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Improvement in LEACH Protocol for Wireless Sensor Networks

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Abstract: A Wireless Sensor Network (WSN) comprises of expansive number of spatially dispersed, wirelessly associated, self-representing sensor nodes, which are for the most part sent in harsh conditions. These sensor nodes require vitality to detect process and transmit data, however their vitality is limited. Therefore, there is a need to plan a vitality effective convention to broaden the lifetime of a WSN. LEACH is a protocol that is energy efficient, in this paper a concept of intermediate and advanced nodes is introduced to improve network lifetime of the energy efficient protocol such as LEACH.

Keywords: WSN, LEACH, Advanced Nodes, Network Lifetime

1. INTRODUCTION TO WIRELESS SENSOR NETWORKS AND LEACH PROTOCOL

Wireless Sensor networks are predominantly records-centric in preference to cope with-centric. So sensed data are directed to a place containing a cluster of sensors rather than precise sensor addresses given the similarity within the information obtained with the aid of sensors in a dense cluster, aggregation of the facts is done regionally. [1][2] This is, a summary or evaluation of the nearby facts is ready by way of the use of an aggregator node within the cluster, consequently reducing the communiqué bandwidth requirements. Aggregation of information will increase the extent of accuracy and decreases data redundancy.[3] A network hierarchy and clustering of sensor nodes permit for network scalability, robustness, green beneficial useful resource utilization and decrease strength consumption. The vital goals for sensor networks are reliability, accuracy, flexibility, rate effectiveness and simplicity of deployment.

LEACH that is one of the most popular hierarchical routing algorithms for sensor networks The concept is to shape clusters of the sensor nodes primarily based on the obtained sign energy and use nearby cluster heads as routers to the sink. [4][5] This will stop electricity since the transmissions will most effective be accomplished with the aid of such cluster heads in place of all sensor nodes. Highest quality range of cluster heads is anticipated to be 5% of the whole range of nodes. All the data processing such as data fusion and aggregation are local to the cluster.[6] Cluster heads change randomly over time in order to balance the energy dissipation of nodes. This decision is made by the node choosing a random number between 0 and 1. The node becomes a cluster head for the current round if the number is less than the predefined threshold. [7]

LEACH achieves over a thing of seven reductions in energy dissipation as compared to direct communication and a component of 4-eight in comparison to the minimal transmission energy routing protocol. [8] The nodes die randomly and dynamic clustering increases lifetime of the system. LEACH is absolutely distributed and requires no global information of community. However, LEACH makes use of multi -hop routing where every node can transmit without delay to the cluster-head and the sink. [9]Consequently, it isn't always applicable to networks deployed in huge regions. Furthermore, the idea of dynamic clustering brings extra overhead, e.g. head adjustments, advertisements and many others, which may additionally lessen the benefit in strength intake.[10][11] Now the next section will represent proposed technique and results.

2. PROPOSED TECHNIQUE & RESULTS

A simulation environment is designed and implemented in MATLAB 15, in order to investigate the energy efficiency with lifetime extension and stability period of the mentioned protocol. We compare the proposed Modified Leach algorithm with Leach routing protocol. The nodes are randomly distributed between x=0, y=0 and x=100, y=100 with the base station (BS) at location x=50, y=50. BS and all sensor nodes are stationary after deployment. We consider packet size of 2000 bits. In the proposed protocol, we make use of Advanced and intermediate nodes. The number of normal nodes is 50 and intermediate nodes is 30 and advanced nodes are 20. The energy fractions to these nodes are given in different fractions. The Cluster Heads are made from intermediate nodes and then the nodes transfer data to

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intermediate nodes or advanced node on the basis of distance between the sink and advanced nodes and distance between the sink and intermediate node cluster head whichever is smaller.

Simulation Results: Figure 1 and 2, show the LEACH protocol Number of dead nodes and alive nodes with respect to round numbers and packets to base station and cluster heads with respect to round number respectively.

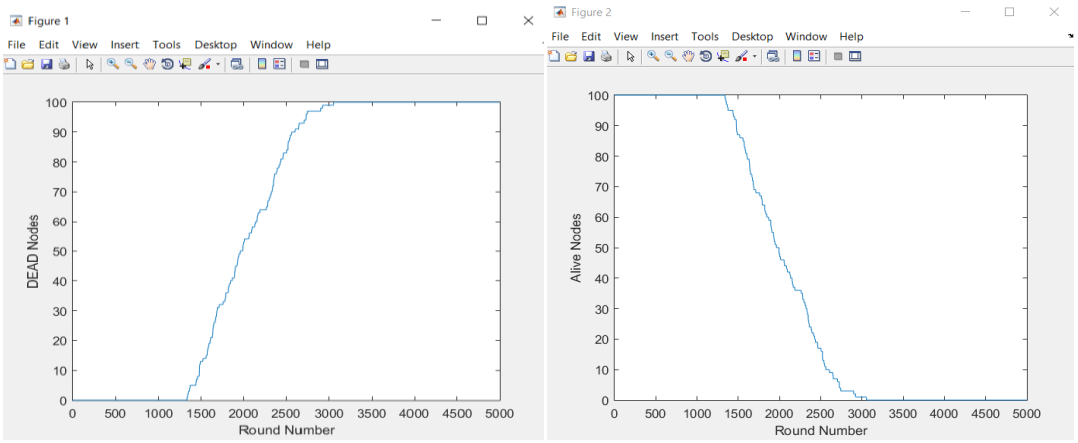

Figure 1: LEACH protocol Dead Nodes and Alive Nodes with respect to Round Numbers

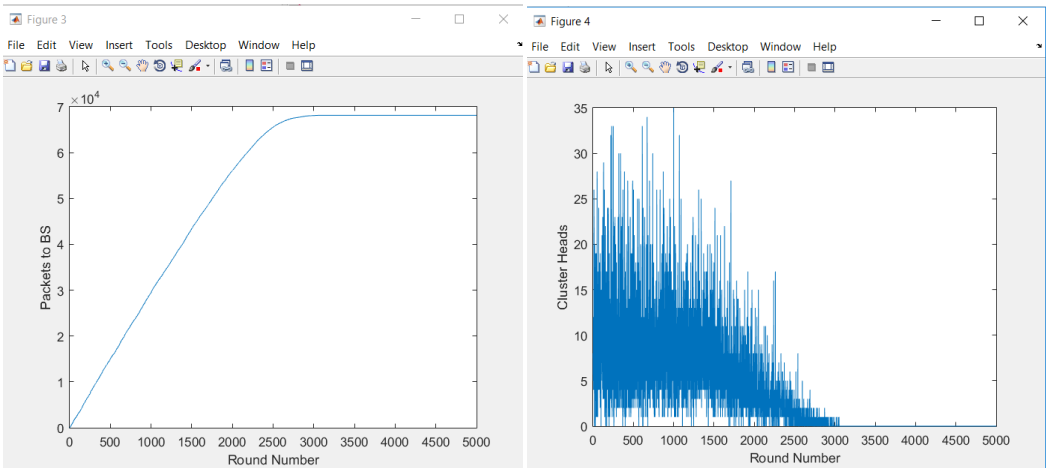

Figure 2: LEACH protocol No. of packets to Sink node and Cluster heads counts

Figure 3 and Figure 4 is representation of proposed protocol parameter, which shows that network life time is increased in the Improved LEACH Protocol.

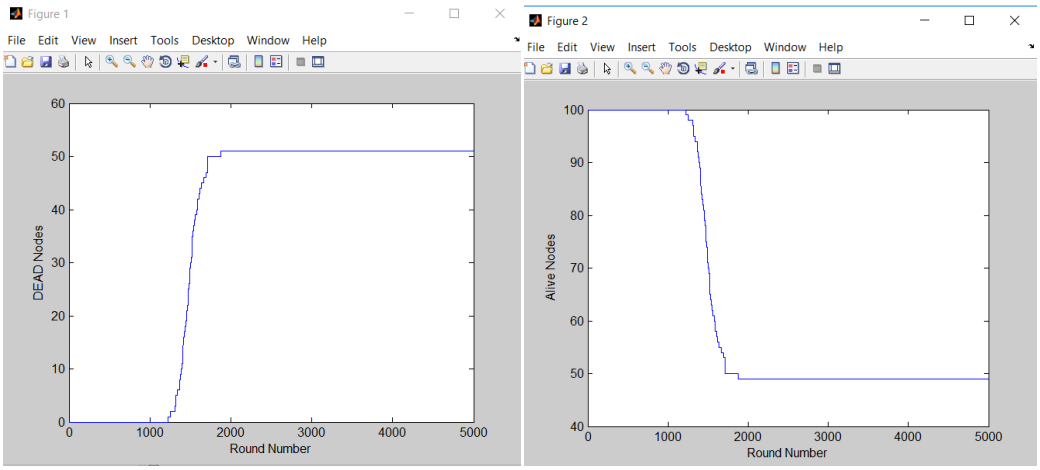

Figure 3: Proposed protocol with combination of Intermediate and Advanced Nodes

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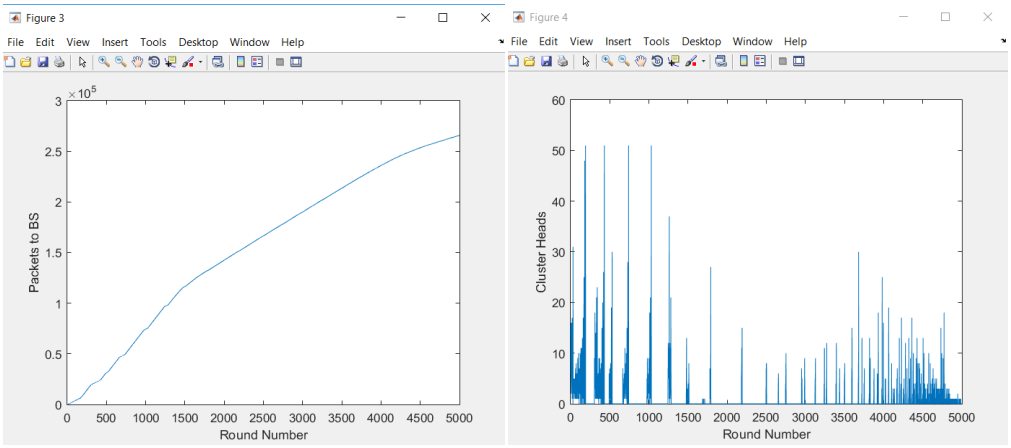

Figure 4: Proposed protocols Packets to BS and Cluster head Count

Table 1 shows comparison of results for LEACH and Proposed LEACH.

Table 1: Comparison of LEACH and improved LEACH protocol

Protocol	First Dead Round Number	All dead Round Number
LEACH	1182	3100
Improved LEACH	1206	9100

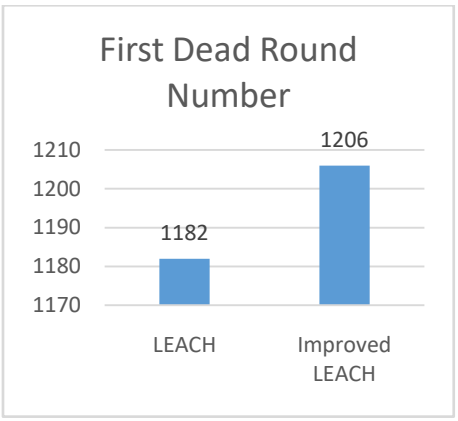

Figure 5: First Dead Round Number

In figure 5, First dead round number is increased which shows that Stability of the network is increased and in figure 6 all dead are represented which clearly shows the network lifetime is increased by a large margin.

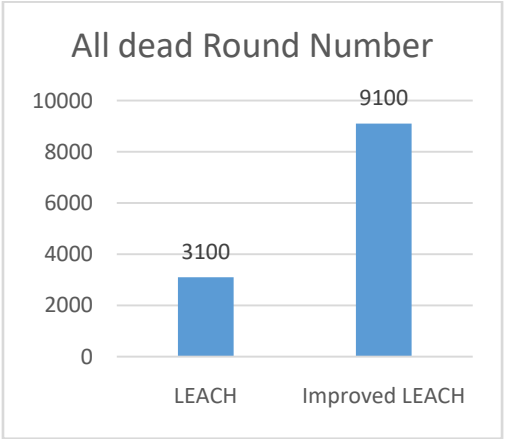

Figure 6: Network Lifetime or All dead Round Number Comparison

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CONCLUSION

Wireless Sensor Networks (WSNs) could be applied in a variety of applications ranging from battlefield reconnaissance to environmental protection. A WSN consists of spatially distributed autonomous sensor nodes with the capabilities of sensing, processing and transmitting information to monitor physical or environmental conditions, such as temperature, sound, humidity, pressure, etc. In this paper, it is seen that the results are improved with 65.9% for network lifetime and the Stability time, when all nodes exist is improved by a significant amount. The energy efficiency and delivery ratio is also effectively improved by the improvement of network life time.

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