

A Novel Hybrid LEACH Protocol for Less Energy Consumption in WSN

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Abstract - wireless sensor networks are used in critical application demands longer lifetime of sensor node to provide stability and to stay connected with base station to send sensor data continually. Having tiny battery, power consumption in sensor node is also important parameter to reduce. The power utilization by battery is also depends on the data collection pattern from node to base station or server. The energy aware networks are the demand of modern data communication system. The WNS nodes are powered by battery sources having limitation of supply power and capacity motivated to design an efficient routing system. To overcome network lifetime and power consumption issues a modified routing hybrid routing algorithm of PEGASIS and LEACH has proposed in this work and optimizes the pattern of cluster head election probability. The simulation has been done for 2000 rounds and the network live longer more than 2000 rounds.

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

I. INTRODUCTION

As of late Wireless Sensor Networks (WSN) is gaining worldwide consideration because of the advances made in wireless communication, data innovations and gadgets field. The fundamental concept of WSN based on a basic expression-

Sensing + CPU + Radio = Thousands of potential applications.

It is an “In situ” sensing technology where tiny, independent and smaller gadgets called sensor nodes or bits sent in a remote area to identify wonders, gather and process data and transmit detected data to clients. The advancement of minimal effort, low-power, a multifunctional sensor has gotten expanding consideration from different ventures. Sensor nodes or bits in WSNs are little estimated and are fit for detecting, assembling and handling data while speaking with other associated nodes in the network, by means of radio frequency (RF) channel.

They give network foundation. Lately another sort of wireless network rose quickly with an alternate objective. It gives a successful method to detecting, preparing and imparting checked data. This new kind of wireless network is termed as Wireless Sensor Network (WSN).

The fundamental block diagram of a wireless sensor node is introduced in Figure 1.1. It is made up four fundamental segments: a detecting unit, a handling unit, a handset unit and a power unit. There can be application subordinate additional parts, for example, an area discovering framework, a power generator and a mobilizer.

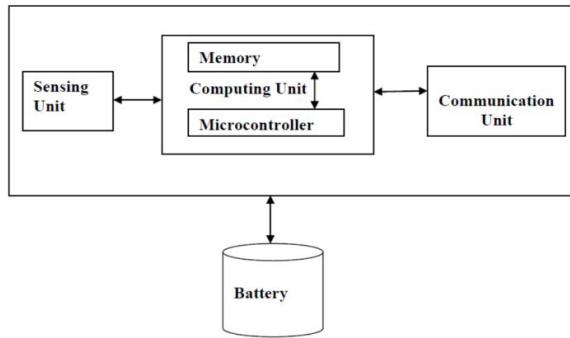


Figure 1.1 Architecture of a wireless sensor.

WSN is exceptionally challenging because of the inborn attributes that recognize these networks from different wireless networks like mobile networks or cell networks. The WSN has some basic differences from traditional network [5] [6]. These are: Capability to perform operations without human interactions. These are densely deployed in the environment and they form a network. Therefore the WSN has no fixed traffic pattern for communication. On the contrary, the traditional network has no such property.

Scalability of Nodes in Network: WSN applications are spread over many small nodes to accomplish a particular task. So the Network can potentially scale to 1000s or 10,000s nodes.

Each individual network is Application Specific: WSN consists of many different combinations of sensing, computing, and communication technologies. Therefore it is too difficult to create a single implementation for all the requirements. On the other hand, traditional network has independent applications.

- Data Centric vs. Node Centric: WSN concentrates on Data rather than node. So redundancy increases in deployment of nodes.
- Simple Software: WSN requires simple software because of small size and Energy constraints than traditional network.
- Self-Configurable: Unlike traditional network, the WSN has the capability to configure the network itself.

II. SYSTEM MODEL

The main idea of LEACH is to make clusters of sensor nodes in light of the quality of the received signals and utilize the cluster heads as switches to the base station. Since data communication to the base station is the primary source of the energy consumption, the roles of the cluster heads rotate among the sensor nodes.

The operation of LEACH is divided into rounds in which each round contain two phases

- 1- Setup phase.
- 2- Steady state phase.

In the setup phase, the clusters are arranged and cluster-heads are chosen. In the first round, every node chooses a random number somewhere in the range of 0 and 1 and compare it to the edge $T(n)$ given and if the number is not as much as a small, the node turns into a cluster head.

Where p represents the level of cluster heads, r represents the number of rounds (revolutions), in each round; chose cluster-heads broadcast an advertisement message to every one of the nodes in the network, illuminating their new status. In the wake of getting this message, each of the non-cluster-head nodes can determine to which cluster they belong to in light of the quality of the got signal. At that point, as indicated by the quantity of nodes in a given cluster, that's cluster-head generates a TDMA (Time Division Multiple Access) timetable, and broadcasts a transmission time window to its CHs.

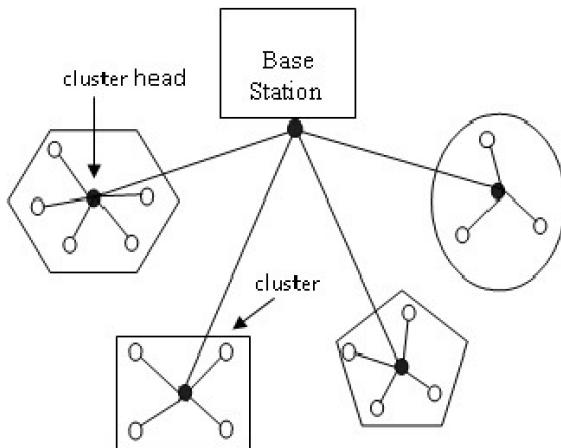


Figure 2.1 LEACH Protocol (Bakaraniya & Mehta 2013).

The issues of wastage vitality in wireless sensor networks coming about because of duplication assignments and capacities for nodes in a similar area inclusion and re-send copy messages. Vitality squandered when misuse certain piece of the network where pass on half of the nodes, which thus leads to the suspension of the whole network. To diminish the high-vitality consumption they proposed the scheduling framework functions to encourage the way toward sending reports from terminal nodes to the intrigued clients or re-broadcasting them to a more elevated amount of the network. Be that as it may, little exertion has been made for the ideal cluster head dissemination, which is an imperative factor for communication vitality productivity. Along these lines, a dispersed cluster heads choice approach ought to be misused to frame sensible clusters so the cluster heads can perform more vitality proficient sending undertakings. Through this element this proposition is a viable and vital addition to the LEACH protocol.

The dispersion of roles dormant cells will empower them to convey roles where oblige nodes that fill indistinguishable need from other neighboring nodes to move to lethargic cells for a timeframe reliant on the time and vitality devoured by the active node. The distribution of functions and tasks during the first phase of the deployment of the network, which can be defined as the objective of this network, expanded network will be dividing into subgroups that is called cluster.

LEACH adopts a progressive and adaptive way to deal with sort out the network into an arrangement of clusters, oversaw by chosen CHs. The CH completes multiple assignments, for example, occasional gathering of data from the individuals from the cluster, accumulation of data to expel excess among corresponded esteems, transmission of the amassed data specifically to the base station through a solitary hop strategy, creation and advertisement of a TDMA plan. In the timetable made by the CH, every node of the cluster is allocated a schedule opening that can be utilized by non-CH nodes for transmission.

III. PROPOSED METHODOLOGY

The wireless networks are division of mobile ad-hoc network has parcel of difficulties to expand the lifetime of the sensor nodes based wireless network to live longer and continue speaking with the network. Here we are to work out main areas by which a node can live longer and i.e. either influence batteries (power source) outfitted with nodes having bigger in estimate or the material having bigger charges sparing ability yet this approach having restricted capacities on the grounds that the bigger battery measure make sensor node more bulky which is not achievable regardless, and to discovering the material has bigger charge storing capacity is likewise difficult task to do. Instead doing above things another strategy is to make transfer of data on network more effective. For this many routing protocols has been given as we discussed in the previously. This examination the hybrid type of two routing protocols predominantly PEGASIS and some element of it adjusted to enhance 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.

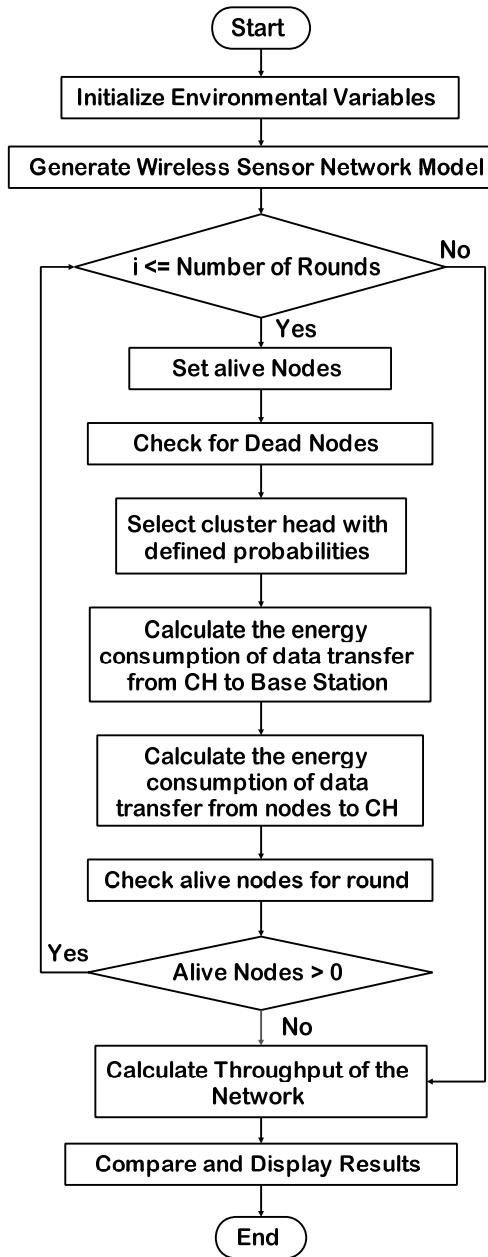


Figure 3.1 Flow Chart of Proposed Methodology.

The implementation and simulation of proposed work has completed on Matlab Simulink Simulation environment. The steps of simulation of proposed work are given as follows:-

- (1) Start simulation in Matlab network simulation environment.
- (2) Initialize variable of simulation environment in Matlab.
- (3) Generate network model of wireless sensor nodes.
- (4) Check for condition if $i \leq \text{number of rounds}$ from algorithm. If conditions is found to be true than follow the next step else calculate throughput of the network.
- (5) set number of alive nodes alive nodes.

- (6) Check for dead nodes in simulating model.
- (7) Select cluster head with defined probabilities proposed algorithm .
- (8) Compute consumption of power during data transfer from CH to base station.
- (9) Calculate the power consumption during data transfer from nodes to CH.
- (10) Check number of alive nodes for round
- (11) If alive nodes are more than 0 jump to step (4) else follow next step
- (12) Calculate throughput of the network model
- (13) Compare results and display.
- (14) End Process.

The primarily and auxiliary cluster heads are equally disseminated all through the network and number of CHs shaped in each round is relatively uniform.

The consistency in number of CHs formed and the multilevel approach enable less number of nodes to take part in long separation transmission, bringing about less vitality utilization in the network and more number of nodes being alive till the end of network lifetime.

IV. SIMULATION OUTCOMES

The proposed protocol has been simulated on Matlab with the random network. Figure demonstrates the extensive vitality investment funds accomplished utilizing LEACH for the vast majority of the parameter space. In addition to decreasing vitality dispersal, LEACH effectively conveys vitality use among the nodes in the network with the end goal that the nodes bite the dust randomly and at basically a similar rate. While these reproductions don't represent the setup time to design the dynamic clusters (nor do they represent any essential routing start-up expenses or updates as nodes kick the bucket), they give a decent first request guess of the lifetime augmentation can accomplish utilizing LEACH.

Figure 4.1 shows the lifetime comparison of Dead Nodes vs Number of rounds. The number of dead nodes are plotted on Y- axis where as number of rounds are plotted on X- axis for hybrid routing of 100 network nodes.

Similarly in figure 4.2 plotted energy consumption of nodes vs number of rounds for hybrid routing of 100 network nodes. From the observation of figure 4.1 to figure 4.2 it is observed that proposed algorithm out performs in terms of network lifetime.

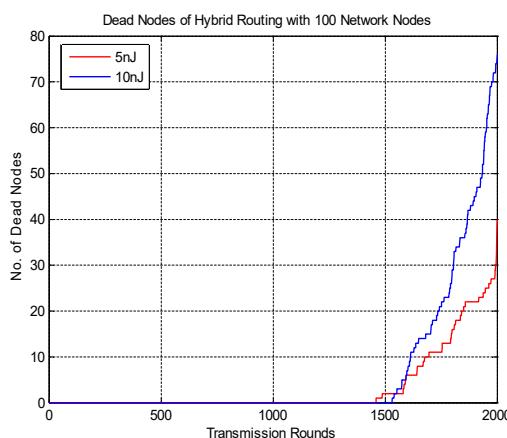


Figure 4.1 Network Life Time: Dead Node vs Rounds

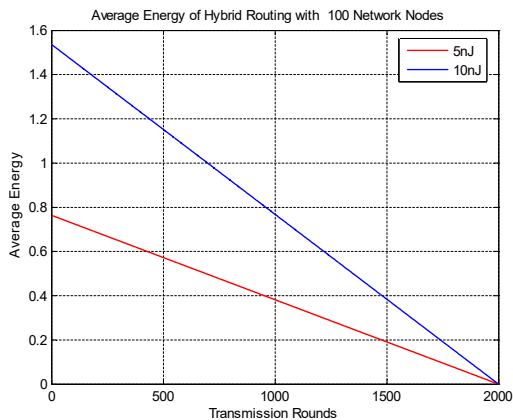


Figure 4.2 Average Energy of Nodes vs Rounds.

V. CONCLUSION AND FUTURE SCOPE

The wireless networks should be support longer to remain with the network, and from the proposed strategy and its simulation investigated that with the lower election probability of cluster head in the hybrid routing will have longer network lifetime which is higher than the current procedures. During simulation of proposed procedure number of dead nodes versus transmission rounds are processed and the equivalent for alive nodes and throughput i.e. packets send to base station likewise ascertained for various probabilities and discovered longer network lifetime (the sensor nodes made due to more number of transmission rounds) with better throughput. With the examination of other network parameters like network area, introductory vitality and so on analyst will make out something more strong routing protocols which have bring down vitality utilization and higher network lifetime.

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