# A Novel Hybrid Technique Based upon Static and Dynamic Clustering to Reduce Consumption in Wireless Sensor Network

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**Abstract:** *The wireless sensor network is the type of Ad hoc network. Wireless sensor network is the self configuring networks; any sensor node can join or leave the network when they want. In Wireless sensor network no central controller is present, wireless sensor node are responsible for data routing in the network. Wireless sensor network is used to monitor the environmental conditions like temperature, pressure etc. Wireless sensor network is deployed in the far places like forests, deserts etc .Wireless Sensor nodes are very small in size and have limited resources. In such far places it is very difficult to recharge or replace the battery of the sensor nodes. In such conditions, we focus to reduce the battery consumption of the sensor nodes. In this work, a new technique is proposed to reduce battery consumption. It will be based on the dynamic clustering using neural network. Experimental results show that new proposed technique is more efficient, reliable and provide more throughput as compare to the existing technique.*

**Keywords:** *Scalability, Fault Tolerance, Neural Networks, LEACH*

## I. INTRODUCTION

A wireless sensor network is a collection of nodes organized in cooperative network. These nodes are the sensor nodes which communicate over the wireless medium. The wireless medium may be either radio frequencies, infrared or the other medium, of course, having no wired connection. These nodes are deployed in a random fashion and they can communicate among themselves to make an ad-hoc network [1]. A sensor node consist a senor module, a battery, a processor and a radio module.

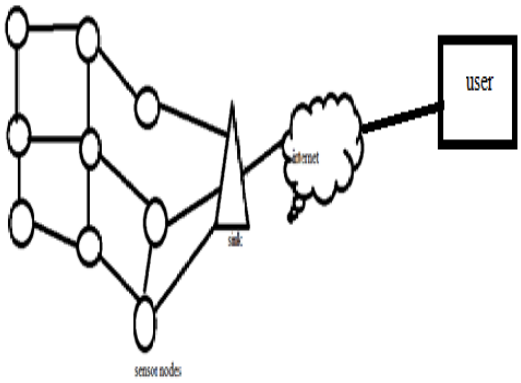


Fig.1.1 Wireless Sensor Network

A wireless sensor network consist a large number of sensing nodes, these nodes are low-power multi functioning sensor nodes, operating in an unattended environment with limited computational and sensing capabilities [3]. The sensor nodes are self-powered nodes and the sensor nodes are used to detect special events and process their data to a base station over wireless fashion.

**1.1 Issues in Wireless Sensor Network:** There are many issues in wireless sensor network. Some protocols are used in WSN, they are used to maximize the lifetime of the network by the effective management of the energy resources. The main challenges are [4]:

**1. Fault Tolerance:** In the WSN, it generally faces the problem like node failure. The nodes can be fails due to physical damage, hardware problem or may be the energy consumption. Generally this kind of problem is occurs in case of infrastructure base wireless network or we can say in case of wired network [4].

**2. Scalability:** In WSN network the scalability of the nodes vary from one to thousand. It depends upon the situation that what is the need of the environment at the particular time. The protocols used in the WSN need to maintain a particular platform to resolve the issues arises in the network. So that it can maintain the performance of the particular network.

3. **Unrehearsed:** The sensor nodes are not connected to the energy sources. In the WSN there is the finite source of energy, which is optimally used for the processing and the communication. For the use of optimal energy the communication between the sensor nodes should be minimize [5].

**1.2 Dynamic clustering:** Dynamic clustering is an energy efficient algorithm. Energy dissipation of the network can be reduced by using clustering algorithms. The energy consumption of wireless nodes is depends upon the transmission distance, optimal routing protocols and amount of data to be transmitted.

In cluster based wireless sensor networks, cluster heads (CH) meets these requirements 1) same adjacent sensors are grouped into a cluster. 2) High energy resources 3) Network should be distributed. Low Energy Adaptive Clustering Hierarchy (LEACH) gives a simple distributed clustering scheme for evenly distributing energy dissipation **[11].**Probability function is used to rotate the position of the CHs. Optimal energy dissipation is not considered by LEACH at each round. CHs are never distributed in LEACH [5].the main aim of dynamic clustering technique is to assign data set patterns to the cluster. Example of dynamic clustering algorithms are LEACH, HEAP

1.3 **Static Clustering:** Static clustering is a technique in which once the cluster is created remains same throughout the network lifetime. Main protocols of static clustering are:

**1. EEPSC:** Energy Efficient Protocol with static clustering divide the networks into clusters, eliminates the overhead of dynamic clustering and utilizes temporary-cluster-heads to distribute the energy load among high power sensor nodes; thus extends network lifetime. The operation of EEPSC is broken up into rounds, where each round consists set-up phase, responsible node selection phase and steady-state phase.

**2. EEEPSC** (Enhanced Energy Efficient Protocol with Static Clustering): Enhanced Energy-Efficient Protocol with Static Clustering (E3PSC) which is basically a modification of an existing routing scheme, Energy-Efficient Protocol with Static Clustering (EEPSC). In EEEPSC, cluster-head selection is performed by taking into account both the spatial distribution of sensors nodes in network and their residual energy with an objective to reduce the intra-cluster communication overhead among the nodes making the scheme more energy-efficient base station computes the mean positions of node-distribution (Pmeani ) of every cluster where i is cluster id which help in reducing the inter-cluster communication.

## II. REVIEW OF LITERATURE

In 2014, Jaideep and Rajiv, "Fault Tolerant Mobility and Aware Routing Protocol For Mobile Wireless Sensor Networks" [1] mentioned that wireless sensor network has made its steps in mobility based applications like health monitoring, wildlife monitoring, search and rescue, it is desirable to have a reliable routing protocol to deal with the routing issues of mobile sensor nodes and battery is also the main constraint for sensor nodes so routing protocol should be energy efficient. Existing approaches for routing in Cluster Based Mobile Wireless Sensor Network (MWSN) considered nodes equipped with GPS for getting its location and delay in joining the mobile node that get out of the cluster in joining new cluster is high. Also the routing between cluster heads is not discussed in existing approaches. So in this study, the fault tolerant routing protocol has been proposed that achieve fault tolerance of cluster heads while routing and mobility management of mobile sensor nodes to reduce packet loss during data transmission in MWSN.

In 2014, Bala Krishna Maddali, "Core network supported multicast routing protocol for wireless sensor networks", [2] explained that the proposed protocol comprises of heterogeneous nodes such as

cluster head (CH) nodes, core nodes (CNs) and sensor nodes (SNs). Multicast routing in the proposed core network supported multicast trees balance the load in the network and improve the network performance as compared to the existing WSN multicast routing protocols. The proposed CNSMR protocol is compared with the existing WSN multicast routing protocols such as DCME-MR, Intelligent-MR, H-GMR and OnDemand-MR. Simulation results indicate improvements in delay latency, energy save ratio, throughput rate, end-to-end packet delay, multicast control overhead ratio and packet delivery ratio for the proposed protocol.

In 2011, Mehrdad Ahadi and Amir Masoud Bidgoli**,** "A Multiple-Sink Model for Decreasing the Energy Hole Problem in Large-Scale Wireless Sensor Networks" discussed that the communication in the WSN [3]. The data received by the nodes of wireless sensor Networks should be sent to the sink. It helps to performing calculations and making the right decisions. The density of data packets increases near

the sink. This scenario is known as the Energy Hole. In the WSN the problem of energy hole should be reduced. It is the one of the key factors for designing large scale wireless sensor networks. The multiple sink model is used to reduce the problem of energy hole. It is done by increasing the number of nodes in the vicinity of the sink. This model consists of different levels of sink intensity. The sensor nodes are responsible for processing their surroundings. It sends the collected data to a specific node called sink. The energy maintenance plays a significant role in consistency of these networks.

**In 2009, Imad S. Alshawi** et al. proposed a new routing method for WSNs to extend network lifetime using a combination of a fuzzy approach and an A-star algorithm. The proposal is to determine an optimal routing path from the source to the destination by favoring the highest remaining battery power, minimum number of hops, and minimum traffic loads. To demonstrate the effectiveness of the proposed method in terms of balancing energy consumption and maximization of network lifetime, they compare their approach with the A-star search algorithm and fuzzy approach using the same routing criteria in two different topographical areas [4].

3. **LEACH (low energy adaptive clustering hierarchy**)

It is first Energy efficient routing protocol for hierarchical clustering. LEACH is "low energy adaptive clustering protocol". LEACH form clusters and selects randomly cluster Heads for each cluster. Non- cluster heads sense the data and transmit this data to cluster head, then cluster head aggregate the data and forward this data to sink.

The principle of this protocol is that it assigned overall energy consumption of the network uniformly to each node by selecting periodically different nodes as a cluster head [5].

There are two phases of LEACH

(a) Set up phase

(b) Steady state phase

In set up phase, clusters are formed and cluster heads are selected. In steady state phase, data from non-cluster heads is transmitted to sink. The sensor nodes communicate with cluster heads with allotted time using TDMA. Cluster heads are randomly selected in each round. LEACH operation is divided into several rounds. Each round begin with set-up phase. In this clusters are organized. LEACH set a threshold value T(n) and then sensor node I generates a random number between 0 and 1. If random number is < T(n) , the node will become cluster head for current round and common nodes join the cluster and become cluster members.

$$T(n) = \begin{cases} \frac{p}{1-p*(r \bmod \frac{1}{p})} & if\ n \in G \\ 0 & otherwise \end{cases} \quad (1)$$

p is probability of node to be selected as cluster head.

r is number of rounds passed

G is selection of ordinary nodes

Once a node become cluster head never become cluster head again, only the node which have not become the cluster head and have high energy can become cluster head at r+1.When cluster head assigns time slots to the members using TDMA then it shifted to the steady state phase. After shift in steady state phase, members sent data to cluster heads , cluster head process the data and then send data information to the base station. After this round, it turn to next round and begin reconstruction new

round [6].. LEACH does not require the control information from the base station and the nodes do not require knowledge of the global network in order for LEACH to operate. LEACH reduces communication energy by 8 times as compare to direct transmission and minimum transmission energy routing. Disadvantages of LEACH are that the cluster heads are elected randomly. So the distribution of cluster heads cannot be ensured. In this protocol, the nodes which have low energy has same priority as the nodes having high energy. Nodes having low energy can become cluster heads. It cannot use in large scale communication.

## III. PROPOSED METHODOLOGY

There is a problem in current work when data is transferred from source to destination; sometimes cluster node became dead due to failure of battery power. This will lead to the problem of degradation of the network and network performance decrease. So there are different techniques minimum energy consumption like clustering, re-girding etc. So the consumption of energy becomes minimum. The main concept of this work is to implement rebuilding of grid for WSN networks using neural network approach. In neural networks weights can be adjusts easily by applying some algorithms. This concept becomes key point in our work also. Here we adjust nodes not weights according the sending capacity of those nodes for communication. The node which has the higher sending capacity as compare with other nodes in a cluster that node becomes the cluster head of a cluster. In a cluster one node should be act as a cluster node only. There is only one cluster head is present in a cluster and number of cluster heads is present in a network. The re-clustering is dynamic processes which can be adjusted according to the situation.

## IV. EXPERIMENTAL RESULTS

The whole scenario is implemented in Ns2. There are three parameter which are considered in this paper for comparison of existing and proposed technique.

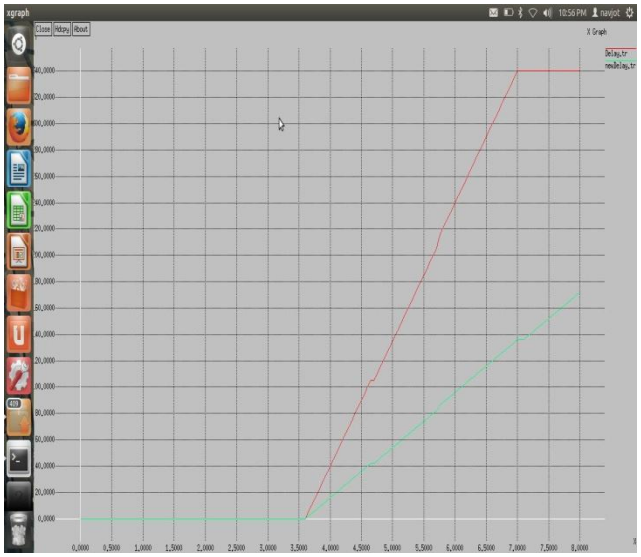

Fig.5.1: Delay graph

As illustrated in figure 5.1, the delay graph has been plotted in which the delay of the previous scenario and new scenario is shown and compared. The graphs represents the delay in the new simulation will be reduced by 30 % due to fault removal in the network.

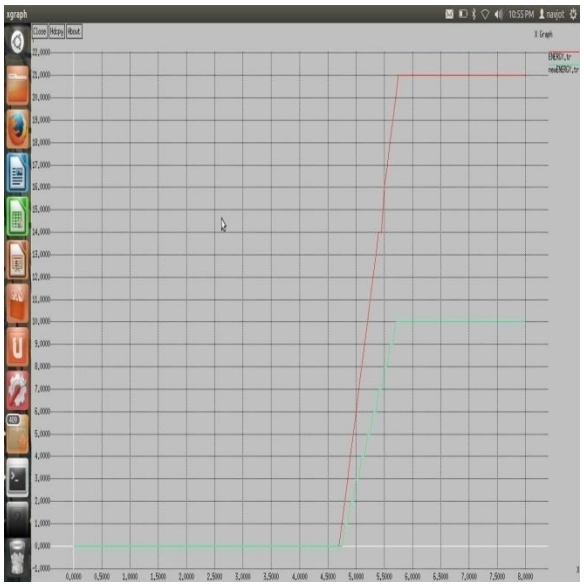

Fig.5.2 Energy

As shown in figure 2, the energy consumption of the previous and new scenario is compared . The graph clearly represents that energy consumption of old scenario is more due to fault in the network. When fault is removed from the network energy consumption is reduced from the network.

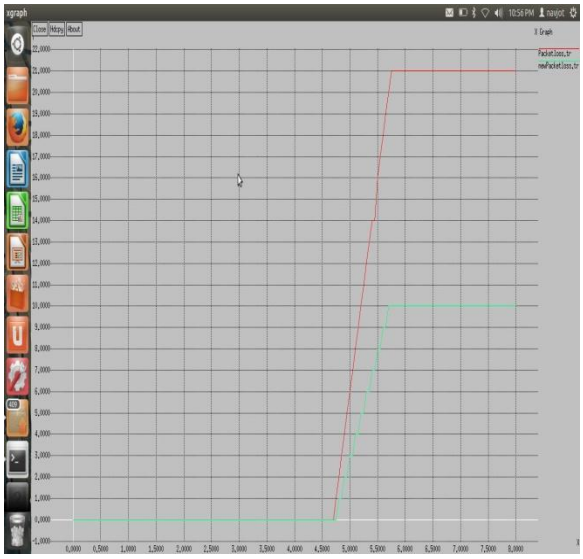

Fig.5.3 Packet Loss

As shown in figure 5.3, packet loss of the previous and new scenario is compared. The graph clearly represents that packet loss in the old scenario is more due to fault in the network. When fault is removed from the network packet loss is reduced from the network.

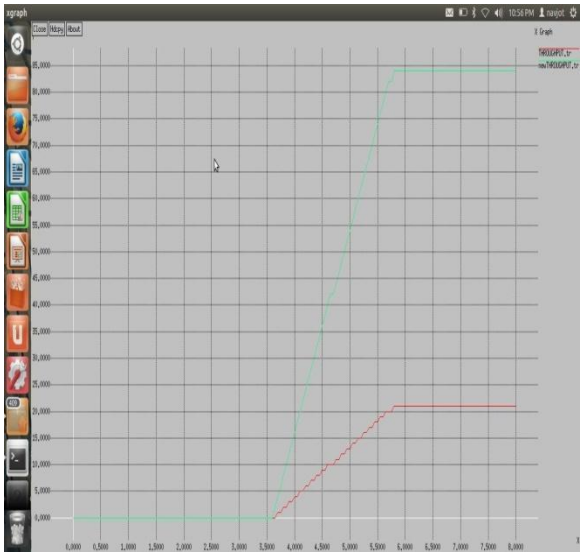

Fig.5.4: Throughput Graph

As shown in the figure 5.4, the throughput comparison of the old and new scenario is shown. Due to fault in the network, the throughput of the old scenario get reduced. When fault will be recovered from the network throughput of the network gets increased

## V. CONCLUSION

In this work, a novel technique has been proposed which is based on neural network and other techniques. To reduce the overhead in dynamic clustering and to increase lifetime of the sensor network, cluster heads are changed using the approach of neural network technique has applied like Knowledge Based Learning to decrease battery consumption of the network. In the previous work, static clustering of grid had been used. But in this research work, clustering of grid is dynamic. It can be adjustable and changeable according to the situation. In this node data which is send can be easily adjustable according to the situation and calculation made on the basis of battery consumption. Here main concern is to avoid battery depletion. The cluster head is also choosing according to the minimum battery consumption by applying election algorithm. Suppose there is a network in which number of batteries a replaced. Each battery has the data send capacity in mill ampere. It is considered that there are number of batteries available and each battery further forward data from source to destination. The routing algorithm which we have used in this work is AODV. There are three clusters having three cluster head. Cluster heads are chosen according to the maximum sending capacity and minimum battery consumption of the node. The implementation of this research work has done in Ns2 and simulation results show that novel technique has increased the network throughput and network lifetime.

## VI. REFERENCES


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