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Enhancement of Energy Model for WiMax Using Bully Election Algorithm

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Abstract—*The Wi-Max network is the type of Ad hoc network. Wi-Max network is the self configuring networks or self-healing network. It is adaptive in nature means sensor node can join or leave the network automatically when they want. It is very difficult to replace or recharge the battery in far places. In such conditions, we have an aim to reduce the consumption of battery of the sensor nodes. In work, main concern is the selection of cluster-head so that battery replacement problem can be solved. Selection of cluster-head is the major task .Firstly all the nodes are combined then cluster formation take place. There is a one controller in each cluster who controls all the activities of node. This controller named as cluster head. All the nodes present in a cluster directly communicate with their cluster head. Then cluster head of another cluster-head communicate with each other and send data packets from source to destination. If cluster-head lose its energy then it dies soon. In our work, we are proposing a new technique to reduce the consumption of battery. The new proposed technique will be based on the selection of cluster-head using bully election algorithm. In previous work, if cluster-head die the whole scenario get failed. This algorithm will decrease the consumption of energy in the network and enhance the network lifetime. This scenario is performed on NS2 simulation tool.*

Keywords: *WiMax, Neural Network, Energy, Clustering.*

1. INTRODUCTION

WiMax stands for World Wide Interoperability for Microwave Access. It is based upon IEEE 802.16 which is worked on the physical layer having the range of 10 to 66 GHz but IEEE 802.16a upgrade in 2004 to 802.16 -2004 and having range of 2-11GHz.[11]Its speed is 70 megabits per second .Since WiMax covers the distance of 50 Km (radius 30 miles) without any wired access. Wireless sensor network which is very light weighted sensors which monitor the environment by observing its physical parameter such as temperature, pressure. Wireless sensor node is self healing and self – organizing in nature. [1] Self-healing network allow the nodes to recognize itself by analyzing the neighboring node and find out their own path for communication. Self-organizing grant the network to automatically connected with the new nodes for communication. In this, there is no need of manual interface requires. Wireless sensor nodes widely used in the WiMax as it has capability of assembling, deposits and exchanging information with the other nodes. WiMax sensor nodes can be deployed anywhere without need of any installation process. It is de-centralized and offer error correction also. As WiMax deals with large coverage area i.e. 50km and its battery consumption is the main problem. As battery replacement is not possible, the whole scenario has to change. [3] Also their speed is higher than others such that it consume more energy .All the sensor nodes depend upon the battery consumption with its lifetime is limited. Since, its battery lifetime can be increased by decreasing the number of nodes in the network, reducing the amount of communication channels, catching only the independent data from the neighboring nodes. In Artificial neuron network is developed by interconnection the artificial neuron [4] .As neural network is based upon the biological neural and used to solve the problem of artificial neurons without creating any architecture. Neural network is developed by the human brain and it behaves like the brain of human. Brain is highly complicated, performing multitask as parallel computer and non-linear in nature. It has the capability to perform the complex computational problem .We can say that ,it is adaptive in nature states that it can adjust itself according to environmental changes such as internal or external information.[5]

In my wok, main concern is the selection of cluster-head so that battery replacement problem can be solved. Selection of cluster-head is the major task. Literature Review written in section 2. And new proposed technique is done in section 3. In the last Results and conclusion is written in section 4

2. LITERATURE REVIEW

Amir Akhavan Kharazian *et.al* (2012),"Adaptive clustering in WiMax network "discussed about the network lifetime which can be increased with consuming low energy. This paper discussed the algorithm, which consider the nodes having low energy and these nodes elect the cluster head. In this selection of cluster-head take place with the help of neighboring nodes based on weight that measured on the energy residual and distance covered between the nodes. Its shows better result than LEACH, LEACH-C [7].

Narottam Chand (2012),"Cooperative Data Caching in WSN" has discussed about cooperative caching scheme ZCS. Such that to enhance the network of WiMax. In this, zone nodes share their information having limited nodes problems and limited latency of query at a node to prolong lifetime of Wi-Max networks. To improve hit ratio replacement policy is also used [3]

Kiran Maraiya *et.al*(2011),"Application based on sensor network "discussed about the overview study of sensor network also tells about the challenges faced in the network, how it different from the previous network .Its benefits over the previous network. They also discussed about different network topologies, different application types are studied in this paper [6].

Chauraseya *et.al(2011)* purposed a technique for routing .As sensor nodes is a small weighted nodes who stores, gathering the important information .In this, they consider the energy efficiency needed for communication .They purposed a model of E3PSC (Enhanced Energy-Efficient Protocol with Static Clustering)is the advancement of previous routing technique, Energy-Efficient Protocol with static clustering. In this, they work on the shortest path routing. It is more efficient than EEPSC [11]

Chee-Yee Chang,*et.al*(2003),"Sensor Network" has discussed about the MEMS technology, manufacturing and dealing with low cost, creating reliable communication. It is inexpensive and powerful sensor. The DNS concept is introduced in that paper [10].

3. NEW PROPOSED TECHNIQUE

In this work, our main concern is the energy (battery of node).In this selection of re-cluster is done with the help of neural network, as it is adaptive in nature. Since any change can be adjusted by itself, change according to the environment and calculation made on the basis of battery consumption .here main concern is to avoid the wastage of battery. The selection of cluster-head is most important task. The selection of cluster-head is done by applying bully election algorithm. For example deployment of nodes in the network.

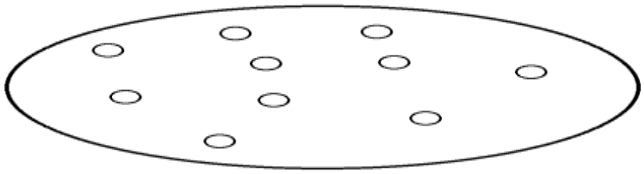


Fig. 1: Network Deployment

Bully election algorithm is choosing for selection of cluster-head.

In this Figure, the selection of cluster-head take place by using bully election algorithm, as the node with highest energy is selected as cluster head .In first cluster, the node having energy of 8 joule is selected as cluster-head, whereas in second scenario, the node with energy of 9 joule is selected as cluster-head.

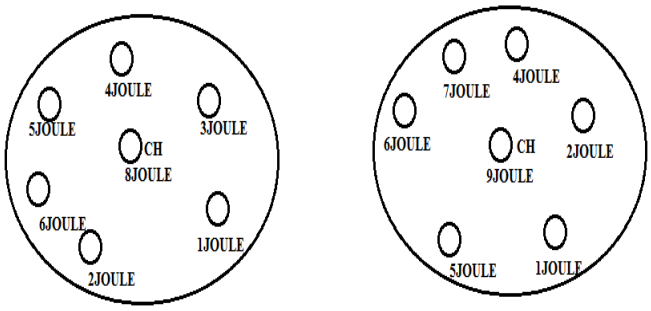


Fig. 2: Cluster head selection

Now the communication between node of 8 joule energy and 9 joule energy take place. Slowly it loses their energy. Hence in this case adaptive learning technique is used which can adjust itself according to the environment.

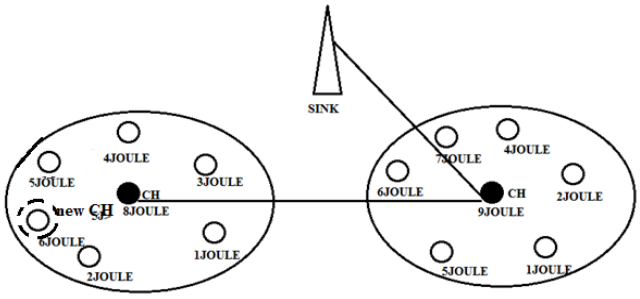


Fig. 3: Communication of cluster heads

3.1 Bully Election Algorithm

It is method used in the distributed computer system. In this each node with highest energy is selected as controller. The cluster is synchronous with other neighboring cluster and it fail when identification process not correctly work. Communication between nodes is reliable.

Types of messages in bully election algorithm:

- Election Message- In this message is broadcasted that the election process will be going take place.
- Answer Message-In this acknowledgement to the election message.
- Co-originator Message-Announcement of selected cluster-head among the nodes.

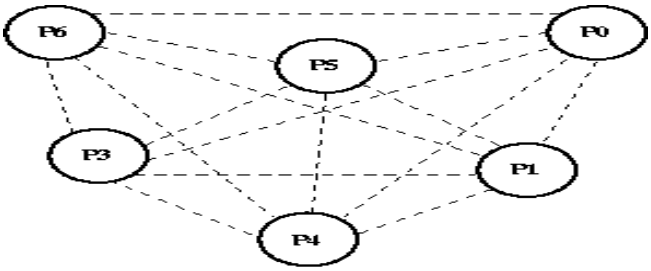
Bully Algorithm Details

- Any node can start this election process.
- For example P broadcast the election process to all the nodes that P has the highest energy.

- And waits OK messages. If no OK messages come then P becomes coordinator.
- If it receives an OK, message from another node and drop the coordinator post and waits for an Coordinator message

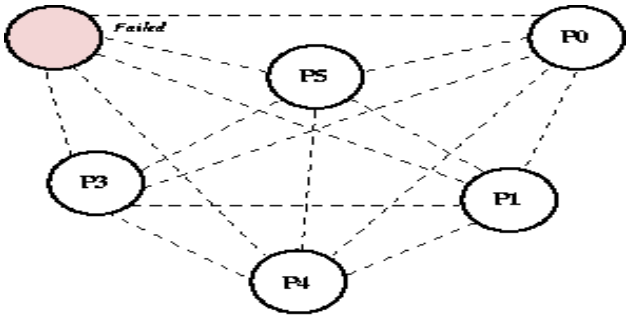
• If a node receives a message from coordinator then it treats the sender as coordinator.

Example of bully algorithm



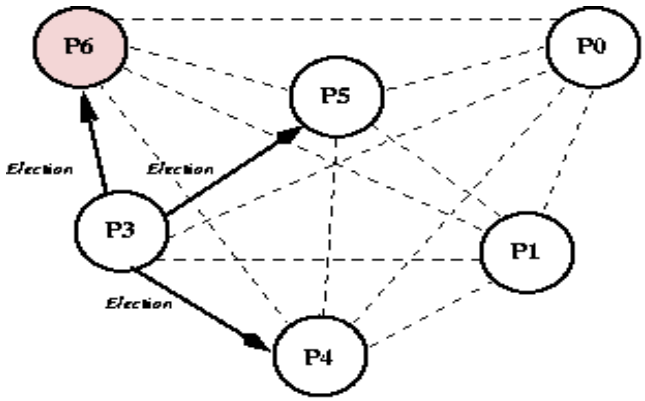
Bully Algorithm: Step 0

In this P6 start the election process with highest energy.



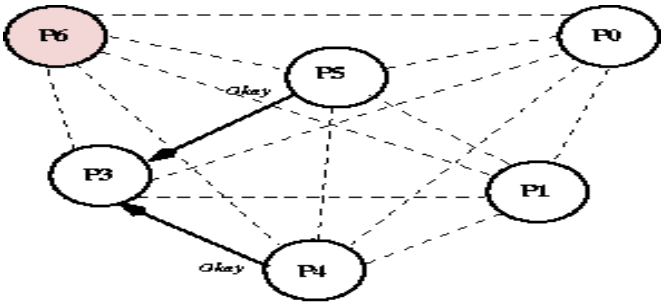
Bully Algorithm: Step 1

In this P6 failed and do not respond back.



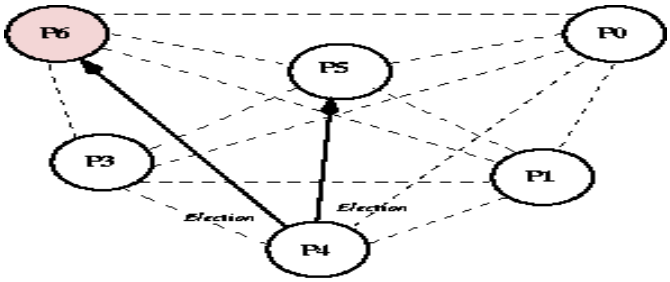
Bully Algorithm: Step 2

As in P6 does not respond, then P3 start the election process and ask the other with greater energy.



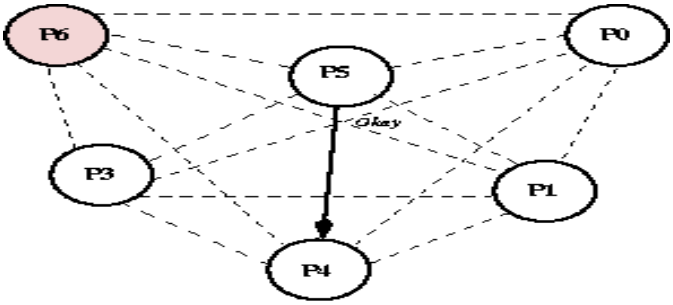
Bully Algorithm: Step 3

In step 3 both the P4 and P5 telling P3 that they will take over here



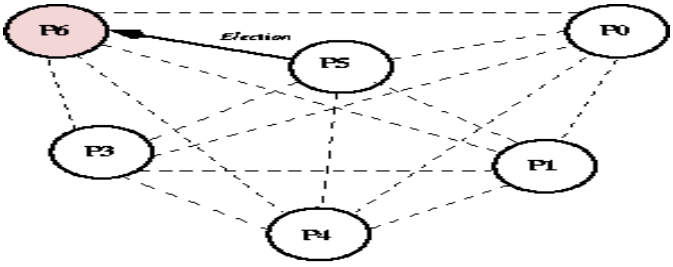
Bully Algorithm: Step 4

In step 4, P4 send the election message to P5 and P6.



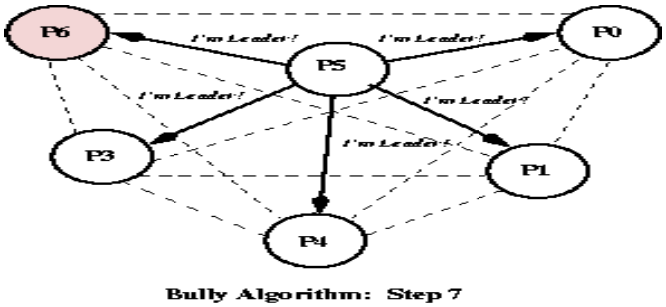
Bully Algorithm: Step 5

In step 5, only P5 respond back to P4 telling it will take over here.



Bully Algorithm: Step 6

In step 6, the P5 send the election message because it has highest energy.



Bully Algorithm: Step 7

In step 7, P5 send the message of leader to each node.

4. RESULTS

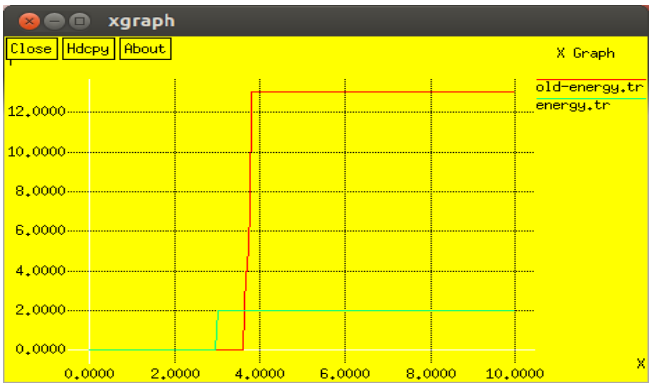


Fig. 4: Comparison of energy

In Fig. ,the red line show the old-energy because it consume more energy whereas green line show the energy of this proposed model.It means using this model , node consume less energy than previous .

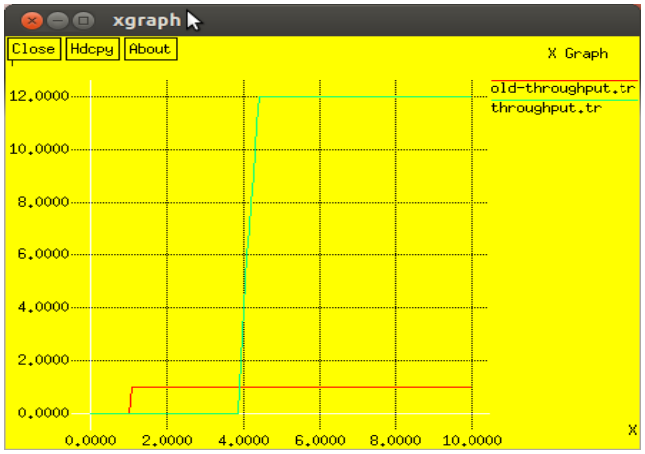


Fig. 5: Comparison of Throughput

In this Figure,comparison between old-throughput (red line)and new throughput(green line). **It will clearly show that in new case throughput is high because there is a less packet loss in that case.**

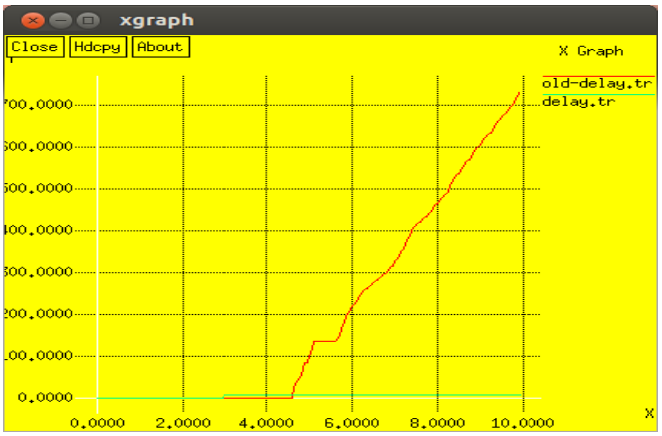


Fig. 6: Comparison of Delay

In this red line show old-delay because cluster head loose all the energy for delivering the packet where as green line show current delay.In this delay of packet is less than previous.

5. CONCLUSION

Conclude that limited battery life of the sensor node is major challenge. This paper discussed about the selection of cluster-head .By using the bully election algorithm the election between nodes take place.In this scenario it consume less energy than previous work.The packet loss is also less because drop rateof packet is also less.

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