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A Study on the Security of Wireless Networks

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Abstract – A wireless sensor network is a self-sufficient system of sensor nodes. It has a Base Station and sensor nodes. Sensor nodes collect information from their environment and send it to the Base Station. Heterogeneous sensor network contains high energy sensor nodes just as low energy nodes. A single-tier network can cause the gateway to overload with the increase in sensors density. Such overload may cause latency in correspondence and inadequate following of events. What's more, the single-tier architecture isn't scalable for a larger set of sensors covering a wider area of interest because the sensors are regularly not capable of long stretch correspondence. Hierarchical clustering is especially useful for applications that require adaptability to hundreds or thousands of nodes. Versatility in this context implies the need for load adjusting and efficient resource use.

All nodes in a network can be organized in hierarchical structures called clusters. Each cluster comprises of a cluster head and several member nodes. The member nodes collect information and send it to their cluster heads. The cluster head aggregates and transmits the information to the Base Station. The energy utilization of cluster heads is higher than that for member nodes. Clustering calculations are required which can efficiently utilize the energy of nodes so life of network can be increased. Here we are proposing Fluffy Rationale based clustering for homogenous sensor networks.

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1. INTRODUCTION

Wireless Sensor Network (WSN) comprises of a large number of minimal effort sensors which communicate with each other by means of wireless channel. WSN has been proposed for a wide variety of uses, for example, target following, security, environment checking. A significant utilization of WSN is to measure the environment parameters and transmit the sensor readings to remote server. Because neighboring sensors may detect the normal phenomenon, there is high redundancy in their crude information and it is inefficient to transmit every single crude datum to remote server. Clustering has been widely used in wireless sensor networks (WSNs) to increase adaptability, improve energy efficiency and provide QoS guarantees. With clustering, sensor nodes are organized into clusters and a cluster head (CH) node is selected for each cluster as indicated by certain rules, while other nodes go about as members in the clusters. In cluster-based information gathering, information collected by cluster members are first sent to CHs, which thus deliver the information to the information sink either by direct correspondence or through relays on intermediate CHs. While clustering is at first introduced to achieve energy efficiency, it can likewise help keep up low packet latency in delay-sensitive information gathering. This is because that packets from different members can be combined as aggregated packets at CHs to reduce the transmission overhead of packet headers and control packets (e.g., ACK packets), leading to shortened transmission delay. Furthermore, clustering simplifies the steering from the source node to the sink and shorter directing ways reduce network traffic also.

2. RELATED WORK

Ajay Jangra et al. [1] present a novel security S-LEACH mechanism which is the extension of LEACH directing convention used for detecting the Sybil assault. The mechanism is configured to initiate the Sybil assault whose detection is relayed on RSSI (a marker of sign strength) when the number of cluster heads in WSN is above the threshold. The security mechanism is canvassed by the safety of the stage and energy utilization through a series of experiments.

Deng Zhejiang et al. [2] performed; due to the impediment of power and memory size for WSN, the directing convention for wireless sensor networks must keep up little steering data and reduce the power utilization however much as could reasonably be expected. LEACH convention and PEGASIS convention are analyzed right off the bat in this paper. Use for reference of the ideas used in both of the two conventions of reducing power dissemination, a three-layered directing convention for WSN based on LEACH(TL-LEACH) is given.

Fan Xiangning et al. [3] studies LEACH convention, and advances energy-LEACH and multihop-LEACH conventions. Energy–LEACH Convention improves the choice method of the cluster head, makes some nodes which have more residual energy as cluster heads in the next round. Multihop-LEACH Convention improves correspondence mode structure single jump to multihop between cluster head and sink. Reproduction results show that Energy-LEACH and Multihop-LEACH Conventions have better performance than LEACH Conventions.

Fuzhe Zhao, You Xu, Ru Li, Wei Zhang et al. [4] propose a new method of picking cluster-heads with decreases unnecessary utilization of energy spent on processing of each node during each round. So as to make the energy distribute more even in the network, the consideration of the dynamic change of sensor nodes energy will be introduced during the selection of CHs.

Fuzhe Zhao et al. [5] proposes a new method of picking cluster-heads which decreases unnecessary utilization of energy spent on figuring of each node all through each round. Because the conventional selection recipe neglecting to the change of nodes' energy will make the nodes going about as cluster-heads (CHs) too often die early inferable from consume more energy.

Haosong Gou et al. [6] this paper proposes an improved (LEACH-C) calculation called parcel based LEACH (pLEACH), which right off the bat segments the network into ideal number of sectors, and afterward selects the node with the highest energy as the head for each sector, utilizing the centralized figurings. The idea behind LEACH is to frame clusters of the sensor nodes depending on the received sign strength and use neighborhood cluster heads as routers to route information to the base station and the corresponding clusters.

Heewook Shin et al. [7] proposed a new energy efficient clustering scheme. He stated that in LEACH, however, extra energy and time are consumed to reform clusters at the setup phase of every round. This side effect is terrible as the number of clusters increases. This paper present a novel energy-efficient clustering scheme to remove cluster recreating process required at every round after the first round, which is called Bunks (Clustering with One Time Setup). The proposed Beds permit that the role of cluster head is rotated among members in a cluster without cluster reforming process. Along these lines essentially saves the energy because the cluster reforming process isn't needed, resulting in increased network lifespan.

Hu Hopping et al. [8] performed a wireless sensor network comprises of hundreds or thousands of little energy-limited sensors that are densely deployed in a large geographical region. It has been demonstrated that Low-Energy Adaptive Clustering Hierarchy is an energy-efficient directing calculation for Wireless Sensor Networks.

Jun YUE, Weiming ZHANG, Weidong XIAO, Daquan TANG, Jiuyang TANG et al. [9] presents a novel unequal cluster-based information aggregation convention is proposed. It divides the network into some lattices with unequal sizes, and implements cluster head pivot in each matrix respectively. It can balance energy dissemination by setting proper sizes of lattices to change the number of nodes that participate in cluster head revolution in different networks.

Y. Yang et al. [10] performed a work, Based on the investigation on the defect in LEACH including the change of the number of cluster heads and the ignorance of the node's residual energy, this paper presents a novel convention called LEACH-B (LEACH-Balanced). At each round, after first selection of cluster head as per LEACH convention, a second selection is introduced to alter the number of luster head in consideration of nodes residual energy. As a result the number of cluster head is consistent and near ideal per round.

Muhamnmad Omer Farooq et al. [11] presents a multi-bounce directing with low energy adaptive clustering hierarchy protocol.MR-LEACH follows the fundamental principle of multi-jump steering from cluster-heads to a Base station to conserve energy, unlike the leach convention. In MR-leach they segment the network into different layers of clusters. Where Cluster heads in each layer collaborates with the adjacent layers to Transmit sensor's information to the base station. Conventional nodes Join cluster heads based on the received sign strength pointer (RSSI).

In year 2010, Muhammad Omer Farooq et al [12] performed a work.In this paper, we present a Multi-bounce Directing with Low Energy Adaptive Clustering Hierarchy (MR-LEACH) convention. So as to draw out the lifetime of Wireless Sensor Network, MR-LEACH segments the network into different layers of clusters. Cluster heads in each layer collaborates with the adjacent layers to transmit sensors information to the base station. Conventional sensor nodes join cluster heads based on the Received Sign Strength Pointer (RSSI).

Nandini. S. Patil, Prof. P. R. Patil et al. [13] presented an information aggregation framework on wireless sensor networks is presented. The framework fills in as a middleware for aggregating information measured by a number of nodes inside a network. They compare the performance of TAG(Tiny Aggregation) in terms of energy efficiency in correlation with and without information aggregation in wireless sensor networks and to assess the appropriateness of the

convention in an environment where resources are limited.

Wei Bo Hu Han et al. [14] performed a work; Conventional LEACH includes distributed cluster arrangement, neighborhood processing to reduce worldwide correspondence, and randomized turn of the cluster-heads. The new convention uses multi-bounce steering instead of 2-jump directing in LEACH, and related calculation is proposed. Reenactment results show that improved convention is more energy-efficient that conventional LEACH.

Wendi Rabiner Heinzelman, Anantha Chandrakasan and Hari Balakrishnan et al.[15];LEACH a clustering based directing convention that minimizes worldwide energy usage by disseminating the heap to all the nodes.

3. PROPOSED PROTOCOLE

Proposed function implements Fuzzy Logic based clustering which in enhanced form of weight based clustering in wireless sensor networks. 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 become 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. The proposed clustering technique is an enhancement our Weight based clustering. The overarching goal of our approach is to prolong network lifetime. For this reason, cluster head selection is primarily based on the residual energy of each node. Measuring this residual energy is not necessary, since the energy consumed per bit for sensing, processing, and communication is typically known, and hence residual energy can be estimated. Fuzzy logic is used for finding cluster head which always chooses optimal number of cluster heads. The use of fuzzy logic is appropriate, whenever it is not possible to employ a mathematical model for the system. Additionally, fuzzy can reduce the complexity of the model; computational effort and memory's receive context information from nodes as input and converts into fuzzy linguistic variable input.

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. ACH 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

4. PERFORMANCE EVALUATION

This part presents the simulation and results of the presented model of chapter 4.

4.1 Simulation Scenario

Initially there is a network in which nodes are disributed randomly as shown in figure 4.1.

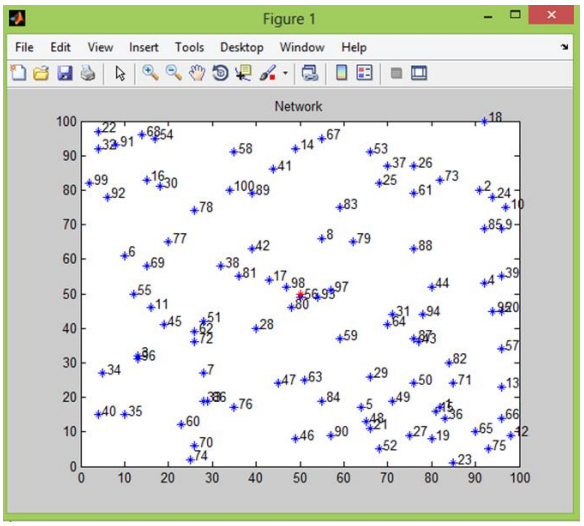

Figure 4.1: Network creation using 100 Nodes.

In figure 4.2 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.

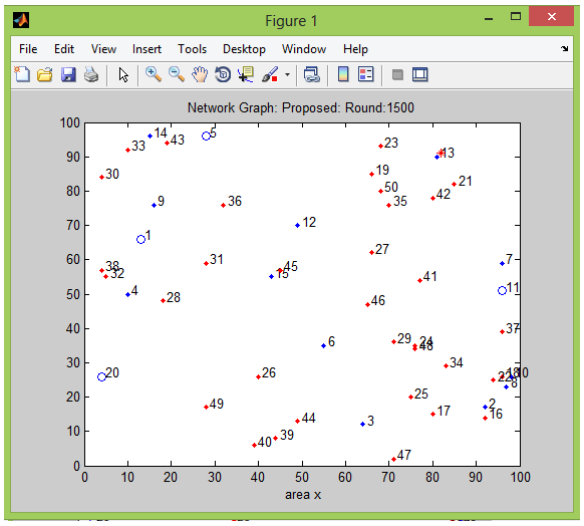

Figure 4.2: Cluster Formation

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 4.3 and figure 4.4 show both inputs and their corresponding graphical representation in fuzzy system.

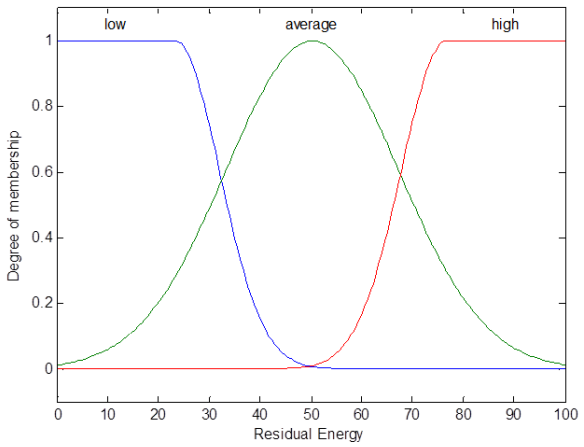

Figure 4.3: Degree of membership for Residual energy as first input for fuzzy system.

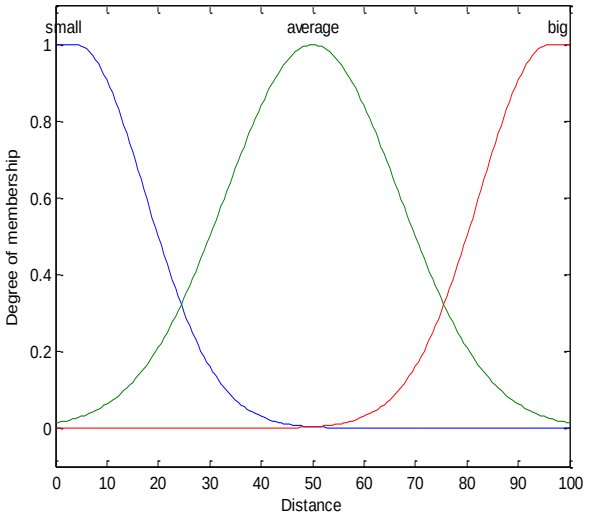

Figure 4.4: Degree of membership for Distance as second input for fuzzy system.

Correlation between Residual energy and Distance for Fuzzy system is shown in figure 4.5.

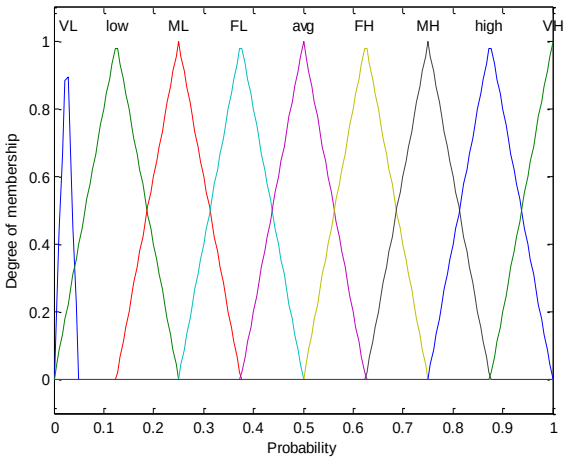

Figure 4.5: Correlation between Residual energy and Distance for Fuzzy system

Finally figure 4.6 shows the surface graph for probability calculation for cluster formation.

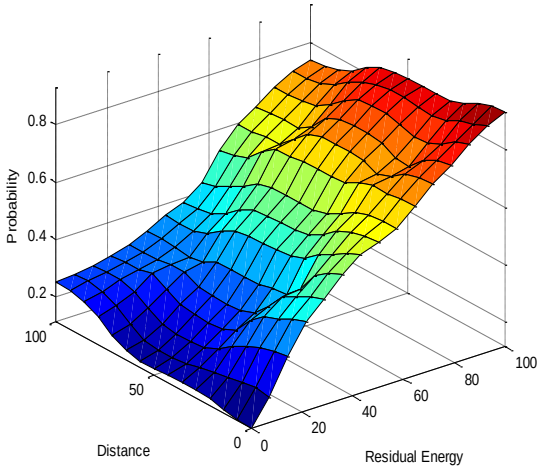

Figure 4.6: Surface Graph for Probability Calculation for cluster formation.

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.

4.2 Performance Evaluation

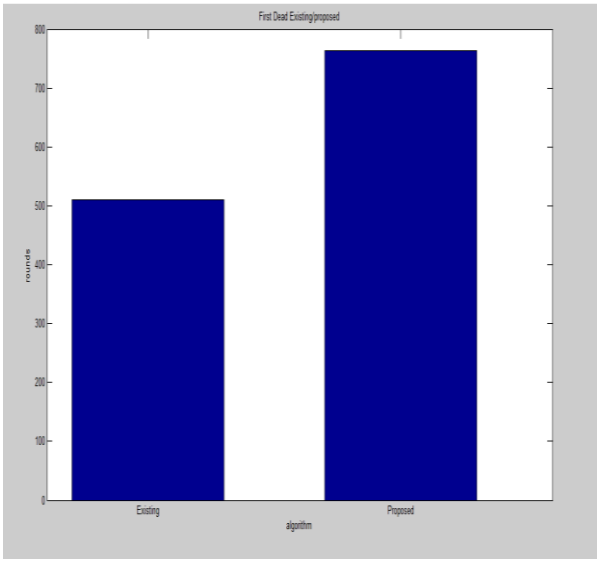

Figure 4.7: Comparison of existing and proposed system in terms of first dead.

The figure 4.7 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 4.8 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.

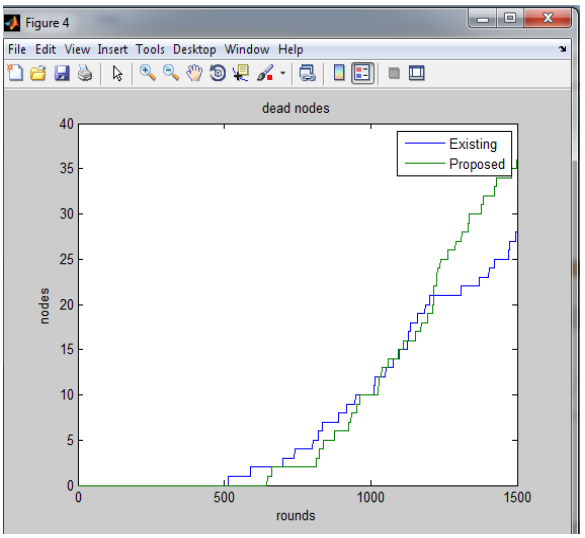

Figure 4.8: Performance Evaluation of existing and proposed system in terms of no. of dead nodes& no. of rounds.

The graph 5.9 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.

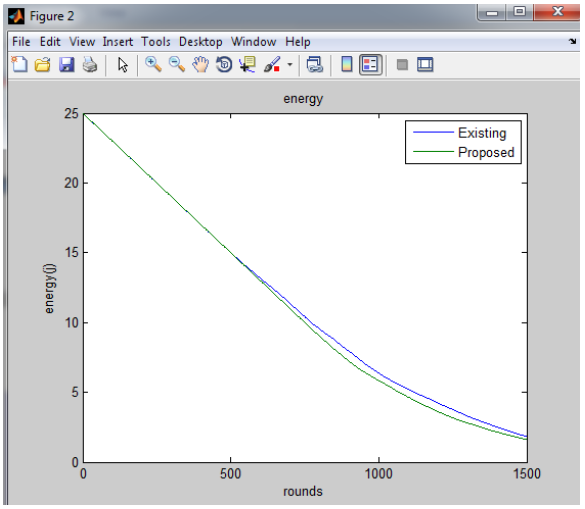

Fig: 4.9 comaprison of the performance of existing and proposed system in terms of number of dead residual energy with total number of clustering rounds

5. CONCLUSION

We have presented an efficient technique for clustering of sensor nodein the homogenous WSNs. In the existing LEACH convention the

clusters are formed utilizing the distance computation from the node to cluster head. In any case, for a network to be acceptable designed there ought to be a better cluster arrangement.

For a better cluster development the concept of fluffy rationale 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 likelihood value to each CH candidate. The non-CH chooses the CH with a higher likelihood value and sends a join message to CH.

The use of fluffy rationale is suitable, whenever it isn't possible to use a mathematical model for the system. Furthermore, fluffy can reduce the complexity of the model, computational effort and memory. Energy utilization is affected by message correspondence between nodes, so our technique is efficient than customary LEACH convention.

Additionally weight based clustering convention has the disadvantage that it elects unnecessarily extra cluster head. Sometimes Nodes with high residual energy were not given a chance to become cluster head. This disadvantage is overcome by Fluffy Rationale based clustering calculation. All nodes with comparable energy are given same chances to become cluster head. Likewise a node with high residual energy even in the event that it is lying in bondage of another cluster head will be elected as a cluster head.

6. FUTURE SCOPE

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

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