High PDR and Energy Efficient Routing Protocol using in WSN based on Cluster Head and FIS

Niranjan Kumar[1], Prof. Satyarth Tiwari[2]
M. Tech. Scholar, Department of Electronics and Communication, Bhabha Engineering Research Institute, Bhopal[1]
Guide, Department of Electronics and Communication, Bhabha Engineering Research Institute, Bhopal[2]

Abstract- Energy conservation and thereby lifetime optimization of Wireless Sensor Networks (WSN) is an open research area due to their deployment environments. The cost of deployment of a sensor network needs to be amortized by prolonging the network lifetime such that the running cost of the network can be reduced. Before network lifetime can be prolonged, the factors affecting lifetime of a WSN needs to be recognized. Of the different factors affecting network lifetime, some are much more prominent than others and thus need to be addressed with more concern than the lesser prominent ones. It is picking up noteworthy consideration as a conceivable route for Internet specialist organizations (ISPs) and opposite end clients to build up vigorous and solid remote broadband administration access at a sensible expense. This paper present dynamic cluster head selection (DCHS) network and used to fuzzy inference system (FIS) technique. The proposed technique is best performance compared to previous one.

Keywords— Wireless Sensor Network, Fuzzy Logic System, Packet Delivery Ratio, Dead Node, Energy

I. INTRODUCTION

Over the past few decades, Wireless Sensor Networks (WSN) have found their application in diverse fields like military applications, precision agriculture, health care, robotics, environment monitoring, logistics and many more [1]. Sensor nodes have come to the forefront in above mentioned application domains as a natural consequence of the convergence of micro-electronics, mechanical systems, wireless communications and digital electronics [2]. A WSN is comprised of numerous sensor nodes deployed over a ―sensor field‖. The numbers of nodes in a WSN are generally several orders of magnitude higher as compared to traditional ad hoc networks (Figure 1). The data transferred by the deployed nodes are collected at the gateway nodes at the sinks. At the sinks data collected are analyzed and necessary actions are taken. The sinks generally have adequate computation and communication facility, memory space and are connected to a power source. On the other hand, sensor nodes and gateway nodes have lesser computation and communication abilities, lesser primary memory and smaller power source in the form of battery.

WSN A sensor node is comprised of four basic units: (i) a sensing unit, (ii) a processing unit, (iii) a transceiver unit and (iv) a power unit (Fig. 2). In addition to these four basic units there may be application dependent units e.g. location finding unit or mobilizer.

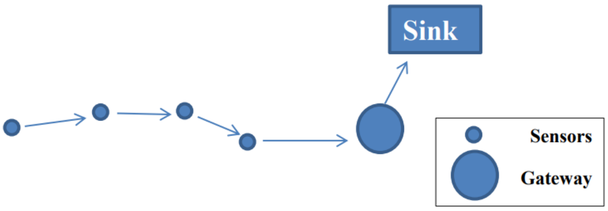


Fig. 1: A single sink

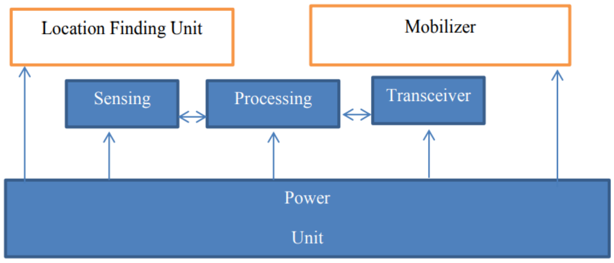


Fig. 2: Basic units of a sensor node

The sensing unit is usually composed of two sub-units: sensors and analog to digital converters (ADC). Analog signals produced due to sensing of physical parameters are converted to digital signals by the ADC. Thereafter it is fed to the processing unit. The purpose of processing unit is to process the digitized signal into transmittable form, as decided by the application. Once the data to be transmitted have been converted into the acceptable format, the transceiver unit completes the action. All these units (and additional units, if any) come as a package more or less close to one cubic centimeter in size [3]. This small size of the sensors constraints its memory, computing and power units. The constraint on power unit is however, the most severe one.

A smart dust mote has a total stored energy in the order of 1 Joule only. Moreover, replenishment of the power sources might be impossible in certain applications. As a result, designing energy efficient routing protocols has been a prominent research area in the field of WSNs. Lesser the energy consumption, more is the lifetime of the network. In other ad hoc networks although energy consumption is an important design factor, it is not the primary concern. However, in WSNs, as network lifetime is solely dependent upon the power unit, power consumption becomes the primary design consideration.

Majority of the energy efficient protocols proposed for sensor networks are designed for single sink scenario [4, 5]. However, one major drawback in having a single sink in a WSN is the possibility of single point failure. In case the only sink present in the network goes down, the whole exercise of sensing, computing and data transfer goes in vain. Other factors like load balancing, reduction in the total number of hops encountered by data packets, reduction in sink hole problem and requirement for providing infrastructure support over multiple interfaces along with increase in the overall network lifetime are important rationale behind choosing multiple sinks for WSNs instead of one sink only [6, 7].

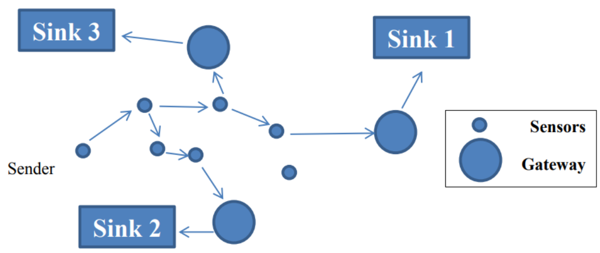


Fig. 3: Multi-sink Wireless Sensor Networks

II. DCHS

In this paper, a clustering algorithm based on clustering is proposed to solve the heterogeneity caused by random selection of LEACH protocol cluster head. First, the k-Medoids clustering algorithm is used to divide the nodes of the whole network area into several classes, and then select the first cluster head and the second cluster head in the cluster.

Algorithm CH-Selection (E, N, K, X, Y)
1. Asc - sort(E)
2. i = 1
3. **while** I ≤ N **do**
4. **if** (E_i>=E_{Avg} and i<= k) **then**
5. Eligible(i) = True
6. **else**
7. Eligible(i) = False
8. **end if**
9. i=i + 1
10. **end while**
11. **if** ($dist_i$ > distj and Eligible (i)) **then**
12. CH_i=CM_j
13. **end if**
14. **return** (CHi , CHj)

Here, we explain in detail our new energy efficient EELACH-C protocol whose goal is to increase the longevity of the network. Let us assume that all the sensor nodes are equipped with equal amount of initial energy.

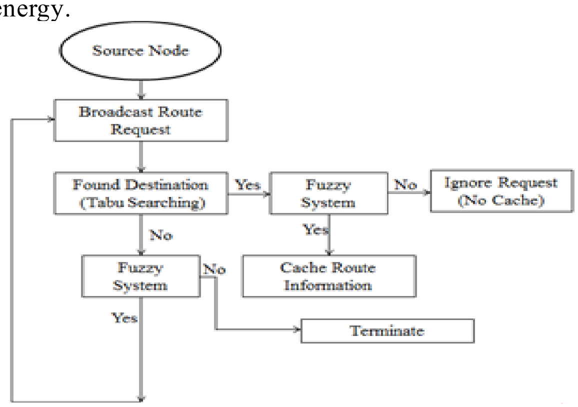


Fig. 4: Flow Chart of Proposed Methodology

The correspondence in WSNs is accomplished through different bounces. The hubs which are in the transferable scope of one another can associate straightforwardly, yet the hubs not coming in the transferable scope of one another can impart the information bundles by utilizing other mid-route bounces for correspondence. About all the steering conventions endeavor to course through most brief way. As we realize that vitality required for the transmission of information bundles is legitimately relative to the way length, all the directing convention that keeps an eye on briefest way has one of the greatest preferred position of vitality productivity. If there should be an occurrence of the briefest way directing some fixed jumps are persistently uses to transmit the information that makes a portion of the hubs be over-burden due to which they pass on making gaps in the system or in most pessimistic scenarios my break the system into equal parts.

In this manner need of burden adjusting steering emerges. The asset usage is one of the significant measurement concerning both static and dynamic traffic request. In [10] the exhibition metric connection use has been utilized for traffic building in the Internet where the point is to upgrade the usage at the best blocked connection. The ebb and flow look into on ideal work system directing [11] normally expected to improve the stream throughput, with fulfillment of the reasonableness requirements.

III. FUZZY INFERENCE SYSTEM

The Fuzzy Logic Algorithm is lit up by the intense capacity of fluffy rationale framework to deal with vulnerability and uncertainty. Fluffy rationale framework is notable as model free. Their enrollment capacities are not founded on factual dispersions. In this paper, we apply fluffy rationale framework to streamline the directing procedure by some foundation. The principle objective is planning the calculation to utilize Fuzzy Logic Systems to extend the lifetime of the sensor systems.

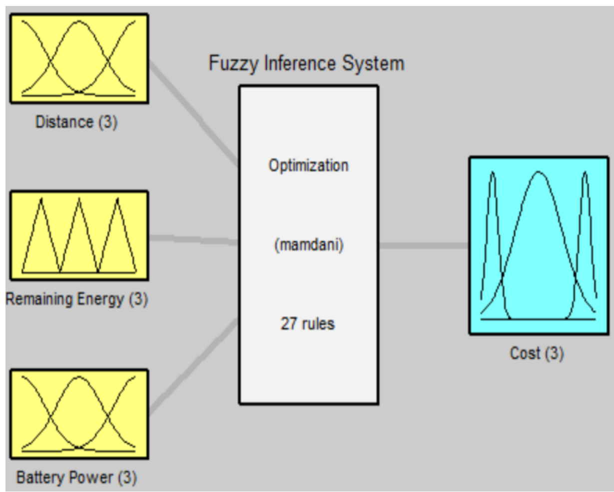


Fig. 5: Optimization 27 rules with 3 inputs, 1 outputs

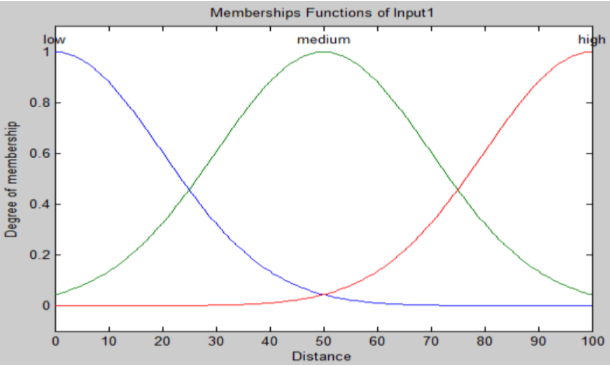


Fig. 6: Members Functions of Input1

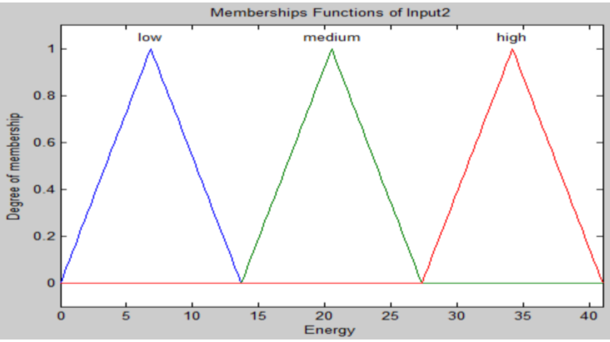


Fig. 7: Members Functions of Input2

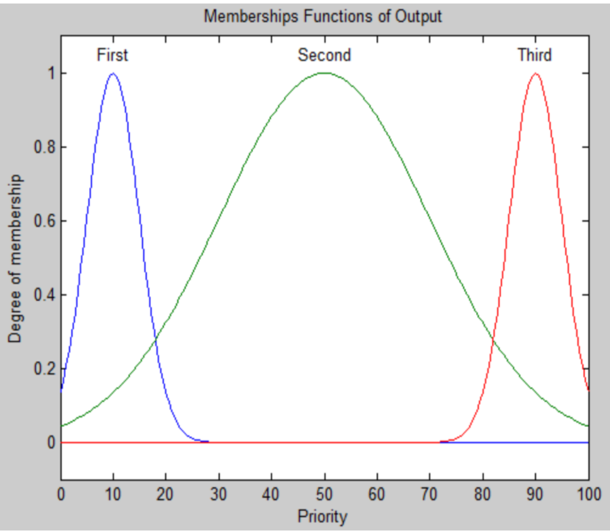


Fig. 8: Members Functions of Output1

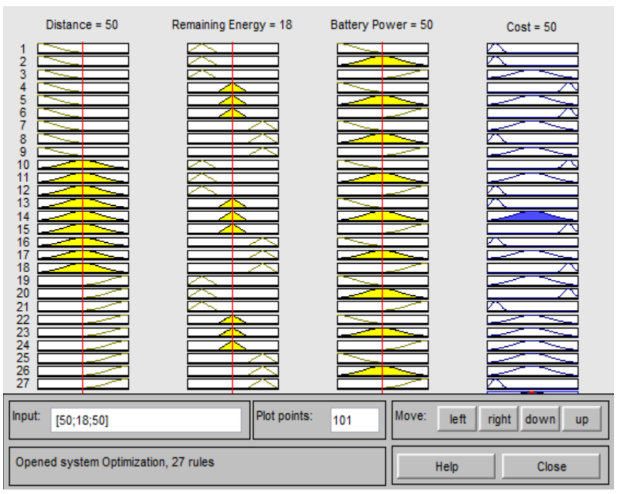


Fig. 9: Rule Viewer Optimization

The throughput in the correspondence in work spine of remote work organize can be expanded by the expansion of new portals as the expansion of new doors effectively lessens the ordinary transitional hubs expected to get to the doors and furthermore it lessens the traffic load from the current entryways. The above preferences can be decreased as a result of the unsatisfactory task of the area to the portals; wrong situation of the new passages may likewise meddle with the current doors. Subsequently the privilege position of the door discharging traffic stacks in the system just as limit the obstruction. A creative plan is proposed in [10] to choose the passage for introducing a WMN if there should arise an occurrence of debacle recuperation which is utilized to accomplish the most extreme throughput of the framework. As indicated by [8] the base station is at the focal point of the system and various work switch it can choose as entryways and sets up the association with every one of them.

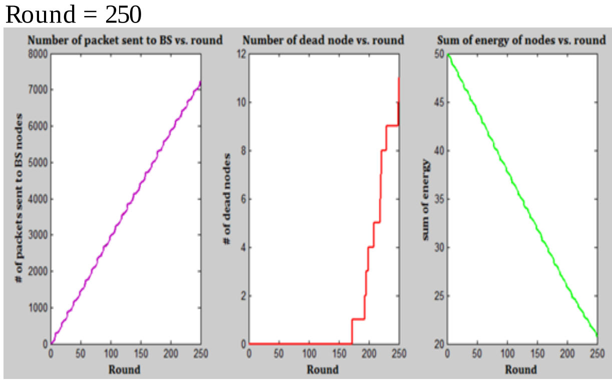
Especially, because of the base station bolsters one channel, it is expected here that a solitary channel is utilized for the correspondence between the work switches. Here a system topology has been intended for the examination of the framework limit throughput. In this the remote work switches are composed discretionarily in certain zone. So as to keep up a one of a kind steering way by expelling the excess way least spreading over tree has been utilized.

IV. SIMULATION RESULT

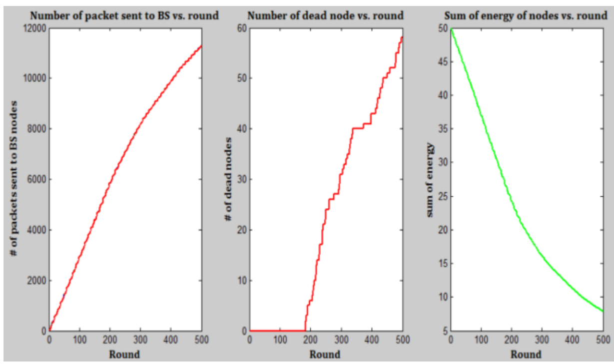
In this subsection we evaluate the performance dynamic cluster head selection using fuzzy system in terms of:

Packet delivery ratio (PDR): The proportion of successful data packets delivered to the destination compared to the total generated data packets.

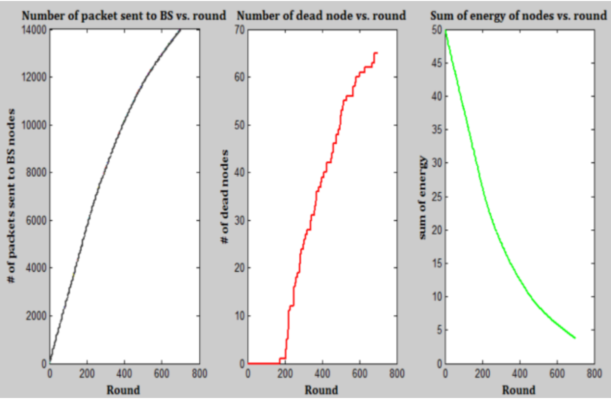
Round = 250



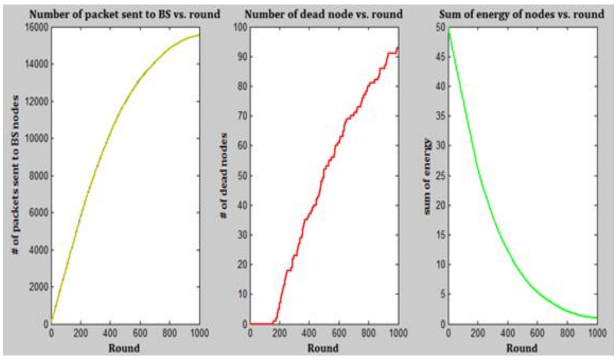
Round = 500



Round = 700



Round = 1000



Round = 1200

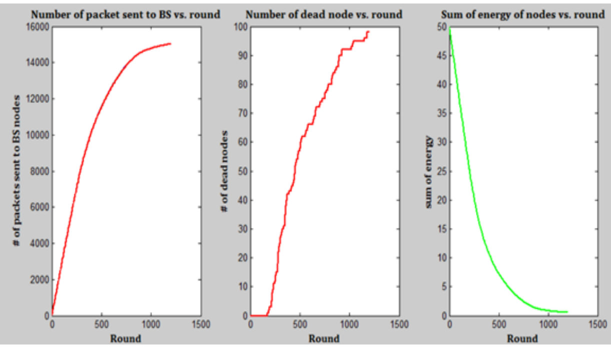


Table 1: Packet Sent to Base Station Node

Round	250	500	700	1000	1200
	7100	11300	14000	15500	15800

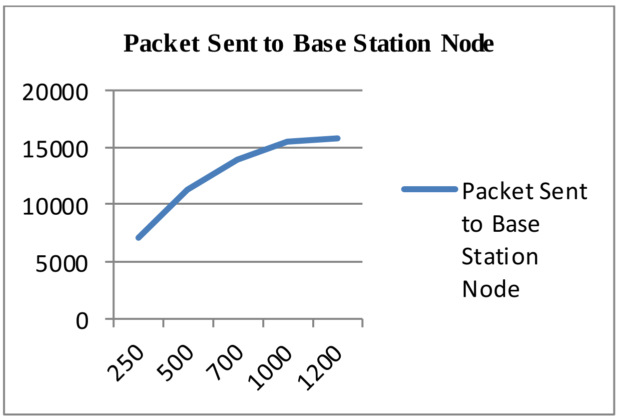


Fig. 10: Bar Graph of the Packet Sent to Base Station Node for Different Round

Table 2: Dead Node vs Round

Round	250	500	700	1000	1200
	11	58	65	91	93

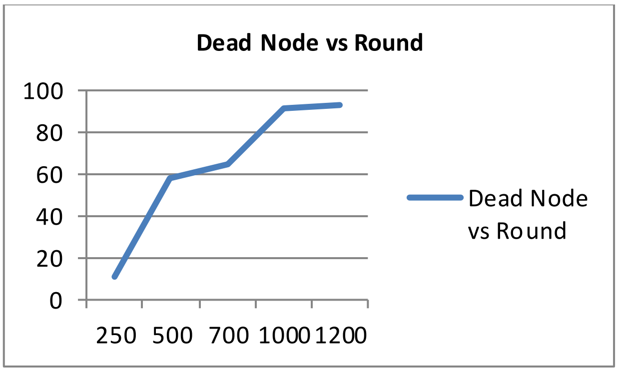


Fig. 11: Bar Graph of the Dead Node for Different Round

Table 3: Sum of Energy vs Round

Round	250	500	700	1000	1200
	22	8	4	2	1

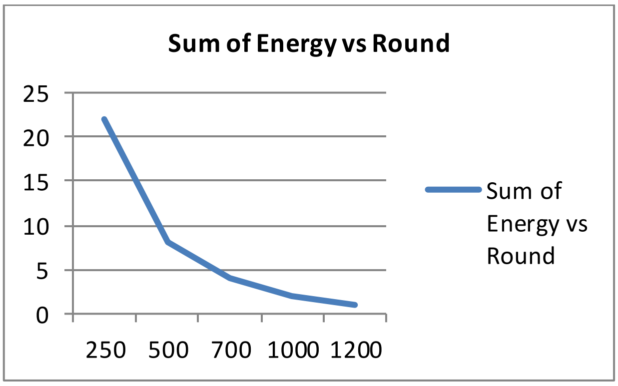


Fig. 12: Bar Graph of the Sum of Energy for Different Round

V. CONCLUSION

Over the years many energy efficient techniques have been proposed to reduce energy consumption in a WSN. However, almost all those techniques proposed were for single sink WSN. This thesis proposes a technique for prolonging lifetime of a multi-sink WSN. In this thesis, firstly, different factors leading to energy consumption of the deployed sensor nodes in a network were recognized. Thereafter, on a closer observation, the primary factors affecting energy health of a WSN were identified. The most prominent of all the different factors affecting lifetime of a WSN as identified in this thesis is the distance travelled by data packets. Simulation results shows that the proposed algorithm is much better than existing algorithm in terms of energy efficiency and lifetime of the network.

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