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Comparative Analysis of Protocols for WSN Applications

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ABSTRACT: A WSN (Wireless Sensor Network) is a cluster of sensor nodes acting together into an environment to monitor an activity. The wireless sensor networks (WSN) consists of several autonomous sensor nodes with sensing, processing and wireless communication capabilities. This paper gives the knowledge of method for clustering and cluster head selection in WSN to improve energy efficiency. It shows a comparison between the different methods on the basis of the network lifetime. In this thesis, we develop and analyse low-energy adaptive clustering hierarchy (LEACH), protocol architecture for both homogeneous WSNs and heterogeneous WSNs. Increased network lifetime, scalability and load balancing are important requirements for WSN applications.

KEYWORDS: WSN, EN-LEACH, Routing, Sensor Nodes, Base Station

I. INTRODUCTION

Now a days, Wireless Sensor Networks (WSNs) become the most popular technologies for recent years. The constant growth in wireless sensor network technology makes it possible to implement the Wireless Sensor Network (WSN) in a variety of scenarios. WSN consists of thousands of tiny sensor nodes deployed in a physical environment for observation of an event of interest. The WSN consists of two main components: 1. Sensor Nodes, 2. Base Station (Central Gateway). The sensor nodes sense data or collect information about the target occurring near that sensor, then the sensor nodes process the data gathered and at last that data is transmitted to other sensor nodes or the base station if required and also a sensor node can receive data from different sensor nodes. This way, the sensor nodes make a network and communicate with each other in that network. Typically, sensor nodes are randomly deployed within a geographic area to measure within or close to a particular phenomenon. The primary function of these sensor nodes is data sensing, data processing and communication with other nodes. A sensor node is typically composed of four main components, as shown in figure 1.

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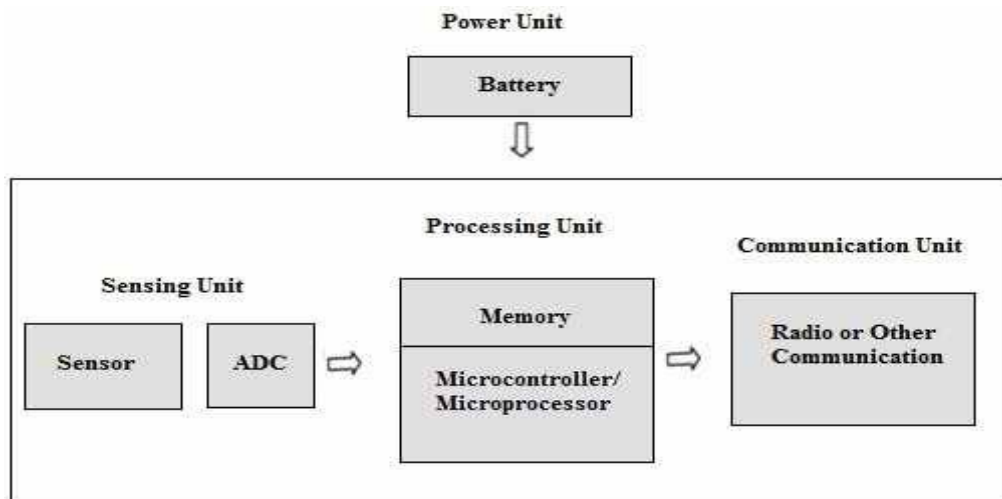


Figure 1: Block diagram of Sensor Node

A base station (BS) connects the sensor network to another network. It consists of an antenna, processor, radio board and USB interface board. It is pre-programmed with low-power mesh networking software for communication with wireless sensor nodes. Deployment of the base station (BS) in a WSN is significant. Sensor nodes handover the data to the base station for processing and decision making. Energy conservation, coverage of sensor nodes and reliability issues are taken care of during deployment of the base station (BS) in a sensor network. Generally, base stations (BS) are assumed static in, but in some scenarios, they are mobile to collect the data from sensor nodes.



Figure 2: Base Station

II. LITERATURE REVIEW

Heinzelman et al. [12] proposed LEACH (Low-Energy Adaptive Clustering Hierarchy). It is an example of an algorithm for the hierarchical clustering networks. In LEACH, WSN is divided into several clusters, some nodes randomly are selected as cluster heads. Each cluster head organizes the nodes around it and forms a local group. The cluster-head collects information from other sensors of its cluster and after the fusion sends the data to the base station or to the next cluster head. In a specific time-frame, which is known as round time, the network is re-grouped, and the cluster-heads are selected again. Comparing with formal non-cluster algorithms, LEACH performs better and the first node failure happens more than eight times as in WSN, which is using a direct transmission or minimum-transmission energy routing with static-clustering.

LEACH-B (LEACH-balanced) is researched in [15]. In each round at LEACH-B, according to LEACH protocol after first selection of cluster head, a second selection is made to modify the number of cluster head in consideration of node's residual energy. The number of cluster-head is constant and near-optimal per round. The problem here is that the protocol needs twice cluster heads selection. This consumes extra energy.

LEACH-SM is proposed in [16] where the spare selection phase is added to LEACH. The authors aim to add a new selection phase between LEACH cluster setup and steady state phases. The extra nodes added into WSNs, are initially

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asleep but they are ready to be switched on when an active node uses its energy. The problem is that when the extra node joins the network, the whole system needs to be reestablished that consumes extra energy for other nodes.

III. APPROACHES

The algorithm has two phases: the setup phase and the steady phase. This chapter describes the proposed algorithm, which consists of the LEACH algorithm and the new mechanism. The new mechanism is added into the LEACH algorithm to reduce the number of needed re-clustering. The proposed work done in this thesis is mentioned below in steps:

1. Deploy WSN by initializing the parameters.
2. After deploying the network, it is worth-noting to use the appropriate topology for that network.
3. Selecting the cluster head in the sensor network.
4. Initializing the communication by sending the data packets.
5. Implementing LEACH, a routing protocol used for finding optimal solution in both Homogeneous and Heterogeneous WSN.
6. Implementing optimal Leach (EN-LEACH).
7. Evaluating the performance and observing the comparative analysis.

When the node which is acting as cluster head stops working before the round time ends, the network should switch the cluster head to another node within the clusters, when the cluster head notifies that the energy is below a threshold. We assume that there is an optimal threshold value, which can be found by experimental way. Assumedly, another node with largest energy way protects the cluster heads, which have lower energy. This algorithm can protect cluster heads from quick death and prolong the network lifetime.

IV. RESULTS

The following table 1 shows the better comparison of Homogeneous Leach, Heterogeneous Leach and optimal leach (EN-LEACH). All the protocols are compared with varying number of nodes on the basis of Network lifetime, packets transmitted to base station and packets transmitted to cluster head.

The figure 3 presents a comparison of the network lifetime with different amount of initial energy of sensor nodes by all the simulated protocols. For the first set of experiments, each node of the homogeneous leach, heterogeneous leach and EN-leach begins with only 0.25 J of initial energy and compare the 1st node dead and last node dead of all protocols and then repeated same simulation for 0.5 J and then 1.0 J of initial energy.

Table 1: Comparison of Dead Nodes Percentage

% of DEADNODES	ROUND		
	Homogeneous LEACH	Heterogeneous LEACH	EN-LEACH
1	745	935	1004
20	1091	1142	1132
50	1196	1262	1204
70	1269	1308	1267
90	1373	1622	1409
100	3010	4169	1556

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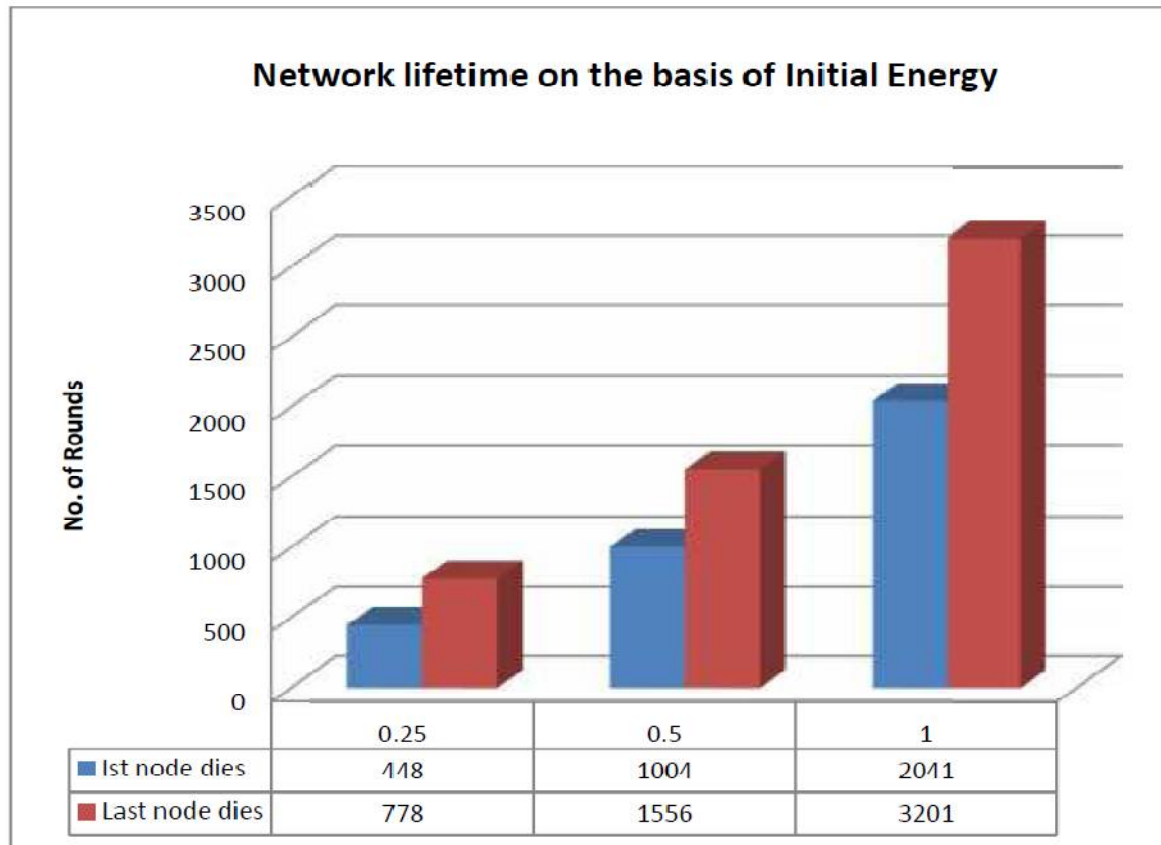


Figure 3: Network Lifetime on the basis of Initial Energy in EN-LEACH

V. CONCLUSION

We also propose EN-LEACH, a new variant of LEACH that can further be utilized in other clustering routing protocols for better efficiency. EN-LEACH tends to minimize network energy consumption by efficient cluster head replacement after very first round and dual transmitting power levels for intra cluster and cluster head to base station communication. In EN-LEACH, a cluster head will only be replaced when its energy falls below certain threshold minimizing routing load of protocol. Hence, cluster head replacement procedure involves residual energy of cluster head at the start of each round.

The current thesis has following scope for future research:

1. Implementation of EN-LEACH protocol on Heterogeneous wireless sensor networks.
2. Next improvement can be possible by considering sink mobility and to ensure successful delivery of data.
3. Design of a better routing protocol in case when CH dies before sending the data to the BS.
4. The future work can include some more level of hierarchy and mobility in the network.

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REFERENCES

- [1] Sunil Kumar Patel and Ravi Kant Kapoor, "A Survey on :Gluster Based Routing Protocols in Wireless Sensor Network", International Journal of Innovative research in Science, Engineering and Technology 3297: 2007 { Vol. 6, Issue June 06, 2017}.
- [2] S. Jabbehdari R. Sheikhpour and A. Khadem-Zadeh, "Comparison of energy efficient clustering protocols in heterogeneous wireless sensor networks", International Journal of Advanced Science and Technology, 36:27{40, November 2011}.
- [3] Prabhat Kumar, M. P. Singh and U. S. Triar, " A Review of Routing protocols in Wireless Sensor Network", International Journal of Engineering, Research and Technology, Vol. 1, Issue June 04, 2012.
- [4] Arifa Anwar and D. Sridharan, "A Survey of Routing Protocols for Wireless sensor networks in various environment", International Journal of Computer Application, Vol. 112- No. 5, Issue Feb. 2015.
- [5] Akramul Azim and Mohammad Mahfuzul Islam, "A Dynamic Round Time based fixed low energy adaptive clustering hierarchy for wireless sensor networks", International Conference on communication, Dec. 15 – 17, 2009.
- [6] Reddy D. L., "A Review Efficiency of Energy clustering and routing in wireless sensor networks", International Journal of Advancements in technology, Jan. 17, 2019.
- [7] G. Ran , H. Zhang , Shulan Gong "Improving on LEACH Protocol of Wireless Sensor Networks Using Fuzzy Logic" Journal of Information & Computational Science 7: 3 (2010) 767–775.
- [8] P.T.V. Bhuvaneshwari, V.Vaidehi., "Enhancement techniques incorporated in LEACH survey", Indian Journal of Science and Technology vol. 2 no. 3 (May 2009), Department of Electronics engineering, Madras institute technology", Anna University Chennai 2009.
- [9] P. Bakaraniya, S. Mehta "K LEACH-An improved leach protocol for lifetime improvement in wireless sensor network" International journal of engineering trends and technology, vol. 4 ,issue 5, May 2013.
- [10] M. F. Khatoon, M.A. Jamali "Modify LEACH algorithm for wireless sensor network" International journal of computer science issues, Volume 8,issue 5,No 1,sept 2011.
- [11] S.K. Singh, M P Singh, and D K Singh, "Routing Protocols in Wireless Sensor Networks –A Survey" "International Journal of Computer Science & Engineering Survey (IJCSES) Vol.1, No.2, November 2010.