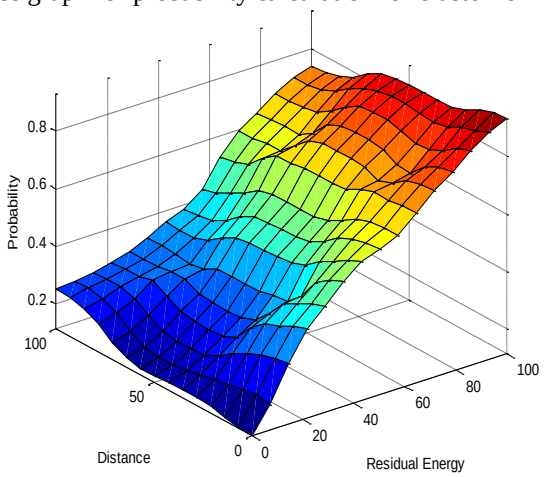

Figure 6: Surface Graph for Probability Calculation for cluster formation.

Using this Probability Calculation fuzzy logic, each normal node calculates the probability for each cluster head. The node which has the highest probability with respect to any cluster head will be the member of that cluster for cluster head in that round. In this way Cluster formation is done in the presented work.

Performance Evaluation

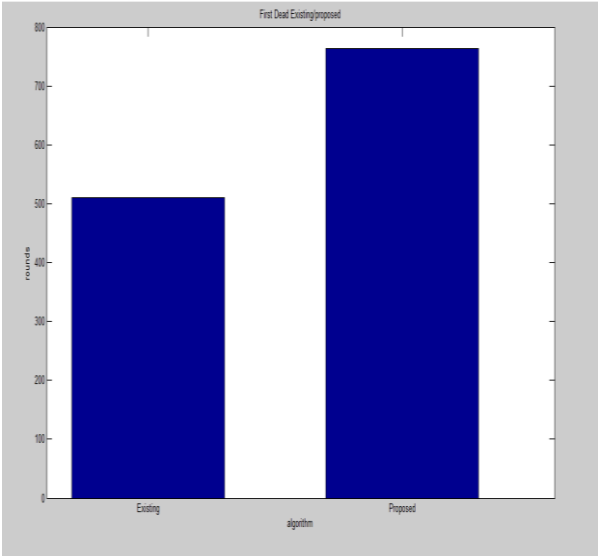

Figure 7: Comparison of existing and proposed system in terms of first dead.

The figure 7 graph shows that first dead node in our proposed algorithm happens after 700 rounds in spite of existing weight based algorithm which is having its first dead very close to 500 round. Hence our algorithm is Energy efficient than existing algorithm.

Figure 8 gives the graph which compares the performance of existing and proposed system in terms of number of dead nodes with total number of clustering rounds. Green line represents the proposed system and blue line represents the existing system. Graph shows that proposed system shows improved performance over existing system in 1000 rounds.

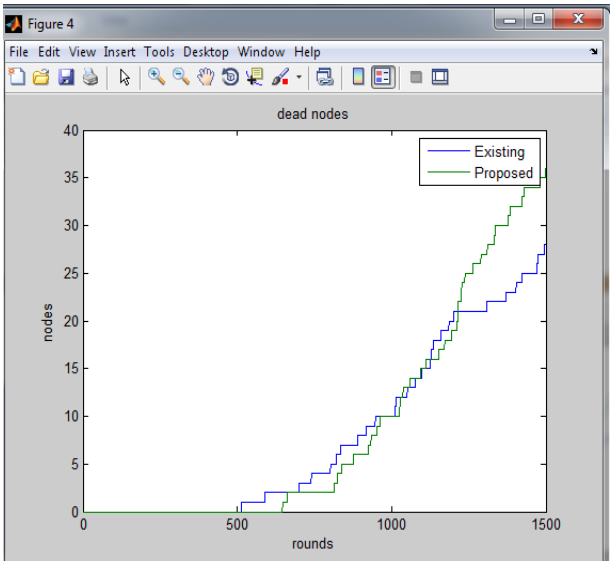

Figure 8: Performance Evaluation of existing and proposed system in terms of no. of dead nodes& no. of rounds.

The graph 9 gives a comaprison of the performance of existing and proposed system in terms of number of dead residual energy with total number of clustering rounds. Green line represents the proposed system and blue line represents the existing system. Graph shows that proposed system have almost same residual energy up to initial 500 rounds as existing system is having.

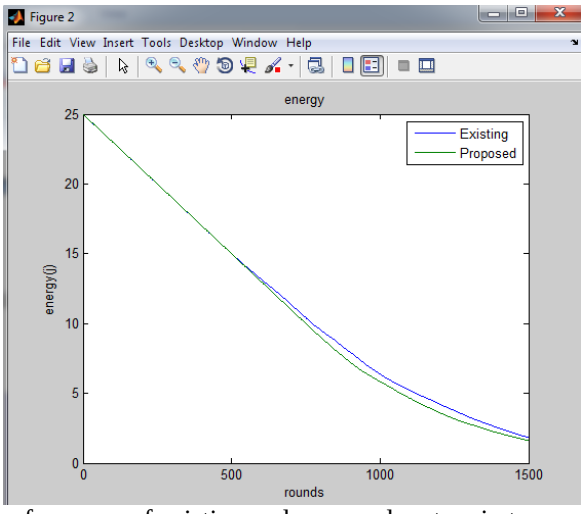

Fig: 9 comaprison of the performance of existing and proposed system in terms of number of dead residual energy with total number of clustering rounds

V. Threat Models

1. Routing Threats

There are a multitude of potential threats facing the routing of ad hoc networks. These include confidentiality, integrity, and availability. When it comes to confidentiality within the realm of routing protocols, the primary threat is towards the, "privacy of the routing data itself." If the routing data were to be compromised, then a secondary threat could occur to other information such as, "the network topology, geographical location, etc."

The integrity of an ad hoc network essentially relies on the accuracy of each node's routing information. Potential attacks include those that would either alter existing routing data or introduce new, but incorrect, routing data. Finally, in the context of ad hoc routing, availability fundamentally equates to nodes being able to have on demand access to routing information at all times. Additionally, routing operations should not delay nodes from obtaining up to date information. Consequently, each node within the network should be able to function normally without unnecessary interference from either security or the routing protocol.

2. External Threats

With ad hoc networks, external threats are distinguished from internal threats by classifying external threats as potential attacks performed by unauthorized network nodes or other outside entities. In contrast, internal threats refer to potential attacks originating from internal authorized nodes. In terms of detection difficulty, external threats are typically easier to detect than internal threats. In ad hoc networks with an authentication protocol to block unauthorized nodes from joining the network, external threats typically focus on attacking the data link and physical layers of the network. Also, external attacks can be further classified into two broad categories, passive eavesdropping and active interference.

Passive eavesdropping generally refers to attacks that attempt to simply listen to the transmitted signals and network traffic without disrupting the network. The most basic of which simply involves the discovery of a wireless ad hoc networks by detecting the existence of the appropriate signals. By extension, passive eavesdropping can pose a threat to location privacy. More sophisticated attacks will attempt to capture messages, including routing updates. Routing updates can be used to infer the topology of the network and the identities of the more active, and possibly more critical, network nodes.

3 Internal Threats

Internal threats refer to potential attacks originating from authorized nodes on the network. These types of attacks are potentially very serious since, "internal nodes will have the necessary information to participate in distributed operations." Typically, the adverse behavior of internal nodes can be classified into four general categories: failed nodes, badly failed nodes, selfish nodes, and malicious nodes. The failed nodes category simply refers to nodes that cannot perform an operation. The badly failed nodes category refers to nodes that behave like failed nodes, but also send out incorrect routing information. The selfish node category refers to nodes that attempt to exploit the routing protocol to their own advantage by not cooperating when a personal cost is involved. Finally, the malicious node category refers to nodes that deliberately attempt to disrupt the network. Furthermore, a node may demonstrate behaviors from multiple categories and multiple nodes within the same category may have differing degrees of incorrect behavior.

VI. Conclusion

We have presented an efficient technique for clustering of sensor node in the homogenous WSNs. In the existing LEACH protocol the clusters are formed using the distance calculation from the node to cluster head. But for a network to be good designed there should be a better cluster formation.

For a better cluster formation the concept of fuzzy logic is used in which non-CHs select the best CH by considering a multiple metrics, i.e. residual energy and a distance from non-CH to CH. Then, non-CHs compute a probability value to each CH candidate. The non-CH chooses the CH with a higher probability value and sends a join message to CH.

The use of fuzzy logic is suitable, whenever it is not possible to use a mathematical model for the system. Additionally, fuzzy can reduce the complexity of the model, computational effort and memory. Energy consumption is affected by message communication between nodes, so our technique is efficient than traditional LEACH protocol.

Also weight based clustering protocol has the disadvantage that it elects unnecessarily extra cluster head. Sometimes Nodes with high residual energy were not given a chance to became cluster head. This disadvantage is overcome by Fuzzy Logic based clustering algorithm. All nodes with similar energy are given same chances to become cluster head. Also a node with high residual energy even if it is lying in captivity of another cluster head will be elected as a cluster head.

FUTURE SCOPE

This algorithm is implemented for homogenous wireless sensor networks. Algorithm can be further implemented for heterogeneous networks.

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