

# A REVIEW OF ALGORITHMS: LEECH AND PEGASIS USED TO ENHANCE LIFETIME OF NETWORK AND DECREASING OVERHEAD COST IN WSN

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## Abstract

Wireless sensor network composed of sensors. Sensors have limited energy associated with them. As more and more packets is transferred over the network, congestion occurs. Congestion causes energy to be dissipated. Sensors having energy completely dissipated are no longer able to hold packets and hence packet drop ratio increases. Protocols are devised, used to reduce congestion and enhance lifetime of network. This literature focus on studying such protocols like LEACH and PEGASIS along with providing comparison of each so that optimal protocol can be selected for enhancement and can be used in future for increasing lifetime and decreasing packet drop ratio.

## KEYWORDS

Sensors, Congestion, Packet Drop ratio, energy, lifetime

## 1. INTRODUCTION

[1], [2]Wireless sensor network consists of nodes having certain energy levels associated with them. Nodes or sensors are organised in the form of network. Packets are transmitted from source towards the destination. [2], [3]Energy depleted as more and more packets transferred through the network. As the energy corresponding to sensor is completely depleted, sensor is no longer able to hold further packets. Hence packets reaching out to that node are dropped. As more and more packets are dropped, packet drop ratio is increased.

$$Packet_{DropRatio} = \frac{Dropped_{Packets}}{Total_{Packets}}$$

Equation 1: Indicating packet drop ratio

[4]Packet drop ratio is calculated by dividing dropped packet count with total packet transmitted. Energy dissipation is the prime cause of packet drop. Energy dissipation as packets are transferred is given through equation 2

$$E(k, d) = E(k) + E_{TS}(k, d)$$

Equation 2: Energy dissipation during packet transfer

K is the length of packet and d is the distance between transmitter and receiver. The protocols are devised used to tackle the issues of congestion and energy dissipation. Next section describes the details of existing protocols used to achieve optimality.

## 2. LITERATURE SURVEY

The protocols used to achieve energy efficiency and decreasing packet drop ratio includes LEACH and PEGASIS

### 2.1 LEACH

[5]LEACH protocol uses cluster containing CH used to transmit the packets towards base station which it receives from cluster members. In case energy associated with CH dies than next sub CH become cluster head.[6], [7] In normal LEACH data is aggregated at CH and then transmitted simultaneously. In case CH dies all the aggregate packets are lost. this increases packet drop ratio and decreases lifetime of a network. LEACH Architecture is shown as under

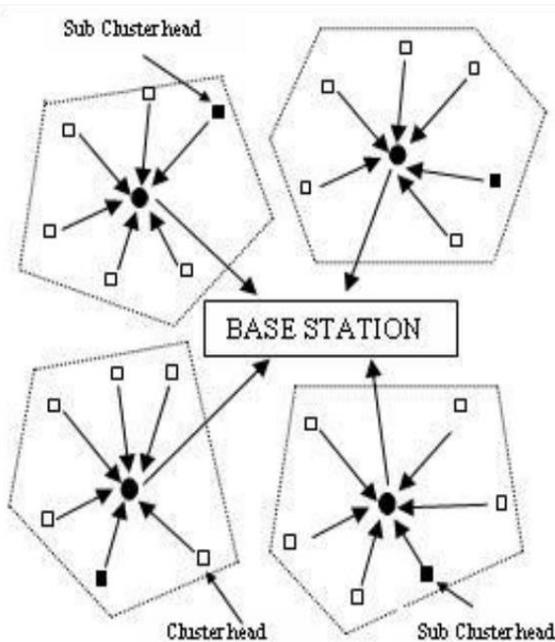


Figure 1: Architecture of LEACH

There are following parameters which are associated with LEACH protocol

Table 1: Parameters considered in LEACH

Parameter	Value(Approximately)
Number of Nodes	100
Base station position	50*50
Propagation delay	3 us
Processing Speed	5 m/s
Data Size	100
Time	900 sec

[8], [9]LEACH is associated with number of phases. These phases includes the following

**SETUP PHASE**

During setup phase each node generates random value between 0 and 1. If the values generated corresponding to node is less than the threshold value then that node become cluster head.

**STEADY PHASE**

During steady phase, nodes send data towards the cluster head using time division multiplexing. Slots are

assigned to each node during which they can transfer the data towards the destination.

[10], [11]Data is aggregate at the cluster and then it is transmitted to base station. Data aggregation at the cluster head location is shown as under

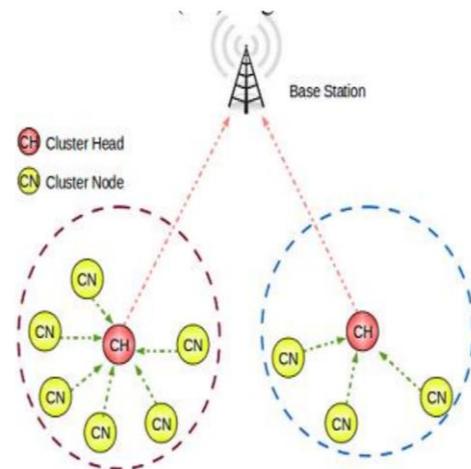


Figure 2: Data Aggregation at Cluster head location

Power consumption and energy efficiency is achieved through the LEACH algorithm. LEACH algorithm has probabilistic approach. To reduce power consumption further PEGASIS is devised.

**2.2 PEGASIS**

[12]Power-Efficient Gathering in Sensor Information Systems is a chain based routing protocol which is an extension of LEACH. It constructs the chain for routing packets. Large amount of chains with distinct power consumption are constructed and then compared. The chain with least amount of energy and power consumption is selected. [13]The key idea behind PEGASIS is to arrange the sensors as data chains used as transmitter and receiver of data. Data transmitted from one node to another forms the aggregation bunch. This bunch is transmitted to the head which assumes that all nodes know the global location of each node.[14] This location is fed into greedy algorithm to form a chain. Chain is organised in the form of tree. Each child node receives the data from its sub child and transfers it to its parent. The process of forming a chain and transmission of data continues until optimal solution to energy consumption and packet drop ratio is achieved.

The cost associated with transmission is give by equation 2. Cost associated with receiver is given as under.

$$E_{RX}(K, d) = E_{RX}(K)$$

Equation 3: Receiver Energy Consumption

Energy consumption of receiver depends greatly on size of packets being transmitted.

Data aggregation cost is given as follows

$$E_{DA}(k) = E_{DA-elec}(k)$$

Equation 4: Data aggregation cost

This algorithm is less probabilistic in nature and hence less power and energy is consumed during transmission of data.

### 2.3 COMPARISON OF LEACH AND PEGASIS

Comparison is presented in terms of tabular structure showing parameters associated with each of the algorithms.

Table 2: Comparison of LEECH and PEGASIS

PARAMETER	LEACH	PEGASIS
Protocol used	Hierarchical	Hierarchical
Lifetime	High	Extremely High
Aggregation	Present	Not Present
Power consumed	High	Very High
Overhead	High	Low
Data Model Used	Cluster	Chain
Quality of service	Not considered	Partly Considered
Specified path	Specified	Specified
Scalable	Yes	Yes
Query Capability	No	No
Percent of node death	High	Low

### 3. CONCLUSION AND FUTURE WORK

This work analyse two protocols namely LEECH and PEGASIS. The comparison indicates that PEGASIS is

better in terms of lifetime, overhead and percentage of node death. The PEGASIS is based on LEECH hence all the features present within LEECH are also present within PEGASIS with some advancement. The probabilistic approach followed in LEECH is improved in PEGASIS.

In future, PEGASIS protocol can be enhanced by introducing priority within it to enhance life time and decrease packet drop ratio.

### 4. REFERENCES

- [1] X. Zhang, H. Bao, J. Ye, K. Yan, and H. Zhang, "A Data Gathering Scheme for WSN/WSAN Based on Partitioning Algorithm and Mobile Sinks," in *2013 IEEE 10th International Conference on High Performance Computing and Communications & 2013 IEEE International Conference on Embedded and Ubiquitous Computing*, 2013, pp. 1968–1973.
- [2] Z. Zhou, C. Du, L. Shu, G. Hancke, J. Niu, and H. Ning, "An Energy-Balanced Heuristic for Mobile Sink Scheduling in Hybrid WSNs," *IEEE Trans. Ind. Informatics*, vol. 12, no. 1, pp. 28–40, 2016.
- [3] V. S. Rao, R. V. Prasad, and I. G. M. M. Niemegeers, "Optimal task scheduling policy in energy harvesting wireless sensor networks," in *2015 IEEE Wireless Communications and Networking Conference (WCNC)*, 2015, pp. 1030–1035.
- [4] S. V. Vasantha, "Bulwark AODV against Black hole and Gray hole attacks in MANET," 2015.
- [5] M. Chowdhury, M. Zaharia, J. Ma, M. I. Jordan, and I. Stoica, "Managing data transfers in computer clusters with orchestra," *ACM SIGCOMM Comput. Commun. Rev.*, vol. 41, no. 4, p. 98, 2011.
- [6] Q. Peng, T. Zhang, and L. Cuthbert, "Research on network coding based Hybrid-ARQ scheme for wireless networks," no. Iceict, pp. 218–222, 2010.
- [7] S. Gambhir, "OE-LEACH : An Optimized Energy Efficient LEACH Algorithm for WSNs," 2016.
- [8] T. Chauhan, "Review on Energy Efficient Protocol based on LEACH , PEGASIS and TEEN."
- [9] P. Bansal, P. Kundu, and P. Kaur, "Comparison of LEACH and PEGASIS Hierarchical Routing Protocols in Wireless Sensor Networks," *Int. J. Recent Trends Eng. Technol.*, vol. 11, no. June, pp. 139–144, 2014.
- [10] M. Prajapat and N. C. Barwar, "Performance

- Analysis of Energy Dissipation in WSNs Using Multi-Chain PEGASIS," vol. 5, no. 6, pp. 8033–8036, 2014.
- [11] F. Zhao, Y. Xu, R. Li, and W. Zhang, "Improved leach communication protocol for WSN," *Proc. - 2012 Int. Conf. Control Eng. Commun. Technol. ICCECT 2012*, no. March, pp. 700–702, 2012.
- [12] A. K. Mishra and M. K. Samantara, "A Dynamic Energy-Efficient Chain Formation Scheme for PEGASIS in Wireless Sensor Networks," *2016 2nd Int. Conf. Comput. Intell. Networks*, pp. 41–46, 2016.
- [13] P. Divya, "Comparison of GSTEB , HEED and PEGASIS Protocols pp. 1935–1939, 2016.
- [14] I. Boulhares and M. Omari, "Hybridizing PEGASIS with LEACH-1R Protocols in Wireless Sensor Networks," pp. 1037–1042, 2016.