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Making Network More Tolerant Towards Fault by Using Centralized Techniques

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ABSTRACT

In wireless sensor networks (WSNs) energy is the main thing of sensor network, Energy is the irreplaceable part of the sensor node, To reduce the energy consumption researchers gives a lot of ideas to increase the life period of the sensor node, Researchers used a cluster head and a gateway to reduce the work load of the sensor network , but we know all the sensor node, gateway and cluster head are a battery operated so it can be difficult secure the sensor node for life time , but we can increase the life period of the sensor node, A DFCA(Distributed Fault-tolerant Clustering Algorithm) recovered the sensor node at run time from the faulty cluster due to sudden failure of the cluster head, this algorithm uses a cost function of the cluster head to form proper cluster with the care of the uncovered sensor nodes. In which the uncovered node increase the load on the gateway which is joined by the uncovered node, so life time period of the gateway is also decrease, to increase the life time, In this paper sensor nodes will find a new cluster head in their own group at run time with this we will decrease the consumption of energy and increase the life time of the sensor node

Keywords:- Wireless Sensor Network, DFCA , Energy Consumption

I.   INTRODUCTION

1.1 *WIRELESS SENSOR NETWORK OVERVIEW*

Wireless sensor network is used to sense the local information; wireless sensor network is a battery operated system so energy is the big issue for the wireless sensor network, A wireless sensor network is a communicate with the infrastructure for monitoring and recording condition at particular location it is used to monitor these parameters are like temperature pressure speed, sound intensity and power line voltage etc, The sensor nodes can communicate with the help of radio signals, In the wireless sensor node, Gateway or cluster head and base station all are work together, Node firstly sense all the local information and collect all information and send it to the gateway, After that the gateway operate on that information and send it to the base station Sensor node consume a lot of energy when it collect the local information so the sensor node die very soon,

1.2 *ENERGY CONSUMPTION ISSUES IN WIRELESS SENSOR NETWORK*

The sensor node works day and night to collect the local information that, It gives us information of the particular area where the sensor node located, we know all the sensor node are battery operated so it work for limited period of time, Sensor node consume a lot of energy when it collect the local information so the sensor node die very soon, Energy consumption is the major issue for the wireless sensor networks because when a sensor node dead it is impossible to recharge and replace the battery of the sensor node .

1.3 *CLUSTERING IN WIRELESS SENSOR NETWORKS*

To increase the life time of the sensor node and increase the Energy efficiency in the WSNs (wireless sensor network) some researchers used a clustering system, this is the efficient techniques to increase the life period of the sensor node , In the clustering system the numbers of nodes grouped together in the single unit with a single leader of group which is called with the name of cluster head or gateway , Each cluster linked with a single CH , Cluster networks used to decrease the energy consumption of node, because with this system nodes share their backup with the CH, In this system the CH operate on the data which sensed by the sensor nodes   and it remove redundancy and uncorrelated data and then send it to BS (Base Station), the cluster head is also a sensor node because it has a more residual energy then other nodes so it selected as the cluster head from the base station or the other nodes , It works only to store the backup of the all sensor nodes

Besides this Gateway and CH both are battery operated system and the limited life time period so large number of data can be loss if the gateway and cluster head died at run, To increase the life period of the all networks the researchers are using the numbers of algorithm it is not possible to save the nodes for life time , but we can increase the life period of the node solve this type of problem and increase the time period of the gateway and the cluster head, The proper assignment of the sensor nodes to the gateways for cluster formation is also very Important to consider the remaining energy of the gateways.

1.4 DFCA (DISTRIBUTED FAULT-TOLERANT CLUSTERING ALGORITHM)

This is a algorithm the sensor node select Cluster head by using the cost function method , DFCA also care of that node which have no CH in their communication range , It is also use for recovery of the sensor nodes at the run time because if any cluster head dead at run time then the all sensor nodes whose are work under the dead CH those nodes link with other cluster head through the cost function techniques , the nodes will connect with those cluster that located in its communication range and have a cluster head , on the other hand if the sensor nodes send message to cluster head but CH not reply back to the member sensor nodes it means fault is detect in the CH, If fault detected by the member sensor nodes then it will send help message to another cluster in their nearly communication range. Then the another cluster members accept the help message of the nodes whose have own cluster head, In the DFCA cluster head randomly selected by the cluster members, In which firstly the initiator node selected by the members which will start all the process for the selection of the cluster head All nodes send their energy level to the initiator node, which node have a more residual energy as compare to the another nodes in the cluster the initiator node select that node as a Cluster head
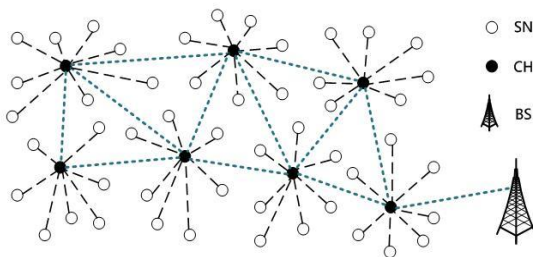
1.5 APPLICATIONS OF WIRELESS SENSOR NETWORKS

WSNs have various applications which can possibly change our lives in various ways. Wireless sensor networks have been effectively connected in different application spaces, for example,

Military applications: wireless sensor network is a piece for the military because it is helpful to solve the numerous problems of the military like zone observation, focusing on frameworks, surveillance and control the dangers activities that can happen suddenly

Area monitoring: In area monitoring, In area monitoring, the wireless sensor node collect the all local information of the area and send it to the base station , when the sensors node recognize the occasion then it being observed (warmth, weight and so on),

Transportation: with this the sensor node gives us Real-time traffic information which is being collected by wireless sensor networks to later feed transportation models, it alert the drivers in advance related to traffic problems or condition of route ,

Health applications: this is a wellbeing applications for sensor systems which supporting interfaces for the debilitated, incorporated patient checking, diagnostics, and medication organization in healing facilities,

Environmental sensing: Environmental Sensor Networks which is used to observe the activities which happened in local environment in the communication range of the sensor node this application used to monitor the following activities in the areas which are listed below:

- Used to monitor the Air pollution
- Detection of Forest fires
- monitoring the Greenhouse
- helpful for Landslide detection

Structural monitoring: In this type of application the wireless sensors used to screen the development inside of both the structures and base, for example flyovers, burrows, dikes etc

Agricultural sector: wireless network is used by the farmer for maintenance of wiring in a difficult environment. Irrigation automation enables more efficient water use and reduces waste.

II. LITERATURE SURVEY

To increase the energy consumption of sensor node the number of algorithm have been developed by the researchers In the DFCA [1] the researcher use a different technique to increase the life period of the sensor node However, the main Disadvantage of this approach is that if the uncovered node has covered by the another cluster then load can be increased on another cluster so the life period of that cluster head can decreased and cluster head can dead very soon, G. Gupta and M. Younis [2] propose fault tolerant clustering In which the sensor nodes recovered at runtime from the cluster of dead Cluster head. In this the author assume at least two cluster head in their communication range, if one cluster head dead in the cluster nodes can join the another cluster head it work based on the communication cost However, real scenario may not stand in this assumption where sensor nodes along with cluster head which deployed randomly G. Gupta et al. [3] not consider in his proposed scheme related to routing in a load balanced clustering algorithm, LEACH is a popular clustering technique that forms clusters in distributed manner. However, the main disadvantage of this approach is that a node with very low energy may be selected as a CH which may die quickly. Navmeet Kaur1 and Kamaljit Kaur [4] takes a another cluster head for saving of the CH in the cluster but this process consume a lots of energy to store the backup of the because in which firstly the nodes send data to the cluster head after that the cluster head will store their backup in the another cluster head , in this research the researcher focus only on to secure the loss of data for life time they does not focus on the life period of the sensor network which can dead after a limited period of time ,D.J. Baker1 and A. Epheremide2 [5] used a link cluster algorithm(LCA) which is created by the wireless sensor network well as grouping

calculation In LCA ID number provides to the every hub , this calculation relies on two components for determination of the group head , A unique id provides to every node and in the networks whose node have not any neighbors that's denoted as the group heads, Since LCA utilized TDMA outline for correspondence between the hubs, in which every casing has spaces in the system to convey for every system. LCA is material for both little systems and bigger system LCA forces more prominent correspondence delay. Creators proposed that other LCA dispose of the race of a pointless for numerous as in LCA. In CISNL[6] researcher determine the location and information of the sensor node and show what benefits of the clustering techniques , with this researcher we can find the accurate information with walls and other concave structure but we cannot collect the information about that node which are not under the cluster, DEEHC[7] Researcher proposed a algorithm which constructs multilevel clusters and the node in each cluster reach the cluster head through the link with neighbour node, DWEHC generate well balanced cluster, intra and inter cluster energy consumption improved by heed-AMRP algorithm , A. Hamed Abbasi [8] research current and main state of the clustering protocols It gives information about their power and reliabilities related it offer a promising improvement over conventional clustering , DDC(distributed data clustering in sensor networks) this research based on to calculate a clustering thereof, in future generic distributed data clustering(DDCA) algorithm used to capture a wide range of algorithm according to this algorithm M-LEACH is more energy efficient than LEACH , Vivek Mhatre[23] its research is based only on a single hop heterogeneous networks and single hop homogeneous , Researcher also used the multi communication in cluster but not consider about the cost function techniques , which take shortest distance to transmit the data from one node to another , so time period of the nodes also can decrease if the node communicate at long distance cluster head

All algorithm and research proposed in these articles did not more focus on to increase the life period of the sensor node because if nodes join the another cluster after dead their own node then the load can increased on the cluster head and the time period of the CH also decreased but we are focusing more on this type of problems to increase the life period of the sensor nodes because if any node will dead before then data which is store in the node also loss so we focus on this type of problems

III. METHODOLOGY

Getting the location of the nodes:

- Firstly we will divide the nodes into clusters.
- After that the network is divided into smaller areas with the help of cluster system. The nodes lying in the particular area will be considered to be one cluster.

Selection of cluster head

- Base station send hello message to every nodes
- Every nodes will reply back with their remaining energy level to the base station
- After receiving the energy levels the base station will arrange all the nodes in the one hierarchy. Starting from highest energy level node at top and lowest energy level node at bottom
- Which node having highest energy that will be the cluster head for the first round, and second highest energy will become the cluster head for second round and so on
- When the first round cluster head becomes dead then the second round cluster head will take over.

V. PROBLEM FORMULATION

- The Distributed fault-clustering algorithm (DFCA) starts with the bootstrapping phase. Which consumes lot of energy,
- In bootstrapping phase the base station and gateway both will sends Hello message to all the nodes deployed in the network.
- When nodes receive the messages, they consume energy
- So the bootstrapping phase consumes lots of energy.
- When the gateway becomes dead, then the nodes have to broadcast the help message to find new gateway. This again consumes energy.
- When gateway is faulty, nodes join some other gateway. This increases load on the newly joined gateway which will die out soon.

VI. RESULTS AND DISCUSSIONS

We performed extensive experiments on the proposed Algorithm using ns2 the experiments are performed with diverse number of nodes placed at small area by 49 sensor nodes and we are using the 6 cluster in the networks. The all nodes assigned a different energy level and the energy level start from 50 joules to 25 joules, which sensor nodes have highest energy that will start work as a luster head in the cluster for the first round and similarly so on, If the nodes and cluster head dead in this networks it means it has a 0 joules residual energy, In the last node 49 has a 100 joules energy so that node work as the base station in the network

1. Energy consumption

Energy consumption is the big issue for the every sensor node, life period of the sensor node depends upon its energy consumption, in our purposed work the remaining energy after completion of simulation is more than the previous research, in the following dig we are compare purposed scheme with the previous scheme
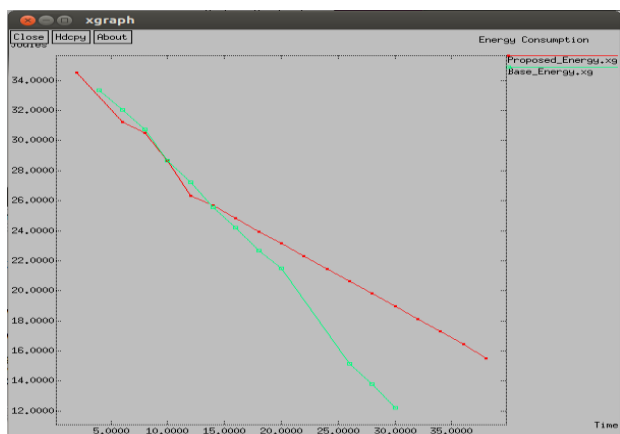
(a)

In the graph we are showing red line and green line, Red line is the result of our purposed scheme and green line is the result of the previous research, the remaining energy in the purposed scheme is 16 joule and the previous research was 12 joules after complete the simulation process, it means the time period of our sensor node is more than the previous research.

2. Routing overhead

The routing overhead is the ratio of number of current packets send and data packet received, In the graph we are showing that our purposed work there are less need for send and receive packets for connectivity, the current packets can be in the form of "help" message, Because if the routing overhead is less it means the nodes will consume less energy to sending the current packets and time period of the nodes also increase,
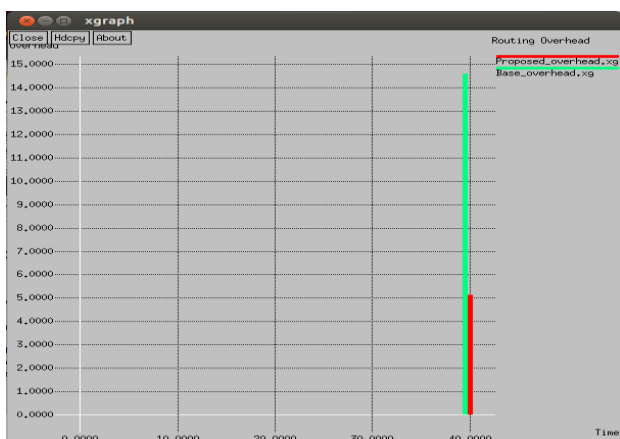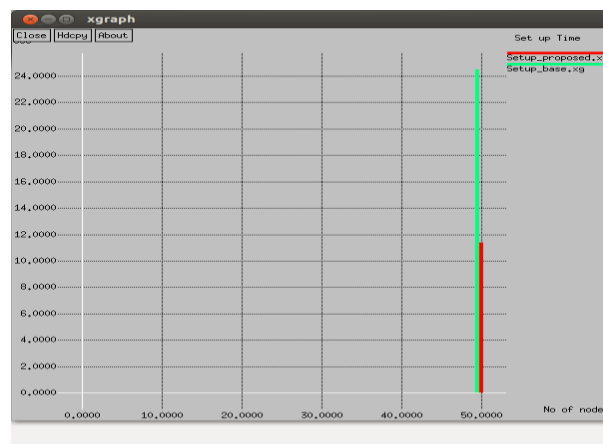

(b)

But previous research consume more energy for the connectivity process, so that nodes cannot do work for long period of time.

3. Set up time

The set of time is also less then previous research it means the node taking less time for sending and reply message, the nodes are using shortest path for connectivity so it means nodes consume less energy at this stage


(c)

In the below we are showing that how the nodes, cluster head and base station working in the cluster.

There are further results whose are showing all results related to the simulation process all nodes arrange into the different cluster with the help of base station, in the diagram there are 6 numbers of cluster and nodes are working as a members of the cluster.
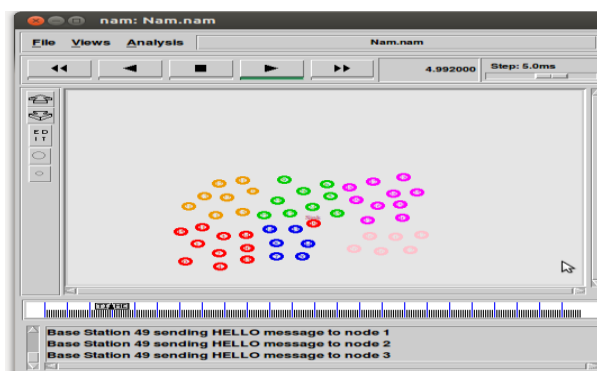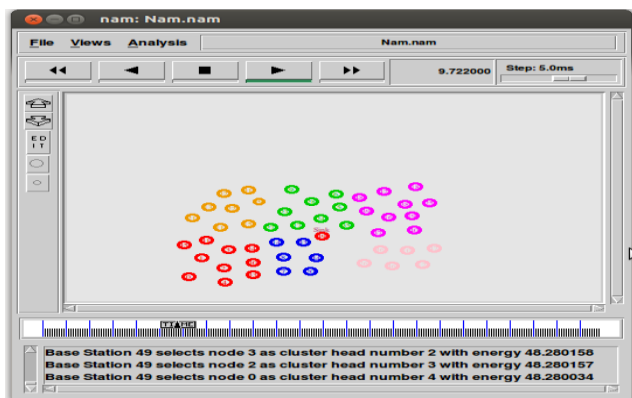

6(a)

In the 6(a) diagram the base station sending hello message to all that nodes whose wants to participate in the wireless sensor networks, all nodes divided into the 6 cluster whose showing below diagram
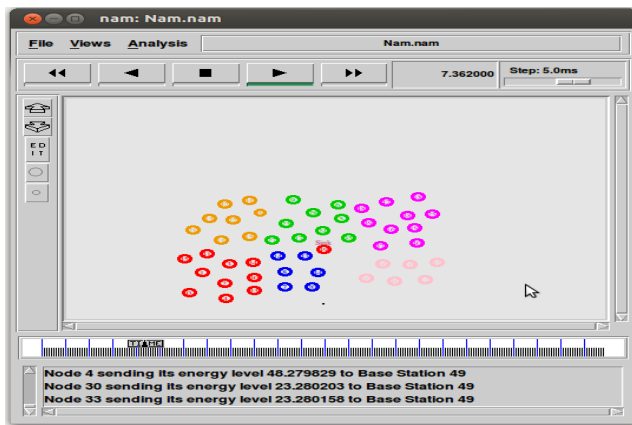
6(b)

In the 6(b) diagram after receive the hello message of the base station the all nodes are replying back in with their remaining energy level to the base station

6(c)

In the diagram 6(c) after receiving the energy levels the base station is arranging all the nodes in the one hierarchy. Starting from highest energy level node at top and lowest energy level node at bottom highest energy that will be the cluster head for the first round, and second highest energy will become the cluster head for second round and so on

VII. CONCLUSION & FUTURE SCOPE

In This study we have consider 50 number of nodes and analysis the performance of the networks in terms of energy Consumption, Routing overhead and Setup time of the networks our approaches have shown to execute the better performance and have improved the life time of the n/w by reducing energy consumption, In future we would like to performance of this scheme by analysis the other parameter such as throughput, packet delivery ratio etc , We can also enhance the performance of networks by optimizing cluster head selection process which consume less energy in the networks, resulting in further increase of networks life time

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