WWJMRD 2018; 4(3): 92-98
www.wwjmrd.com
International Journal
Peer Reviewed Journal
Refereed Journal
Indexed Journal
UGC Approved Journal
Impact Factor MJIF: 4.25
E-ISSN: 2454-6615

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To Evaluate and Propose Secure Data Aggregation Technique for WSN

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Abstract
The Wireless Sensor Networks (WSN) resides of an oversized range of Sensor nodes that area unit incomplete in energy, process power, and storage. The energy of nodes is that the most vital thought amid them as a result of the time period of Wireless sensor Networks is incomplete by the energy of the nodes. LEACH is one in every of the foremost celebrated clump mechanisms; it elects a cluster head (CH) created on a chance model. This paper improves LEACH protocol mistreatment Cross Layer LEACH and HEED and Super Cluster Head. Hybrid Energy economical Distributed protocols for the heterogeneous wireless sensor network are according. The most necessities of the wireless sensor network area unit to prolong the network time period and energy potency. Here, Heterogeneous- HEED: A Protocol for clustered heterogeneous for Wireless sensor Network has been proposed to prolong the network time period. Here residual energy and network life time area unit the fundamental parameters that area unit accustomed improve the work.

Keywords: HEED, WSN, SCH, Protocol, Algorithm etc

I. Introduction

TQM has been presented by many definitions over the years. TQM is ways of thinking that typical sensor nodes area unit ready to perform sensing, processing and communication elements, creating them possible for a large vary of promising applications, like environmental watching (e.g., humidity, temperature), disaster, healthcare, military, etc. [1]. Sensor nodes for these applications area unit typically deployed densely and operated autonomously. Sensor nodes area unit usually battery hopped-up and left alone in adverse environments, creating it quite difficult to recharge or replace node batteries. Hence, one in every of the crucial challenges in WSNs is to prolong network lifespan thanks to affected energy resources. The critically-located sensors area unit those situated close to the sink, which carries the burden of relaying massive amounts of knowledge traffic, particularly once multiple high-rate routes taste these nodes. Thus, avoiding the failure of such nodes caused by early energy depletion is vital for up the network lifespan. Another necessary challenge happens once every and each node needs to at the same time transmit and receive knowledge at an equivalent time [2]. This can cause plenty of knowledge collisions and congestion. As a result, an oversized quantity of energy is wasted, and most of the nodes can run out of energy terribly quickly. Several proposals have targeting up the energy potency. The analysis in data-centric WSNs is targeting bunch by reducing the quantity of transmissions to the sink, selectively of a correct mackintosh layer associated an energy-efficient knowledge aggregation mechanism to alleviate the challenges of WSNs. bunch means that grouping the nodes supported geographical location into totally different clusters. The bunch technique decreases the quantity of nodes needed to forward knowledge to the sink node, thereby reducing the channel load and up the quantifiability [3].

However, the benefits of bunch algorithms go together with further overheads throughout CH choice and therefore the cluster formation method. Improvement within the mackintosh layer will increase the responsibility and increase the sleep time of nodes. The mackintosh layers are often supported rivalry, contention-free or hybrid protocols.

II. Related Works

Wireless sensor nodes have certain constraints associated with them particularly minimizing energy consumption is the basic and key requirement in formulating the sensor network protocols. Since the nodes are small, it is untenable, batteries may drain out very fast, so it is necessary that the network be energy efficient in order to maximize the lifetime of the networks [6]. It demands fault tolerance scalability, production costs and reliability[6].By using direct diffusion(DD), a query based technique for routing the packet and by aggregating, caching and reinforcement the suitable link is dynamically selected for transmission. In LEACH protocol the selection of cluster head is elected dynamically in rotation. Data fusion is adopted to reduce the amount of data send over the link in the network [3]. In continuation the time interval is partitioned into fixed intervals with equal length and updating is made for selection of CH here[4,5]. Sensors sense and gathers the data's of its sensing and through the data forwarding transmission technique the data's are transmitted[5,6]. Some stochastic mode of technique is adopted for cluster head selection. In HCR method each cluster is managed with the set of associates and the lifetime of the clusters last long [7]. In S-MAC concept, some random nodes are put to sleep mode for a particular time till then the traffic is controlled by storing the packet in the neighboring nodes. When the node is ON it starts retrieving the packets from its neighboring nodes. This mode selection is made in random so that the consumption of energy by the network is maintained low[8]. In some papers it is discussed that the cluster head is selected based on the number of times the node has been a cluster head so far or by choosing the random number and if it's below the optimized threshold that particular nodes is given a chance as a cluster head in the network[9]. Some cases by deducing the hierarchical clustering strategy it has been found that the energy savings increases with the number of levels in the hierarchy [10]. As a conclusion, CHs are elected based on the various techniques seen above and these strategies supports the concept of reducing the residual energy in the network. Even the concept of iteration plays a vital role in electing the heads as term basis and performs the task. Critical data's are sending out to the destination immediately after sensing the status of it.

III. Low Energy Adaptive Clustering Hierarchy (Leach)

LEACH is the first network protocol that uses hierarchical routing for wireless sensor networks to increase the life time of network (as shown in figure 1.6). The entire node in a network organizes them into local cluster, with one node acting as the cluster head. All non-cluster head node transmit their data to the cluster head, while the CH node receive data from the entire cluster member, perform signal processing functions on the data aggregation and transmit data to the remote base station. Therefore, being a cluster head node is much more energy intensive than being a non cluster head node. thus, when a cluster head node dies all the nods that belong to the cluster lose communication. The problem of LEACH protocol is balance the energy consumption, network energy consumption. LEACHES minimize the communication energy that is dissipated by the cluster heads and the cluster members as much as 8 times when compared with direct transmission and minimum transmission energy routing.

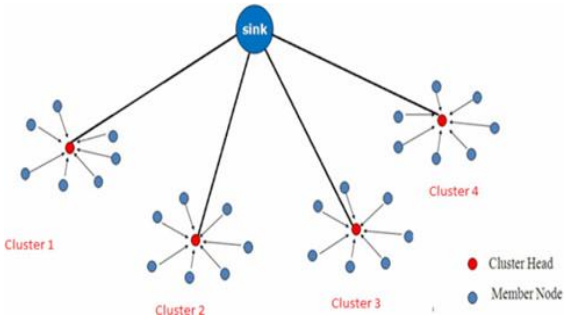

Fig.1: LEACH Protocol [1]

IV. A Power-Efficient Clustering Scheme

A "super" cluster that contains all sensors of the WSN would be attractive. However it is not feasible as the size of WSN grows larger. Considerations such as energy limitation, cost, and scalability make a single-centered WSN not only unfavorable, but also difficult to implement. The proposal of hierarchical organization of WSN is to distribute the computational and managerial tasks to a group of cluster heads. This approach will reduce the communication traffic in network, and will allow the deployment of less powerful, lower priced processors to do the WSN's computational and managerial jobs in a collaborative manner. We assume each transmission round will collect data from one sensor. That is a simplification of real situations where multi-channel transmission/reception maybe supported [11].

V. Heed Algorithm

HEED clustering algorithm is a distributive clustering method that considers energy and communication value at the similar time. HEED is iterative grouping algorithm formula that utilizes the residual energy of nodes and their communication value to settle on the most effective set of cluster head nodes. Throughout clustering procedure, a sensor node may well be tentative cluster head, final cluster head or coated. At the start of grouping part, a node with higher energy state is additionally probable to be selected as a tentative cluster head. It sends a message to all or any sensor nodes existing in its cluster vary and informs them concerning its new condition [12]. For this purpose, AMRP (average power) is introduce cost criterion and is exploited for breaking constraints in the procedure of cluster head selection. This formula has four main goals [13]:

- Increasing network lifetime by distributing energy utilization
- Terminating clustering method by constant variety of iterations
- Minimizing management overload
- Providing acceptable distributed cluster heads and compressed clusters. HEED doesn't think about any assumptions concerning distribution, density or ability of nodes (such as nodes ability relative to their location). Since the formula aims to prolong network period, it decides supported the residual energy of every node. Thus, cluster vary is decided by transmitted power level utilized in inhume cluster communication and through clustering [14].

  When many nodes are the candidate for being cluster head, the node that has all-time lowest inter-cluster value is going to be elite as the cluster head. This cost is a function of:

- Cluster characteristics, like the size of a cluster.
- Variability or non-variability of energy levels utilized in intra-cluster communications. If power levels for cluster nodes are an equivalent, communication value can be addicted to the following parameters: Node degree, if it's necessary for the load to be distributed on cluster heads. An inverse of node degree, if denser clusters are needed. Now consider a case where variable power levels could be utilized for intra-cluster communications. In this condition, MinPwri is the minimum power node i (1<i<M) [15].

A) **Distance calculation**

To avoid the selection of the node with low residual energy as a cluster head, the residual energy takes into consideration when the value of the threshold is calculated. Initially, the network all the sensor nodes in the network is divided into smaller groups known as clusters. These clusters further involve in cluster formation and cluster head selection. During the cluster head selection process, all the nodes in a particular cluster select a head node that is known as cluster head. The selection of cluster head depends upon on the distance from the base station and residual energy

Algorithm for Cluster Head Selection

Input: N, IE
Output: Cluster Head
Begin
For all nodes N, update location;
Split node based on the location;
Compute energy for all nodes N;
If deg (v_i) > N(v_{ij})
Select as a Node as a CH and allocate slot;
End If;
If (N IE<NE || N IE = NE)
If (NID_{ID}<BD)
Select Node as Super Cluster Head and calculate the distance between nodes for transmission
End If;
End If;
Return;
End;

The above algorithm describes the cluster head selection, where the node and the initial energy are taken as the input. For all nodes, update the location and then split that nodes based on the location. If the initial energy of the node (NIE) is lesser than the total number of energy (NE), then it checks for the current node distance. If current node distance (NID) is less than the base station's distance (BD), then the cluster head will chose and allocate the slot accordingly. The distance of the node from the base station to destination is calculated to discover the route. The distance between the source node and all other nodes can be calculated by using the formula.

$$D= \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$$

Where, (x1, y1) are the positions of the source node and (x2, y2) are the positions of the node from which the distance is calculated. After finding the shortest distance from the base station, the residual energy is calculated by using the cross-layer protocol.

Initially, the position of the node is updated and the neighbor node with one-hop distance is estimated. Furthermore, it verifies whether the node is in the neighbor list or not. If this case is true, then it checks whether the remaining energy is greater than the threshold value. If the condition satisfied, then the relay node is selected. Once the node is equal to the destination, then the data will processed and stop the relay station. Let us consider E_i be the initial energy of a node, and the residual energy is E_{re} of a node at time t, can be calculated by using the formula:

$$E_{re} = E_i - E_c (t)$$

Where, E_c is consumed energy and is estimated as follows:

$$E_c (t) = E_{tx} + E_{rx} + E_i + E_s$$

Here, the E_{tx} denotes the transmission energy, E_{rx} is the reception energy, E_i is the idle energy, and Es is the sleeping energy. In case, if the distance is within the transmission range and the node energy is less than the threshold value, then update the neighbor list of the source node. A route error message is sent back to the previous process. Once again the distance calculation is performed. If the energy value is greater than the threshold value, the route will be maintained.

VI. Results

This includes the different snapshots that are on research work. These are given below:

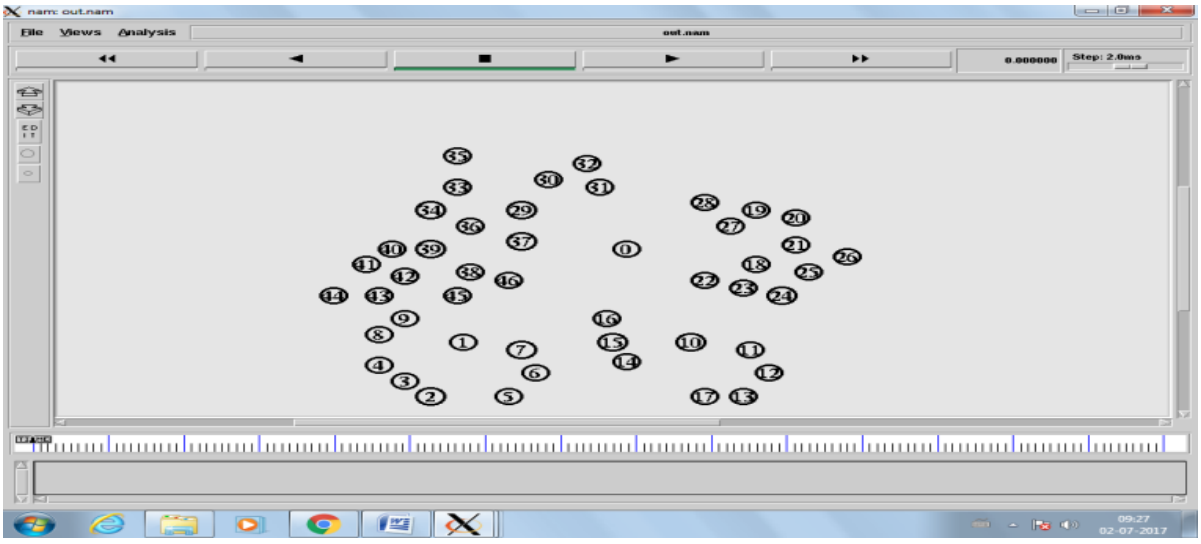

Fig. 2: Input node distribution

Figure 2 is the input node distribution on the network. In this figure, different nodes are located at different positions on X-axis and Y-axis. Each node has unique ID to identify the address.

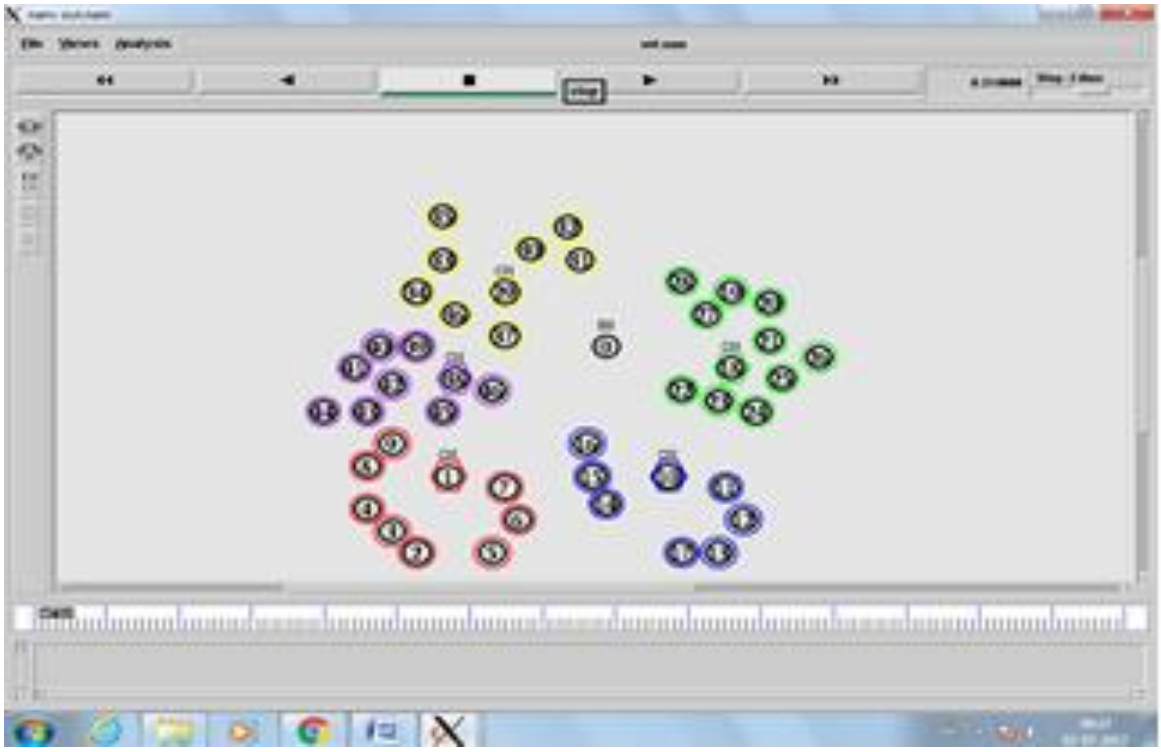

Fig. 3: Node and Cluster distribution with colour

In figure 3, is the processing of nodes with their colour. Here each node has different colors.Some node has red, green, purple and yellow colors. Different colour node has different clusters.

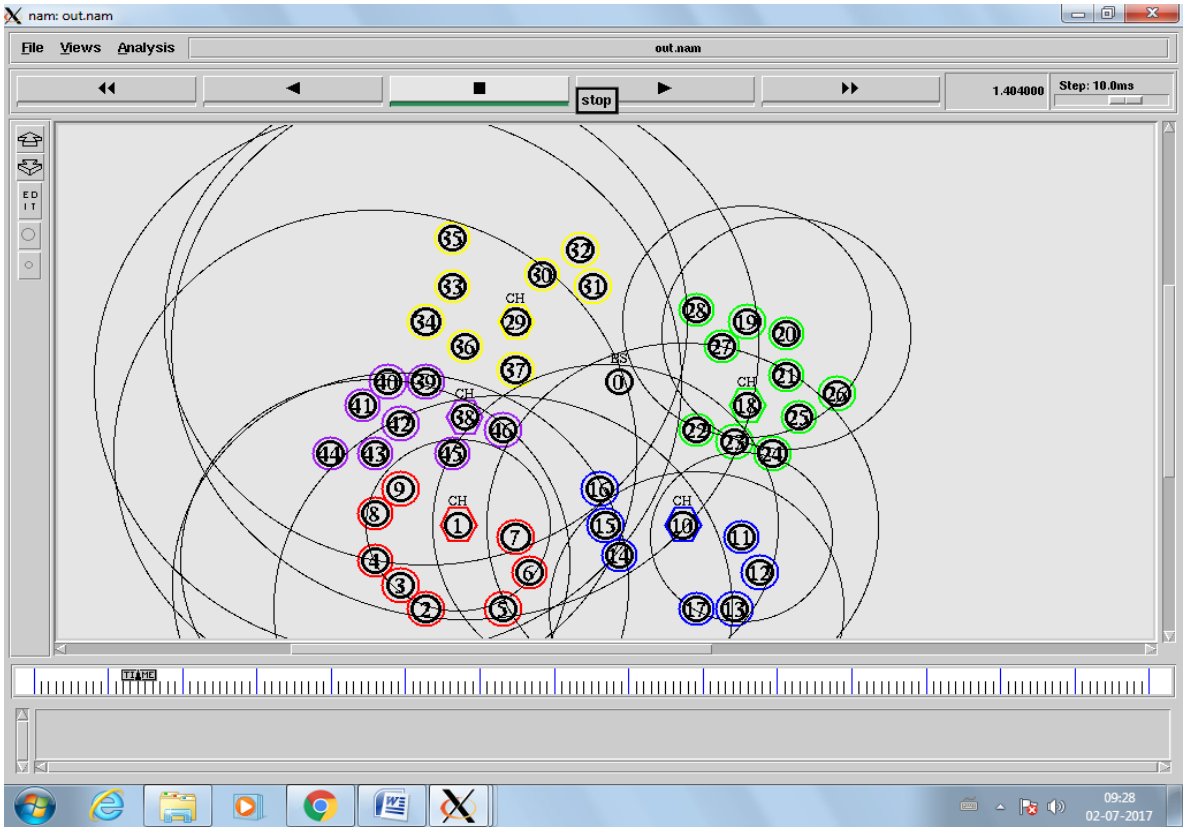

Fig. 4: The transmission of signals in nodes and clusters

Figure 4 is the transmission of the signals in nodes and clusters. In this figure, different circles are displayed. It is the processing of signals between clusters and nodes.

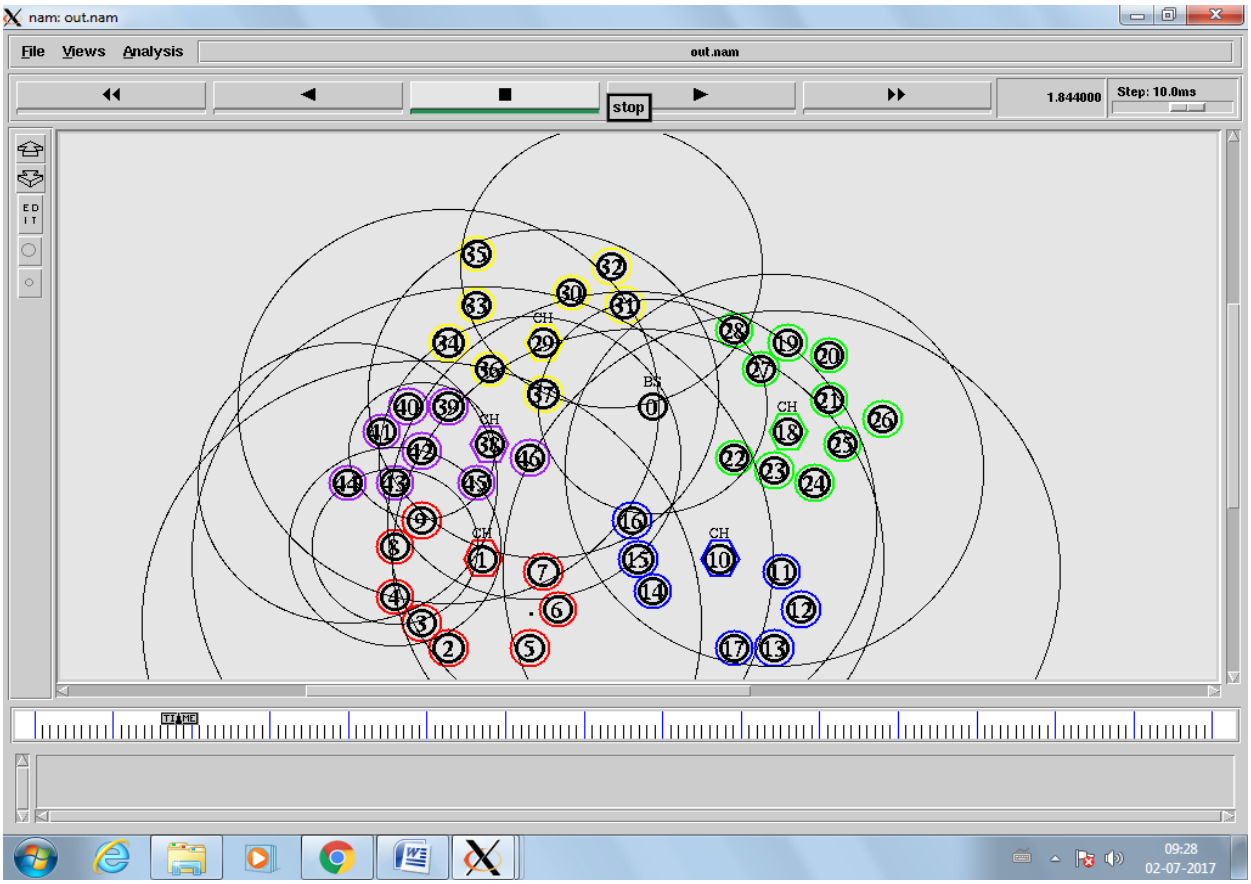

Fig. 5: Node and cluster transmission of signals

Figure 5 is the broadcasting of the signals from node to node and the clusters. Here the signals are broadcasts with different signals. In this source and destination receive signals

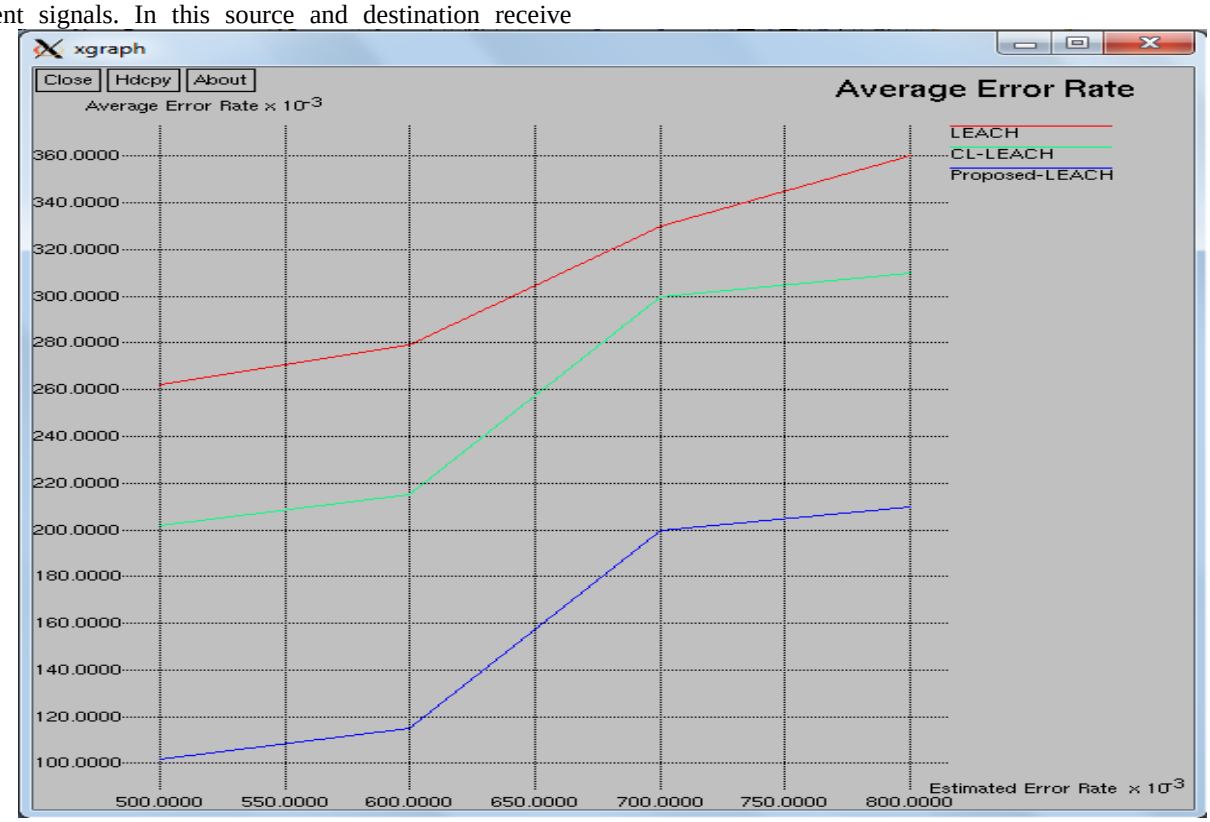

Fig. 6: Average Error Rate w.r.t Estimated Error Rate

The figure 6 is the Average Error Rate w.r.t Estimated Error Rate. In this figure green line is the existing work and the Blue line is the proposed work.

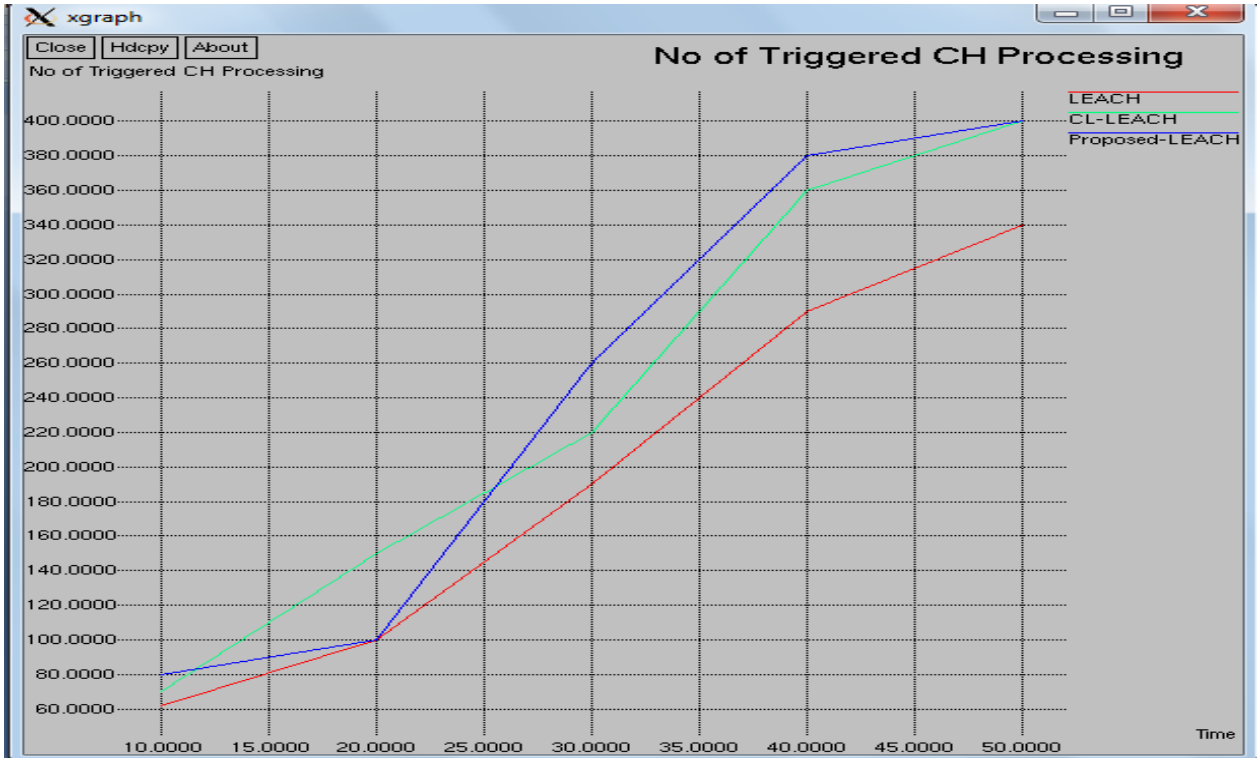

Fig.7: No of Triggered CH Processing w.r.t time

The figure 5.9 is No of Triggered CH Processing with time during the transmission of data on network. It is the total No of Triggered CH Processing with respect to the time.

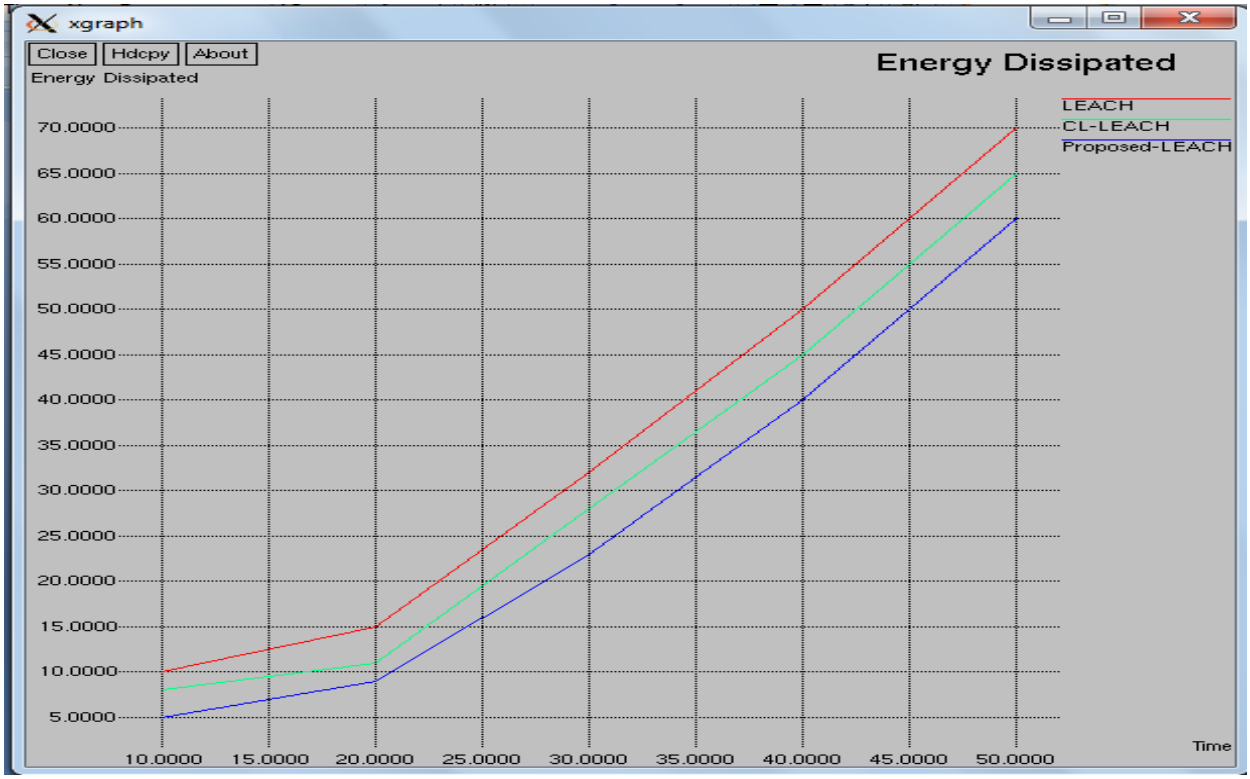

Fig.8: Energy _Dissipated w.r.t time

The figure 5.7 is the energy Dissipated of signals from node to node and node to the cluster head. It displays the total energy used in Network with time.

VII. Conclusion and Future Scope

Clustering is one of important method to be applied in order to prolong the network lifetime of wireless sensor network. The existing protocols are not applicable to those WSNs that are deployed in large regions because it uses single hop routing where each sensor node can communicate directly to the cluster head and the base station. So, it causes problems of energy imbalanced. In this work there is data duplication and data redundancy problem that I have faced and some other problem is the

network life time problem due to the redundancy and transmission energy is lossed, so there is energy consumption problem. Due to these problems some other problems like scheduling problem. All these Problems are resolved with the help of the hybrid techniques (combinations of Modified LEACH and SCH) for data aggregations and for energy efficiency; the CH based routing algorithm on WSN is designed. The whole work is implemented in the NS2. The performance of proposed work is better than the existing work. The overall performance of work is 70%.

Future Work

The research work includes a new energy-efficient routing algorithm for the software-defined wireless sensor networks. In our routing algorithm, the control nodes are assigned different tasks dynamically. It is further implemented with the help of other intelligent types like Honey Bee and ACO with PSO to get the real time work

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