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The Comparison between Leach Protocol and Pegasis Protocol based on Lifetime of Wireless Sensor Networks

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Abstract--- Energy efficiency of the wireless sensor network mainly depends on the Routing protocols. In this paper two hierarchal protocols are used. There are various hierarchal protocols but we will discuss the two protocols i.e. LEACH and PEGASIS. Low Energy Adaptive Clustering Hierarchy (LEACH) and Power Efficient Gathering in Sensor Information System (PEGASIS). Hierarchal protocol uses the data aggregation clustering. Data aggregation is a process to reduce the duplicity of data transmission. Comparison is to be done between the Leach protocol and Pegasis protocol in terms of energy efficiency using Matlab.

Keywords: WSN, LEACH, PEGASIS, Matlab.

INTRODUCTION:

Wireless sensor nodes (WSN) consists of thousands of micro sensor nodes which communicate with each other. These sensor nodes once deployed collects the data from the sensor node and after processing sends it to the base station (BS) directly or through relay node [1]. One or more nodes will serve as sink nodes that are capable of exchanging the information with the user either directly or through the existing nodes. Energy efficiency is the major constraint in wireless sensor network and using the Hierarchical routing protocols we can overcome that constraint [3]. There are various types of Hierarchical routing protocols e.g. LEACH, PEGASIS, TEEN, APTEEN, VGA, SOP.

As sensor nodes are generally battery-powered devices, the critical aspects to face concern how to reduce the energy consumption of nodes, so that the network lifetime can be to reasonable times. WSNs possible today due to technological advancement in various domains, it envisioned to become an essential part of our lives[7], it designs Constraints need to be satisfied for realization of sensor networks and also tremendous research efforts being made in different layers of WSNs protocol stack. The factors Influencing WSN Design is: extended

- Fault tolerance
- Scalability
- Production costs
- Hardware constraints
- Sensor network topology
- Environment
- Transmission media
- Power Consumption
- Sensing
- Communication
- Data processing
-

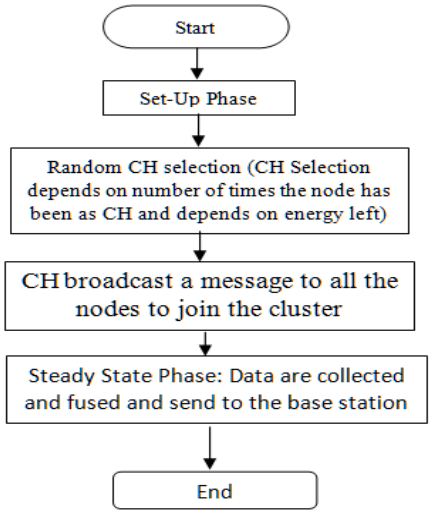
ROUTING PROTOCOLS IN WSN:

1. Location based protocols
2. Data-centric protocols
3. Hierarchal based protocols
4. Mobility based protocols
5. Multi-path based protocols
6. QOS based protocols

In this paper the routing protocols used are the hierarchal based protocols i.e. Leach and Pegasis. Comparison of both the protocols is done in the terms of network lifespan[14].

LEACH

LEACH is Low Energy Adaptive Clustering Hierarchy. It is a Hierarchal protocol with high network lifetime and high power consumption. It works on data aggregation [5]. It is cluster based approach in which data is send to the base station. In this routing protocol the whole network is divided into clusters and one cluster head is to be choosen[4].Work of the cluster head is to collect all the information and send it to the base station. The cluster head is selected using the threshold value t(n).[8]Each cluster chooses a number either 0 or 1 and this number is compared with the threshold value, if the selected value is less than threshold value then the node becomes the cluster head else it behaves as the ordinary node[10][2].



PEGASIS

Power efficient gathering in sensor information systems. Pegasis follows the chain based approach and greedy algorithm[6].The sensor nodes organize themselves to form the chain or it uses the greedy approach. If any of the node dies in between then the chain is reconstructed to bypass the dead node, One leader node is assigned and that node will transmit the data to the base station(BS)[12].The main goal of Pegasis is to receive and transmit data to and from the nearest neighbour and take turns being the leader for transmission to the BS[13].Gathered data moves from node to node, get fused and eventually a designated node transmits to the base station. Leader of each node is selected randomly. All the data is collected to the leader node, get fused and send it to the base station[9].

TABLE I.

COMPARATIVE TABLE FOR LEACH AND PEGASIS

LEACH PROTOCOL	PEGASIS PROTOCOL
LEACH is an hierarchical routing protocol	PEGASIS is an hierarchical routing protocol
LEACH is cluster-based hierarchy	PEGASIS is a chain-based approach
Supports data aggregation	No data aggregation occurs
No of dead nodes are more	No of dead nodes are less

Simulation Result:

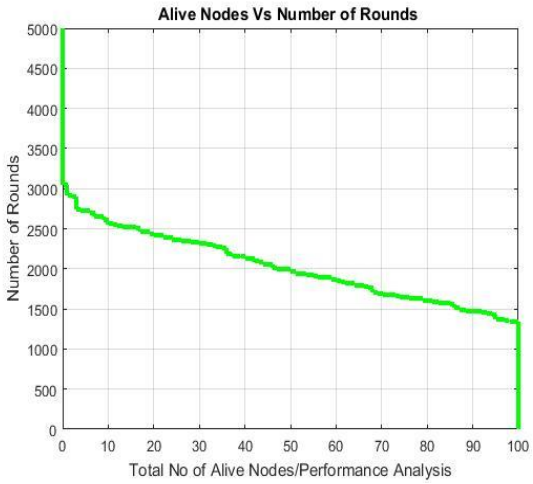
In this section, the performance of proposed work has been evaluated by carrying out simulations. Now to prove the effectiveness of the proposed approach is done using MATLAB [11]. Let us assume 100 sensor nodes having the area of network 100*100m.sq in which (50, 50) nodes are randomly distributed in four regions.

TABLE 1

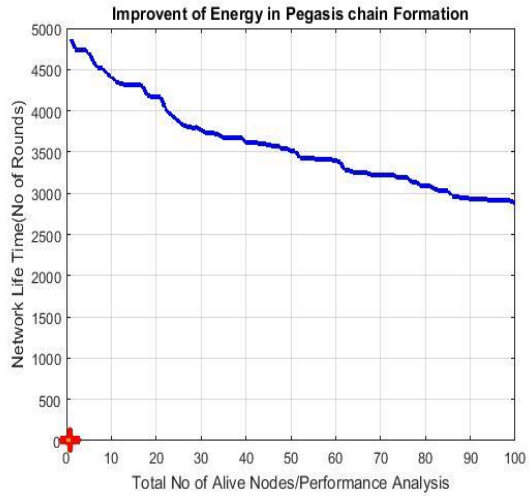
THE SIMULATION PARAMETERS ARE SHOWN IN:

Parameters	Values
Network size	100m*100m
Node number	100
Number of rounds ,r	5000
Initial Energy of nodes	0.5J

LEACH:



PEGASIS:



In the above figure simulation is carried out inside the sensing field. As the number of rounds increases, number of alive nodes decreases due to power consumption, the results show that PEGASIS has higher network lifetime as compared to LEACH and it increases with the increase in percentage of nodes death.

CONCLUSIONS

Comparison of two hierarchical routing protocols – LEACH and PEGASIS is done in this paper. Our research shows that performance of PEGASIS is better than LEACH in terms of network lifetime, communication overhead and the percentage of node deaths. PEGASIS also have an extended lifetime of the network because of the energy efficiency. For large networks, the early death of the nodes reduces the network stability in LEACH as compared to PEGASIS.

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