ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 8, August 2014

Wireless Energy Protocol Advancement Using Multicast Data Transmission for Enhancing Lifetime of Network

Pratistha Sharma, Abhishek Gupta

M.Tech Student, Dept of CSE, BUEST, Himachal Pradesh, India.

Assistant Professor, Dept of CSE/IT, BUEST, Himachal Pradesh, India.

ABSTRACT: The most important objectives of wireless sensor network are to enhance or to increase the lifetime of the sensor network and also to use the energy of the network effectively. Many traditional approaches had been proposed in wireless sensor network (WSN) to achieve these objectives. But, they are not so efficient and reliable in terms of utilization of energy on the network nodes. However, nodes in network are typically considered to be homogeneous in nature since the researches in the field of WSN, have been evolved but in real world, homogeneous sensor networks hardly been considered for research. Thus, we require a clustering technique which will work in heterogeneous environment which are more closely relates with real life environment. In this paper, we proposed a multi node approach for data routing. This will consume less energy in long distance communication. In our methodology we propose intermediate gateways which lie between cluster heads and main station so will consume less energy than previous single hop protocols which also help in reducing distance between Tx node and Rx station, as distance decrease the energy consumption by nodes for transmission decreases so lifetime also get enhanced.

KEYWORDS: Clustering; Leach; Matlab; Sep; WSN network lifetime

I. INTRODUCTION

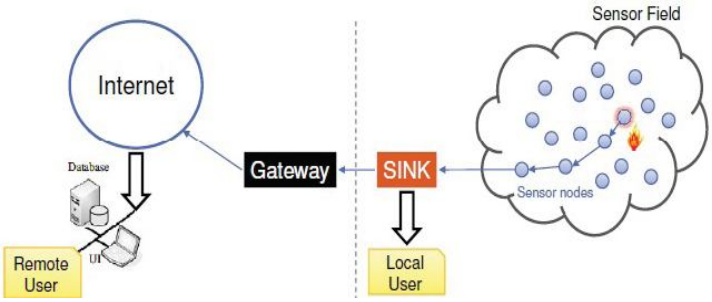
Wireless sensor networks (WSN's) have gained worldwide attention in recent in Micro-Electro-Mechanical Systems technology which has facilitated the development of smart sensors. These sensors are small, with limited processing and computing resources, and they are inexpensive compared to traditional sensors. A WSN has little or no infrastructure. It consists of a number of sensor nodes working together to monitor a region to obtain data about the environment. These sensors have the ability to communicate either among each other or directly to an external base-station. A greater number of sensors. The sensor sends such collected data, usually via radio transmitter, to a sink either directly or through a gateway. Routing protocol is one of the core technologies in the WSN. Due to its inherent characteristics, routing is full of challenge in WSN. Clustering is a well-know and widely used exploratory data analysis technique, and it is particularly useful for applications that require scalability to hundreds or thousands of nodes. Many disaster management applications require networks of sensors that can be easily deployed. In such applications wires or cabling is not practically possible. To overcome these drawbacks wireless sensor networks are used. Wireless sensor networks are fast, easy to install and maintain. Energy conservation and maximization of network lifetime are the key challenges in the design and implementation of WSN. In this paper, we analyze energy efficient multiple single hop clustering routing algorithm by a sensor node for WSN. The remainder of this paper is organized as follows: Section 2 describes the related work. section 3 describes the proposed multi-hop routing scheme. Simulation results are discussed in section 4 and conclusions are drawn in section 5.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 8, August 2014



.**FIG 1**:- WIRELESS COMMUNICATION IN CLUSTERED NETWORK

II. DESIGN ISSUES

1. **Network dynamics**- Most of the network architectures assume that sensor nodes are stationary, because there are very few setups that utilize mobile sensors. It is sometimes necessary to support the mobility of sinks or cluster-heads. Route stability becomes an important optimization factor, in addition to energy, bandwidth etc. The routing messages from or to moving nodes is more challenging. So, the sensed event can be either dynamic or static depending on the application.

2. **Load balancing**-Load balancing is helpful for extending the lifetime of network in WSNs. Distribution of sensor nodes are done even among the clusters for cluster construction where the data processing and intra-cluster management performed by the cluster heads. Due to the equal size of clusters, it extends the lifetime of networks and prevents exhaustion of energy of Cluster heads

3. **Scalability:** If Sensor nodes are increased in the sensor networks then networks functionality should not be decreased but it shouls increase it it is called scalable network.Routing protocols should be designed such that it should work with large number of sensor nodes spread in large area.

4. **Node deployment**- It is application dependant that affects the performance of the routing protocol. The deployment is either deterministic or self-organizing. In deterministic deployments, the sensors are placed manually and data is routed through a fixed-determined paths. On other hand, in self-organizing systems, the sensor nodes are scattered randomly creating an infrastructure in an adhoc manner.

5. **Energy Considerations**- During the creation of an infrastructure, the process of setting up the routes is greatly influenced by energy considerations. As the transmission power of a wireless radio is directly proportional to the distance squared or even higher order in the presence of obstacles, multi-hop routing will consume less energy than direct transmission. However, multi-hop routing incurs significant overhead for management in topology and medium access control. Direct routing would perform well enough if all the nodes were very close to the sink. Sensors are scattered randomly over an area of interest and multi hop routing becomes unavoidable

6. **Data delivery models**- Data delivery models to the sink can be continuous, event driven, query-driven and hybrid, depending on the application of the sensor network.

7. **Avoidance of energy holes** -The data is delivered to sink node or BS by using the multi-hop routing. The sensor nodes which are closer to the BS transmit more number of packets than the sensor nodes which are away from BS. Due to this, the nodes nearer to BS, first it decrease their energy, hole is leaving near to BS, whole network

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 8, August 2014

partitioning and the nodes which are outside preventing them for sending of data to BS, nodes which are remaining still have some amount of energy. This concept is known as energy hole.

8. **Node capabilities-** In a sensor network, different functionalities can be associated with the sensor nodes. Depending on the application, a node can be dedicated to a particular special function such as relaying, sensing and aggregation since engaging the three functionalities at the same time on a node might quickly drain the energy of that node.

9. **Data aggregation/fusion-**The purpose of data aggregation is for aggregating of data from multiple nodes to eliminate the redundant transmission and provide aggregated data to the BS. It is the best way to save energy. The CH first collects the aggregated data and then transmits to the BS.

III. RELATED WORK

Energy conservation becomes one of the major issues in sensor networks. One way to reduce energy consumption in sensor networks is to adopt a clustering algorithm. A clustering algorithm tries to organize sensor nodes into clusters. Within each cluster, one node is elected as the cluster head. The cluster head is responsible for:

1. Collecting data from its cluster members
2. Fusing the data by means of data/decision fusion techniques
3. Reporting the fused data to the remote base station

In each cluster, the cluster head is the only node involved in long distance communications. Energy consumption of the whole network is therefore reduced. Intensive research has been conducted on reducing energy consumption by forming clusters with appropriate network structures.

Heinzelmanet al. proposed a clustering algorithm called LEACH. Using the ideaof clustering, the amount of long distance transmissions can be greatly reduced.In LEACH, the nodes organize themselves into local clusters, with one node acting as the cluster head. All non-cluster head nodes transmit their data to the cluster head, while the cluster head node receives data from all the cluster members, performs signal processing functions on the data (e.g., data aggregation), and transmits data to the remote BS. Therefore, being a cluster head node is much more energy intensive than being a noncluster head node. If the cluster heads were chosen a priori and fixed throughout the system lifetime, these nodes would quickly use up their limited energy. Once the cluster head runs out of energy, it is no longer operational, and all the nodes that belong to the cluster lose communication ability. Thus, **LEACH** incorporates randomized rotation of the high-energy cluster head position among the sensors to avoid draining the battery of any one sensor in the network.

S. Lindsey and Raghavendra proposed another clustering algorithm called PEGASIS, which is a completely different idea by organizing sensor nodes into a single chain (SC) network. In such networks, a single node on the chain is selected as the cluster head. By minimizing the number of cluster heads, the energy consumed in long distance transmission is further minimized. The main idea in PEGASIS is to form a chain among the sensor nodes so that each node will receive from and transmit to a close neighbour. Gathered data moves from node to node, get fused and eventually a designated node transmits to the BS. Nodes take turns transmitting to the BS so that the average energy spent by each node per round is reduced. The advantage of this method is that it removes the overhead caused by dynamic cluster formation. As a result, PEGASIS outperforms the LEACH. However, there are some disadvantages as well i.e. excessive delay is introduced for distant nodes, especially for large networks.

M. Ye, C. Li, G. Chen and J. Wu proposed Energy Efficient Clustering Scheme (EECS) protocol in the year 2005. The protocol is a novel clustering scheme which is used for periodical data gathering applications in wireless sensor networks.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 8, August 2014

The cluster heads election is done with more residual energy nodes through local radio communication. Here, a constant number of candidate nodes are elected and competes locally without iteration for cluster heads based on the residual energy. The protocol also ensures a uniform cluster heads distribution in the wireless sensor network. Further, to maintain the load balancing among cluster heads, a novel approach is introduced. But, the requirement of global

Q. Li, Z. Qingxin and W. Mingwen in 2006, proposed Distributed Energy Efficient Clustering (DEEC) protocol which is a cluster based protocol for two level and multi level energy heterogeneous wireless sensor networks. In this method, the cluster heads selections are done through the probability which is based on the ratio of residual energy of each node and the average energy of the network. In this, those nodes with high initial energy and residual energy are having more chances to become cluster heads compared to nodes with low energy.

IV. PROBLEMS WITH PREVIOUS WORK

As we know in WSN when sensor are deployed in unstructured environment sensor nodes are typically powered by irreplaceable batteries with a limited amount of energy supply then we generally want sensor network to work as long as possible. So to achieve this we have to perform transmission with less power or energy consumption.As per previous work many algorithm for routing has been proposed as LEACH, HEED, PEGASIS, SEP etc. but all these algorithm are single hop routing protocols.

V. DISADVANTAGES OF SINGLE HOP ROUTING

Single hop routing can reduce communication overhead by selecting cluster head for data routing to main station but when communication distance that is distance between cluster head and main station increases single hop communication consume more energy.

VI. PROPOSED METHODOLOGY

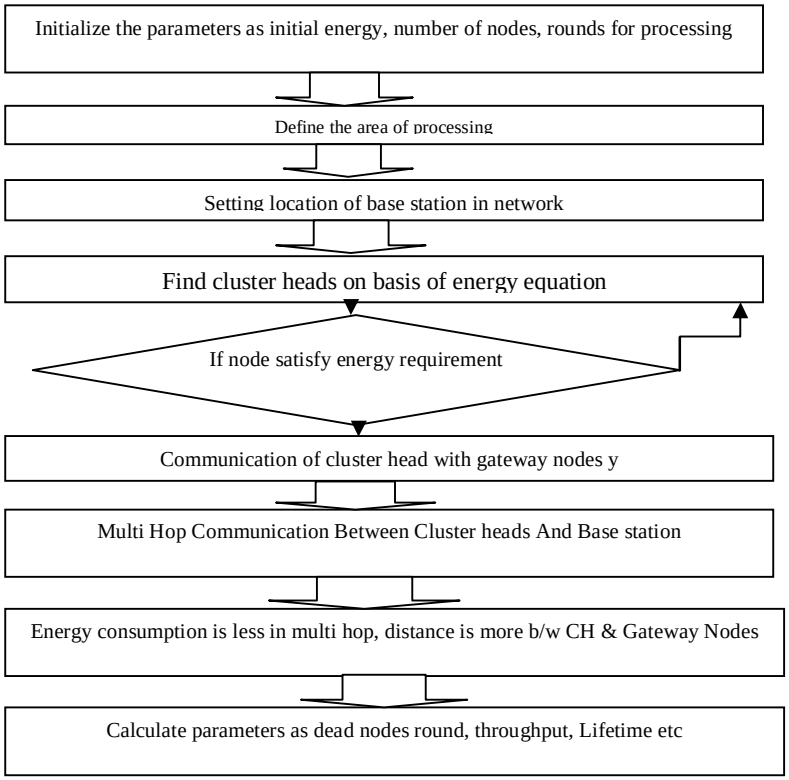
We proposed a multi hop approach for data routing. This will consume less energy in long distance communication. In our methodology we propose gateway nodes which lie between cluster heads and main station so will consume less energy than previous single hop protocols. Because the distance between cluster heads and base station is reduced byadding gateway nodes. So we know as distance decrease the energy consumption by nodes for transmission decreases so lifetime also increases.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 8, August 2014



VII. SIMULATION AND RESULTS

The performance of multiple single hop protocol is being evaluated by simulation. For simulation we used MATALAB, performance evaluation following parameters are taken into account:Lifetime, Energy consumption, Throughput Network size is considered as 100m X 100m and the number of nodes is 100 which are scattered randomly in the sensor.

VIII. PARAMETERS WHICH ARE USED IN SIMULATION

Nodes of Network	100
Total iteration	500
No. of data packets	3000
Initial Energy	0.5J
Energy consumed by the amplifier to transmit at a longer distance	0.0013*0.000000000001J

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 8, August 2014

Energy consumed by the amplifier to transmit at a shorter distance	10*0.000000001J
Energy consumed in the electronics circuit to receive the signal	50*0.00000001J
Energy consumed in the electronics circuit to transmit or receive the signal	50*0.000000001J

Table 1: Different values used during simulation

IX. SIMULATION SETUP

1. Initialize the various parameter for data transmission i.e no. of nodes , initial energy of nodes, no. of rounds for processing.
2. After that , describe the total coverage area of wirelss sensor network where data is to be transmitted. Then find the location of various nodes and set base station node.
3. According to energy equation find the cluster head node which have highest energy is selected as the cluster head.
4. Every node is selected by the cluster head in every rounds. If the condition is satisfied then all node communicate to the cluster head and cluster head to gateway nodes which are near by the cluster head.
5. Gateway nodes are allocated on the basis of FIFO to the cluster head and these gateway nodes are not fixed to any CH is given to any other approaching CH.
6. Then gateway nodes communicate to the base station .These gateway nodes are out of clusters and have multiuse.
7. Then we calculate the parameter i.e lifetime, throughput, energy consumption.

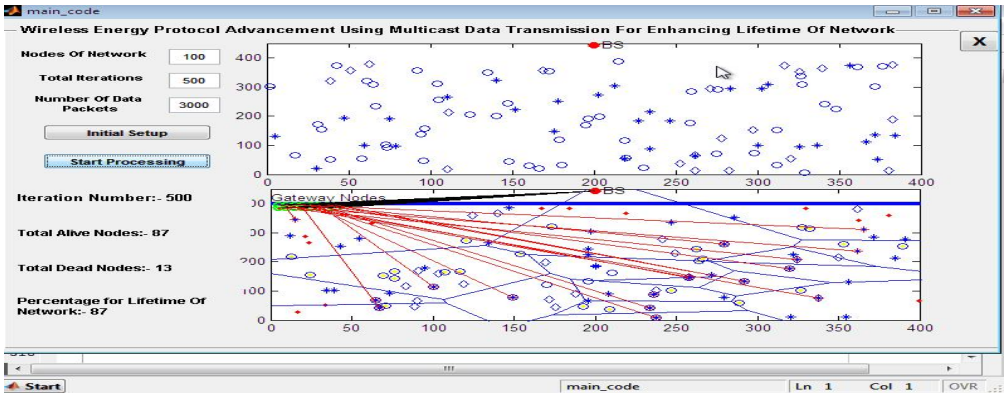


Fig3: Output screen

When we click on the start processing then it calculate the total no of alive nodes, total dead nodes and percentage of life time of network.After click the button of start processing then it calculate the no. of total alive nodes, total dead nodes and percentage of lifetime of network.

i.e Iteration No.=500, Total Alive Nodes=87, Total Dead Nodes=13, Percentage of life time of network=87

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 8, August 2014

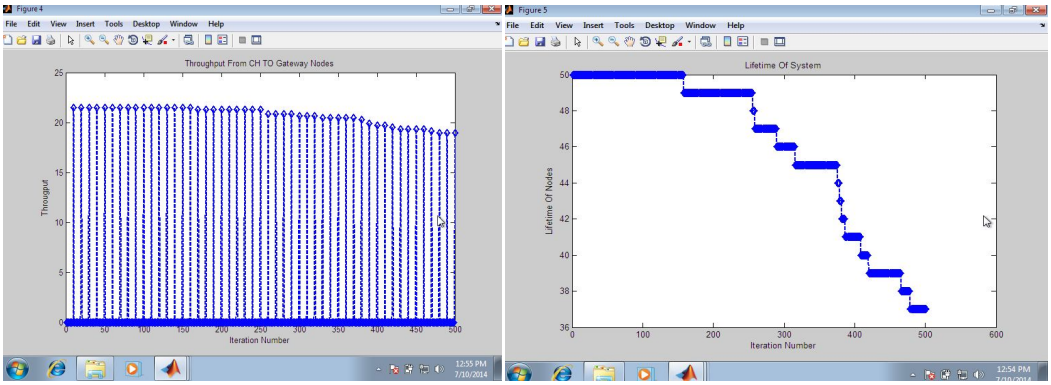


Fig.:4 Throughput from clusterhead to gateway nodes**Fig.:5** Lifetime of system

Figure 4 shows that when no. of iteration is increased then throughput is slowly decreases. Throughput means to use bandwidth . Bandwidth means the average rate of successful data transfer through a communication path. When no. of rounds is increases then throughput from cluster head to gateway nodes is decreases.Figure 5 shows that lifetime of nodes of network is depends on the no. of iteration. In this graph , when no. of rounds of network is around 180 then life time of nodes is maximum i.e. 50. It is lifetime of system reducing as per rounds of transmission increases.This graph shows that lifetime of nodes of network is depends on the no. of iteration. This graph shows that the life time of a system .Network stability will improve by adding more no. of nodes in the network.

X. CONCLUSION

The overall conclusion is that Multiple single hop clustering is the best choice to move towards to improve the performance of wireless sensor networks. We concluded that energy consumed for single hop transmission is more than multi-hop transmission for long distances. A new multi-hop routing protocol for the homogeneous wireless sensor networks has been presented and the performance of the system is evaluated to minimize the energy consumption and increase the life time of sensor network. We have determined lifetime, throughput and energy consumption. Finally, simulation results indicate that proposed protocol can more efficiently balance energy consumption of an entire network and thus extends the network lifetime.

REFERENCES

[1] Biswanath Mukherjee, Dipak Ghosal, Jennifer Yick,"Wireless sensor network survey" , Department of Computer Science, University of California, Davis, CA 95616, United States
[2] H. S. Seo, H. W. Kim, "Modeling of Energy-efficient Applicable Routing Algorithm in WSN", International Journal of Digital Content Technology and its Applications, vol. 4, no. 5, pp.13-22, 2010
[3] A. P. Cnandrakasan ,W. B. Heinzelman, , "An application-specific protocol architecture for wireless microsensor networks," IEEE Transactions on Wireless Communications, vol. 1, no. 4, pp.660–670, 2002
[4] Ankita Joshi , Lakshmi Priya.M "A Survey of Hierarchical Routing Protocols in Wireless Sensor Network", International Conference on Information Systems International Journal of Wireless & Mobile Networks (IJWMN) Vol. 4, No. 4, 2012
[5] Dr. S. R. Sawant , Dr. R. R. Mudholkar ,Dr. V.C .Patil Rajashree.V.Biradar ,"Inter-Intra Cluster Multihop-LEACH Routing In Self-Organizing Wireless Sensor Networks", International Journal of Research and Reviews in Computer Science (IJRRCS) Vol. 2, No. 1. 2011
[6] Abdul Basit Dogar, Ghalib Asadullah Shah,Muhamnmad Omer Farooq," MR-LEACH: Multi-hop Routing with Low Energy Adaptive Clustering Hierarchy", Fourth International Conference on Sensor Technologies and Applications.
[7] Chengfa Li,Guihai Chen ,Mao Ye · JieWu," An unequal cluster-based routing protocol in wireless sensor networks", Wireless Network DOI 10.1007/s11276-007-0035-8
[8] Edward J. Coyle, Seema Bandyopadhyay," An Energy Efficient Hierarchical Clustering Algorithm for Wireless Sensor Networks".
[9] Anantha P Chandrakasan, Hari Balakrishnan, Wendi B Heinzelman, et al. An application-specific protocol architecture for wireless microsensor networks. IEEETransactions on wireless communications, 1(4):660–670, 2002.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 8, August 2014

[10] F. Akyildiz, W. Su, "A survey on sensor networks", Communications Magazine, IEEE, vol. 40, no. 8, pp.102-114.
[11] .Stephanie Lindsey and Cauligi S Raghavendra. Pegasis: Power-efficient gathering in sensor information systems. In Aerospace conference proceedings, IEEE, volume 3, pages 3–1125. IEEE, 2002.
[12] H¨useyin ¨Ozg¨ur Tan and Ibrahim K¨orpeog(lu. Power efficient data gathering and aggregation in wireless sensor networks. ACM Sigmod Record, 32(4):66–71, 2003.
[13] Hongke Zhang , Shuai Gao and Sajal K Das. Efficient data collection in wireless sensor networks with path-constrained mobile sinks. Mobile Computing, IEEE Transactions on, 10(4):592–608, 2011.
[14] Ahmed E Kamal , Jamal N Al-Karaki,"Routing techniques in wireless sensor networks: a survey. Wireless Communications, IEEE, 11(6):6–28, 2004.
[15] David Moss, Kyle Jamieson and Philip Levis. Collection tree protocol. In Proceedings of the 7th ACM Conference on Embedded Network.