

# Efficient Hybrid Routing using PEGASIS and LEACH Protocols in Wireless Networks

Kanchan Ubnare<sup>1</sup>, Asst. Prof. Vimal Shukla<sup>2</sup>

<sup>1</sup>M. Tech. Scholar, <sup>2</sup>Research Guide

Department of Computer Science and Engineering, Kailash Narayan Patidar College of Science and Technology, Bhopal

**Abstract** - The wireless networks need to be improved to live longer specially when sensors are involved as nodes to send information to the base station of the network considered. The basic fundamental to reduce the energy consumption of the particular sensor network is to optimize the collection pattern of information from the nodes to base station or server. The energy aware wireless sensor networks are the need of today's wireless generation of information communication. The conservation of energy is also important due to all the wireless network nodes are battery sourced. The battery has the restricted source of energy and this drawback is also motivation to build up efficient routing system. This work have proposed modified routing algorithm hybrid routing of PEGASIS and LEACH and optimize the pattern of cluster head election probability. The simulation has been done for 3500 rounds and the network live longer more than 2000 rounds.

**Keywords** - PEGASIS, LEACH, Hybrid Routing, Energy Efficient, Wireless Networks, Routing Protocols.

## I. INTRODUCTION

Like living creatures, an assortment of present day devices and types of equipments depends on the sensory data from the globe around it. These sensory data comes is given by Wireless Sensor Networks (WSN), which comprises of a few little sensor nodes to screen physical or natural conditions, for example, temperature, vibration, weight, sound or movement, and after that all in all send these data to a focal figuring system, called the base station or sink. Distinctive steering protocols administer the development of this data. Extensively the steering protocols can be named level based directing, progressive based directing, and area based steering. Drain (Low Energy Adaptive Clustering Hierarchy) is a various leveled based directing protocol which utilizes arbitrary revolution of the nodes required to be the bunch heads to equally disseminate vitality utilization in the network. Sensor network protocols are very basic and thus are exceptionally vulnerable to assaults like Sinkhole assault, Selective sending, Sybil assault, Wormholes, HELLO surge assault, Acknowledgment ridiculing, changing, replaying steering data. For instance, Selective sending and HELLO surge assault influences networks with bunching based protocols like LEACH.

The late headways in wireless communications and electronics has prompted to the improvement of minimal effort, low-control, multifunctional little keen sensors. These sensors ought to be able to detect, handle data, and communicate with each other by means of a wireless link. a wireless sensor network is a framework involved number of spatially disseminated self-ruling wireless sensors nodes to screen a marvel in a predefined domain, and to agreeably forward their measures(collected data) through the network to a coveted sink (s).

Sensor networks alludes to a heterogeneous system comprising of various discovery stations called sensor nodes with a communications framework proposed to screen and record conditions at assorted areas. Sensor nodes, otherwise called bit, are little, lightweight and compact devices furnished with a transducer, microcomputer, handset, and power source. The transducer produces electrical signals based on the detected physical wonders. The microcomputer procedures and stores the detected data. The handset gets guidelines from the base station/focal processing system and sends data to it. Every sensor nodes gets its energy generally from a battery or some other implanted type of power harvesting or battery. The measure of the sensor nodes differ from that of a shoebox to that of a moment sand-molecule. Likewise their cost additionally differs from many dollars to a couple of pennies. Size and cost requirements bring about relating limitations on vitality, memory, computational speed and communications data transfer capacity.

A wireless sensor network (WSN) in its least difficult frame can be characterized as a network perhaps having low-size and optimized complexity. The devices that are included indicated as nodes that can detect the earth and communicate the data accumulated from the observed field through wireless connections; the data is sent, perhaps by means of different bounces handing-off, to a sink that can utilize it locally, or is associated with different networks (e.g.- the Internet) through a passage. As such, a sensor network is made out of countless nodes, which are thickly conveyed either inside the marvel or near it.

The sink node is the node which is the destination of message originate by sensor nodes, i.e.- It speaks to the end purpose of data accumulation in wireless sensor network. The position of sensor nodes require not be designed or pre-decided. This permits irregular organization in difficult to reach landscapes or fiasco help operations. This normal for sensor network shows sensor network protocols and calculations must have self-sorting out capacities. The nodes in the sensor network cooperate to gather and send data to sink node or base station. Sensor nodes are fitted with an on-board processor. Each node in the sensor network, rather than sending the crude data to alternate nodes, they have in charge of the combination of data. During the time spent data combination we can decrease the measure of data transmitted between sensor nodes and the base station. It joins at least one data parcels from various sensor nodes to deliver a solitary bundle. The sensor nodes utilize their preparing capacities to locally do basic calculations and transmit just the required and halfway processed data.

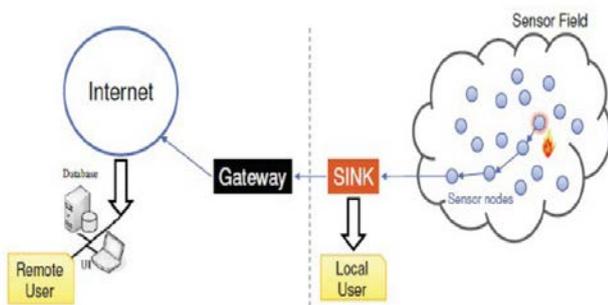


Figure 1.1 Basic WSN network structure.

The Figure 1.1 portrays the essential network structure of Wireless sensor network. The sensor nodes are having constrained battery power and it is very surprising from routine networks.

## II. SYSTEM MODEL

Wireless sensor nodes sense data and send it specifically to the base station or they perform a clustering technique as in LEACH. LEACH is known for cluster formation which contains cluster members sensing the data and the cluster head which gathers the data gathered in an intertwined manner (all the data is sent as a single packet) to the base station. This strategy has gained in conserving a considerable measure of energy that would otherwise be wasted. PEGASIS is an expansion to LEACH; it has better ways of conserving energy which last significantly more than using cluster mechanism in LEACH.

The enter idea in using PEGASIS is that it utilizes all the nodes to transmit or get with its nearest neighbor nodes. This is achieved by the formation of a chain as appeared in the Figure 2.1 below. All the nodes which gather the data

combine it with the data got by the neighbor node and transmit it to the following nearest neighbor.

In this way all the nodes get and combine their data, and pass it to the following neighbor in a chain format till they all reach the base station. Every node in the network takes turns as a leader of the chain and the one answerable to transmit the entire intertwined data gathered by the chain of nodes to the base station.

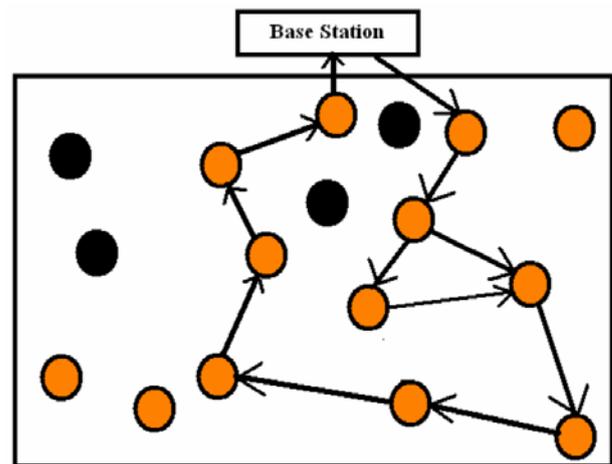


Figure 2.1 Formation of chain using nodes in PEGASIS.

the average amount of energy spent by each node is lessened. Ravenous algorithms are utilized to see that all nodes are utilized during the chain formation. PEGASIS assumes that all the nodes with varying or low energy levels can be compensated keeping in mind the end goal to calculate the energy cost of the transmissions with the remaining energy they are left with. It is not necessary that all the nodes need to know its neighboring nodes, the base station can determine the path or form the chain for all nodes, or all the nodes can determine their neighboring nodes by sending a signal. Depending upon the signal quality, the nodes adjust their signal with the end goal that they hear just the nearest neighbors in the network.

## III. PROPOSED METHODOLOGY

The wireless networks are division of mobile ad-hoc network has lot of challenges to increase the lifetime of the sensor nodes based wireless network to live longer and keep communicating with the network. Here we are to work out main areas by which a node can live longer and i.e. either make batteries (source of energy) equipped with nodes having larger in size or the material having larger charges saving capability but this approach having limited capabilities because the larger battery size make sensor node more bulk which is not feasible in any case, and to finding out the material has larger charge storing capability is also tough task to do. Instead doing above things another method is to make transfer of information on network

more efficient. For this many routing protocols has been given as we discussed in the previously. This work is the hybrid form of two routing protocols mainly PEGASIS and some feature of it modified to improve lifetime and taken from LEACH routing protocol. The flow chart of it is shown in the fig. 3.1, it explains the step by step execution of algorithm of proposed hybrid routing.

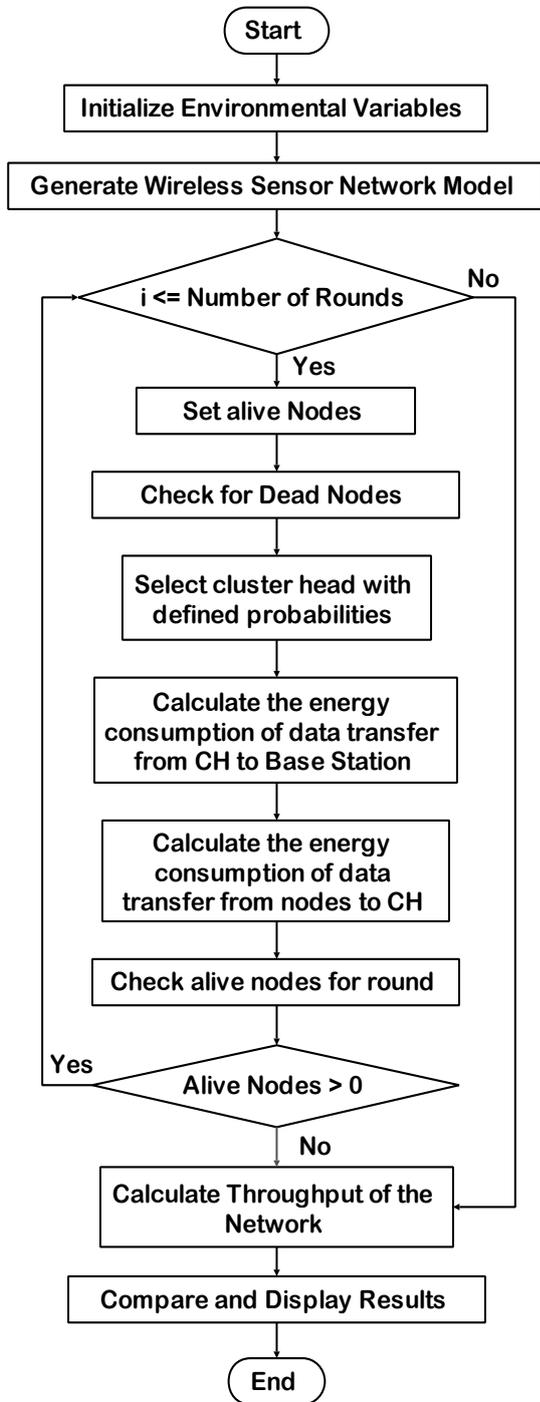


Fig. 3.1 Flow Chart of Proposed Methodology

IV. SIMULATION OUTCOMES

Wireless networks are having lots of research areas to work on and here we have chosen routing protocol to make

network life span more than the previous work. The simulation performed on hybrid routing which is integration of PEGASIS and LEACH protocols or it can be say that modified PEGASIS routing protocol because the changes has been inspired by the LEACH protocol. The routing performed on reducing the data aggregation energy. The simulated results are showing the terms of number of alive nodes and numbers of dead nodes versus number of transmission rounds and packets sent to base station and packets sent to cluster groups.

In existing work life span of the network is calculated up to 2000 transmission rounds. If the network sustain for more number of rounds means life span of the network is going better. In proposed approach the life span of the network reaches more than 2000 rounds in 100x100 network, which is greater than the previous work.

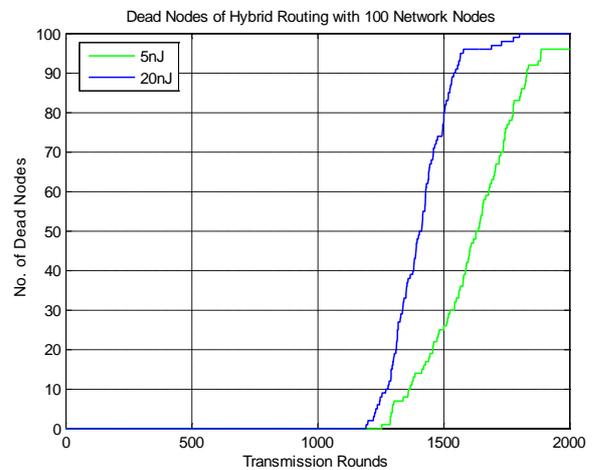


Fig. 4.1 Network Life Time: Dead Node vs Rounds

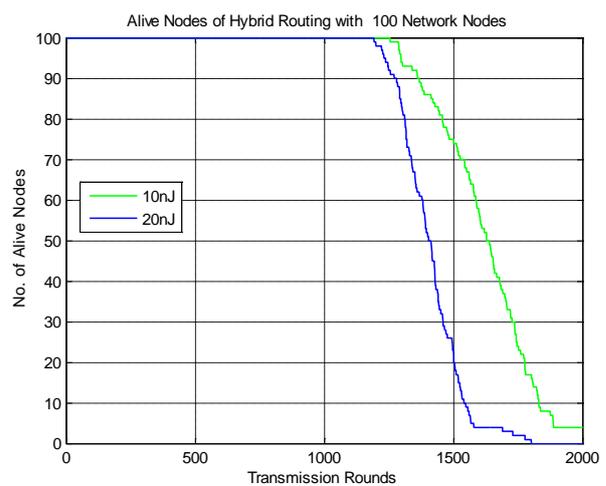


Fig. 4.2 Network Life Time: Alive Node vs Rounds

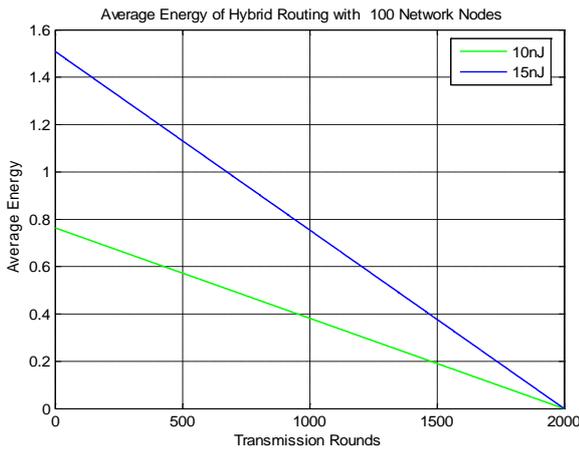


Fig. 4.3 Average Energy of Nodes vs Rounds .

From Fig. 4.1 to 4.5 shows the dead node characteristics, alive node characteristics, average energy of nodes, cluster head throughput and base station throughput vs transmission rounds. These parameters clearly shows the merits over existing routing protocol.

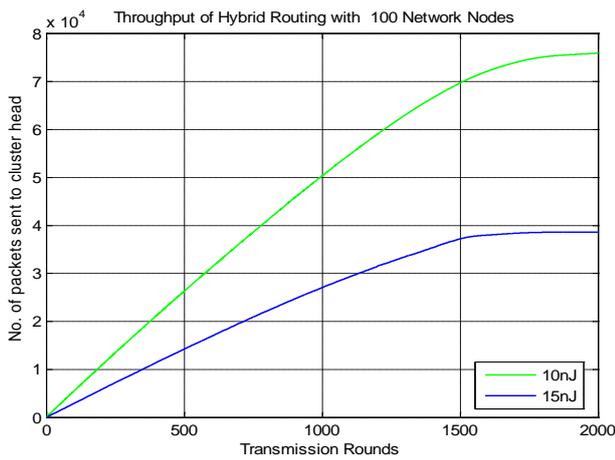


Fig. 4.4 Cluster Head Throughput vs Rounds

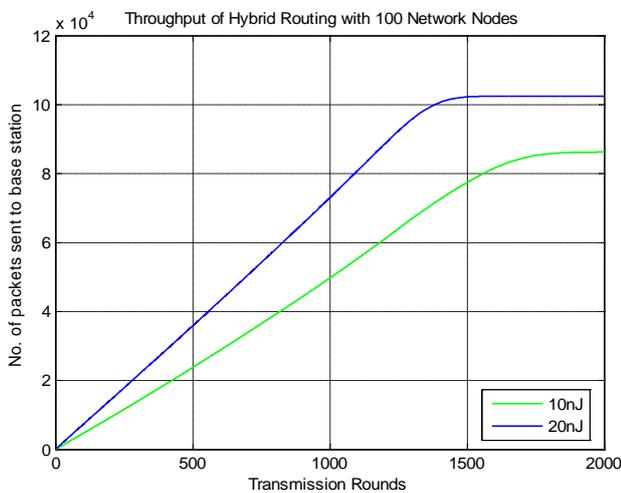


Fig. 4.5 Base Station Throughput vs Rounds

## V. CONCLUSION AND FUTURE SCOPE

The wireless networks is need to be sustain longer to stay with the network, and from the proposed methodology and its simulation results analyzed that with the lower election probability of cluster head in the hybrid routing will have longer network lifetime which is higher than the existing methodologies. During simulation of proposed methodology number of dead nodes versus transmission rounds are calculated and the same for alive nodes and throughput i.e. packets send to base station also calculated for different probabilities and found longer network lifetime (the sensor nodes survived to more number of transmission rounds) with better throughput. With the analysis of other network parameters like network area, initial energy etc. researcher will make out something more robust routing protocols which have lower energy consumption and higher network lifetime.

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