Proceedings of
National Conference on Innovative Trends in Computer Science Engineering (ITCSE-2015)
held at BRCMCET , Bahal on 4th April 2015

Effects of keeping the Same Density in Heterogeneous and Homogeneous LEACH

[1]Yashpal, [2]Manju, [3]Dr. Vikram singh
[1]M. Tech Scholar, [2]Assistant Professor, [3] Professor
[1,3] Department of Computer Science , CDLU , Sirsa
[2] Faculty of Engineering & Technology
[2]Mody University of Science & Technology Lakshmangarh
[a]yashtada@gmail.com

***Abstract*— Wireless Sensor Network is a network of sensor nodes without having any central controller. Its growth is expeditiously increasing and that's why there is an immense field for research in this area. In this paper, we compare homogeneous and heterogeneous using different number of area as well as number of node. We analyze the basic distributed clustering routing protocol LEACH (Low Energy Adaptive Clustering Hierarchy), which is a homogeneous system, and then we study the impact of heterogeneity in energy of nodes. Each sensor node has power control and the ability to transmit data to any other sensor node or directly to the BS. Simulation results using MATLAB.We have considered various parameters such as packet size and Base Station position. In this if we have increase the value for the X and Y directions then the different result. And another we also use the change the no. of node with the respectively value that is also same the range of X and Y region.**

Index Terms—**Wireless Sensor Networks (WSN), LEACH, Heterogeneous, Homogeneous, Density.**

I.INTRODUCTION

Wireless Sensor Networks (WSNs) are being used in wide range of potential applications such as environment monitoring, military operations, target tracking and surveillance system, vehicle motion control, earthquake detection, patient monitoring systems, pollution control system etc. [1]. WSN is widely used to collect reliable and accurate information in the distance and hazardous environments, and can be used in National Defense, Military Affairs, Industrial Control, Environmental Monitor, Traffic Management, Medical Care, Smart Home [2]-[4] etc. The sensor whose resources are limited is cheap, and depends on battery to supply electricity, so it's important for routing to efficiently utilize its power in both military and civilian applications such as target tracking, surveillance, and security management. The sensor node has four basic components: sensing unit, processing unit, radio unit, and power unit. applications of sensor network is to periodically gather data from a remote terrain where each node continually senses the environment and sends back the data to the Base Station (BS) for further analysis, which is usually located considerably far from the target area With their capabilities for monitoring and control, the sensors are expected to be deployed in vast area. The most restrictive factor is the lifetime of wireless sensor network is limited energy resource of the deployed sensor nodes. Because the sensor nodes carry limited and generally irreplaceable power source. The use of potentially unique identifier such as the MAC (Medium Access Control) address or the GPS coordinates is not recommended as it forces a significant payload in the messages [3]. Also, the network protocol should take care of other issues such as self-configuration, fault tolerance, delay, etc. [5]. LEACH [6] [7] is the first and most popular energy efficient hierarchical clustering algorithm for WSNs that was proposed for reducing power consumption.

The idea is to form clusters of the sensor nodes based on the received signal strength and use local cluster heads as routers to the sink. This will save energy since the transmissions will only be done by such cluster heads rather than all sensor nodes. The three important features of LEACH are:

- Localized co-ordination and control for cluster setup.
- Randomized cluster head rotation.
- Local compression to reduce global data communication.

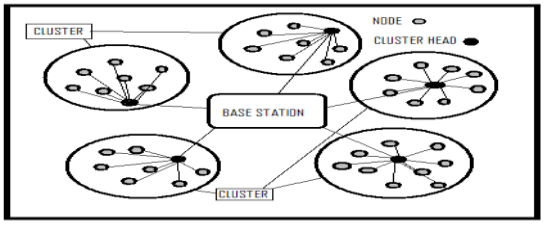


Fig. 1: LEACH Protocol

LEACH divides the network into several clusters of sensors, which are constructed by using localized coordination and control not only to reduce the amount of data that are transmitted to the sink, but also to make routing and data dissemination more scalable and robust. LEACH uses a randomize rotation of high-energy CH position rather than selecting in static manner, to give a chance to all sensors to act as CHs and avoid the battery depletion of an individual sensor and die quickly.

II. RELATED WORK

In LEACH, a data collection model is described as shown in One hundred of homogeneous nodes are uniformly distributed in a 100m * 100m square region. This model is based on the military object tracking and hazards environment monitoring application background, where the base is often far from application area. Some assumptions are made that node can selected its transmission range and every node knows the positions of other nodes and itself. The selectable range assumption is closely based on the function of current sensor devices. The network includes some of the initial setting of energy parameters and the initialization of the sensor nodes. So it is necessary to generate a random distribution of these nodes in the 100 *100 m^2 of the region (X=100, Y=100). Sink is located at (bs_x=50, bs_y=50). o

indicates Normal nodes and dark o indicates CHs For homogeneous wireless sensor network system initialization all the available wireless sensor network nodes are having equal amount of initial energy E_o = 0.5J. In the paper, we have considered the following assumptions:

1. Each sensor node has power control and the ability to transmit data to any other sensor node or directly to the BS.
2. Our model is based on the clustering hierarchy process using the characteristic parameters of heterogeneity, namely the fraction of advanced nodes (m) and the additional energy factor (α) between advanced and normal nodes.
3. Advanced nodes have to become cluster heads more often than that of normal nodes by separate threshold for each type of nodes.
4. There is no mobility [8].

III.PROPOSED PROTOCOL

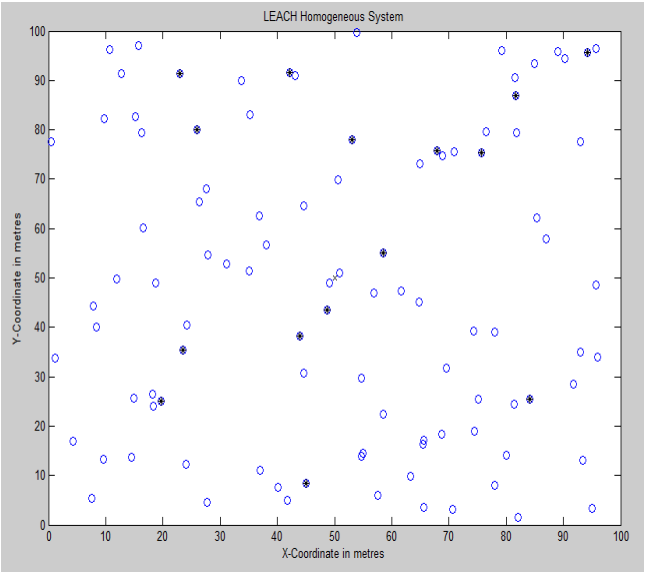
In this Leach-Heterogeneous system 0.10% of nodes are having more initial energy than the other nodes in the wireless sensor networks. For this case of Leach-Heterogeneous system 10 nodes are having 1Joule of initial energy out of 100 nodes in the network. The remaining 90 nodes are having 0.5 joules of initial energy. When we increase the additional amount of energy to the nodes in the heterogeneous system of wireless sensor networks ultimately the additional energy are going to lost their energy in the end of the round. Depend the application, the number of advanced nodes can be increased and the total system lifetime can be increased significantly. In the homogeneous sensor networks, all the sensor nodes and base stations are identical in terms of hardware capability and initial battery power. In this method, the static clustering elects cluster heads (CH) only once for the entire lifetime of the net-work. This results in overload on cluster heads. As proposed in LEACH [4], the role of cluster heads is randomly and periodically rotated over all the nodes to ensure the same rate of dissipation of battery power for all the sensor nodes. In this if we have increase the value for the X and Y directions then the different result are come .In this paper we use the same number of node in the X and Y region. And another we also use the change the number of node with the respectively value that is also same the range of X and Y region. In this approach the same procedure as in the normal LEACH protocol is followed i.e., the formation of the clusters is same in this heterogeneous system and also the cluster head selection by comparing the residual energy of the individual in every round [9].

III. SIMULATION RESULTS

The simulation is done in MATLAB. Let us assume the heterogeneous and homogeneous sensor network with 100 sensor nodes are randomly distributed in the 100m * 100m area. The base station is located at the centre (50, 50).In this region we have total number of maximum rounds are 1000. The value that is calculated in the Table 2 is after the completion of 1000 rounds. In this paper we compare the result for the homogeneous as well as heterogeneous LEACH with the varying number of node according to the area, after that we find heterogeneous is good as compare to the homogeneous. In this the BS position that is 50 m * 50m the initial energy that is the 0.5J.

Table 1: Simulation Parameters

PARAMETER NAME	VALUES			
Network area	$100m * 100\ m$			
Number of nodes	100			
Initial Energy (E_o)	0.5J			
BS position	$50\ m * 50\ m$			
E_{delay}	50nJ/bit			
$E_{tx}=E_{rx}$	50nJ/bit			
ε_{fs}	10pJ/bits/m2			
ε_{amp}	$0.0013pJ/bit/m^4$			
D_o	$sqrt(\varepsilon fs\ /\ \varepsilon mp)$			
E_{DA}	5nJ/bit			
Packet size	4000bits			
X(in meters)	100	200	300	400
Y(in meters)	100	200	300	400
Total no. of node	**100**	**200**	**300**	**400**
No. of Round	1000	1000	1000	1000
Homogeneous (No. of Nodes Dead)	52	109	240	444
Heterogeneous (No. of Nodes Dead)	1	19	180	317
X(in meters)	100	200	300	400
Y(in meters)	100	200	300	400
Total no. of node	**100**	**100**	**100**	**100**
No. of Round	1000	1000	1000	1000
Homogeneous (No. of Nodes Dead)	52	56	84	91
Heterogeneous (No. of Nodes Dead)	1	29	78	84



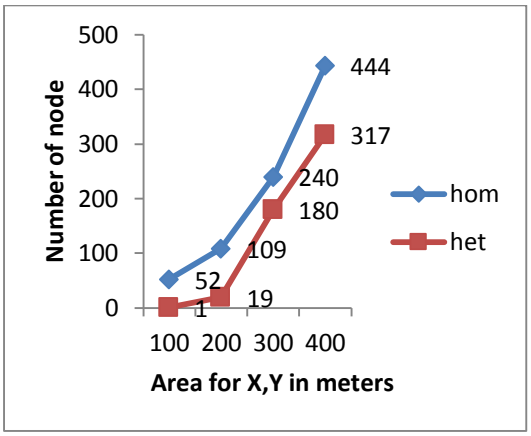


Fig.3.Graph when the number of node varies as well as area also changed X,Y in meters

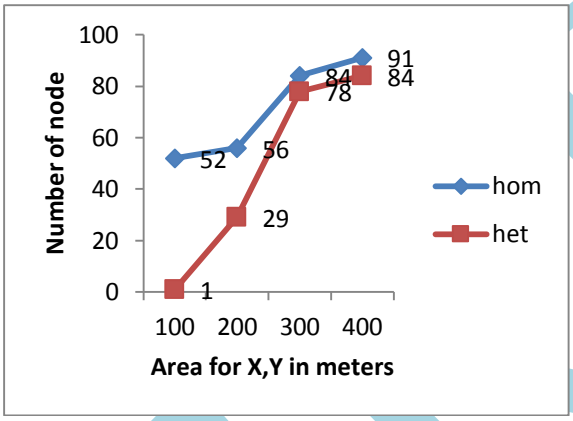


Fig.4.Graph when the number of node same as well as area changed X,Y in meters

We have the same area for the X and Y in meters but number of nodes are varying. In this if we have an area of 100*100 then the total number of nodes are 100.If we have a area of 200*200 then the total number of nodes is equal to 200.In this graph there is a total number of dead node also increase if we increase the area.

V. CONCLUSIONS

We have considered various parameters such as packet size and Base Station position. We conclude that the heterogeneous wireless sensor networks are more suitable for real life applications as compared to the homogeneous counterpart. For future work, a model with high density of heterogeneous wireless sensor nodes with its topology is proportionately increased according to the application to have good energy efficient and increasing lifetime network may be investigated. From the results it can be concluded that Leach Heterogeneous System provides better performance in energy efficiency and increasing level in lifetime of the wireless sensor networks. This may try to implement in ns2 with stable and mobile mode of the system.

REFERENCES

[7] I.F. Akyildiz, W. Su, Y. Sankar subramaniam and E. Cayirci, “Wireless Sensor Networks: a survey", Computer Networks, Vol. 38, pp. 393-422, Mar. 2002.

[8] Saravana kumar.R, Kavitha.M,” Performance Evaluation of energy aware data centric routing algorithm in wireless sensor networks”, National level conference on Intelligent systems and their applications, held at Sudharsan Engineering College pudukkottai,Tamilnadu, India during 24th and 25th, August-2007.

[9] Lin, J.; Liu, Y.; Ni, L.M. SIDA: Self-organized ID Assignment in Wireless Sensor Networks. In Proceedings of the 4th IEEE International Conference on Mobile Ad-hoc and Sensor Systems Conference (MASS), Pisa, Italy, October, 2007.

[10] Saravana kumar.R, Malaisamy.K,”Energy-Efficient MAC for WSNs”.National conference on Application of Emerging Technologies held at Adhiyaman College of Engineering ,Hosur, Tamilnadu, India during 24th and 25th May 2008.

[11] Eugenio M., “A Survey on Wireless Sensor Networks”, www lia.deis.unibo.it/Courses/RetiLS/.

[12] W.R.Heinzelman,” Energy-efficient Communication protocol for Wireless microsensor networks”, Proc. of 33rd Annual Hawaii Inter Cord on System Sciences, Hawaii, and USA: IEEE Computer Society, 2000.

[13] W. Heinzelman, A. Chandrakasan and H. Balakrishnan. “An Application-Specific Protocol Architecture for Wireless Microsensor Networks,” IEEE Transactions on Wireless Communications, Vol. 1, pp.660-670, Oct. 2002.

[14] Md. Golam Rashed, M. Hasnat Kabir, Shaikh Enayet Ullah,” WEP: AN ENERGY EFFICIENT PROTOCOL FOR CLUSTER BASED HETEROGENEOUS WIRELESS SENSOR NETWORK,” International Journal of Distributed and Parallel Systems (IJDPS) Vol.2, No.2, March 2011

[15] Nishi Sharma,Vandna Verma” Heterogeneous LEACH Protocol for Wireless Sensor Networks” Int. J. Advanced Networking and Applications Volume: 05 Issue: 01 Pages:1825-1829 (2013) ISSN : 0975-0290 .