Novel Approach to Reduce Chances of Fault in Wireless Sensor Networks

Harpreet Kaur[1], Er. Gagandeep Kaur[2]
[1]*Research Scholar,* [2]*Assistant Professor*
[12]*Yadawindra College of Engineering (Talwandi Sabo)*

Abstract- The wireless sensor networks are the decentralized networks in which sensor nodes can join or leave the network whenever they want. Due to unique properties of the network, energy consumption is the major issue to WSN. The LEACH protocol is an efficient protocol which can improve the lifetime of WSNs. In this paper, the LEACH protocol is improved which can reduce chances of fault in the network. The proposed algorithm is implemented in MATLAB and it is analyzed that lifetime of WSN is increased at steady rate.

Keywords- LEACH, Fault, Network Lifetime.

I. INTRODUCTION

A wireless sensor network is a collection of nodes which are organized in a cooperative network. These nodes are the sensor nodes which communicate with each other over the wireless medium. The wireless medium may either be the radio frequencies, infrared or any other medium 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]. In wireless sensor network the sensor nodes monitor different conditions at different locations, such as temperature, humidity, vehicular movement, lightning condition, pressure, soil, noise levels, the presence or absence of certain kinds of objects, mechanical stress levels on attached objects, the current characteristics such as speed, direction and size of an object. If the node is not able to communicate with other through direct link, i.e. they are out of coverage area of each other; the data can be sent to the other node by using the nodes in between them. This property is referred as multi-hoping. Wireless sensor network (WSN) is a network of small light weight wireless nodes which are highly distributed and deployed in large numbers. Wireless sensor networks monitor the system or environment by measuring physical parameters such as humidity, pressure and temperature. Wireless sensor networks provide an economic approach for the deployment of the control devices and distributed monitors also avoiding the expensive wired system [2]. The main source-sink communication is based upon multi-hop message rely. If the sensor is closest to the sink the battery will exhaust very fast as compared to the batteries of the nodes that are far away from sink node. The reason for above phenomenon is simple: compared with sensors from a sink, nearby sensors are shared by more sensor-to-sink paths, have heavier message relay load, and therefore consume more energy. Researchers have built many energy models to give proper explanation. Energy depletion causes energy holes and leads to degraded network performance. In the WSN caching is go about as a tree. Here the caching have the multiple numbers of levels where its leaf nodes are communicate with the internet nodes in the WSN. In the WSN each sink is not ready to communicate straightforwardly to the source node. Thus it saves the unwanted traffic in the network and it likewise save the season of the communication between the different nodes [3]. The caching has the feature to reduce the data traffic and save the energy consumption in the network. The WSN are prone to the node failure. The node failure happens in the WSN because of the power loss in the network. To provide the reliable services throughout the network, the nodes self change in the network. The bottleneck node has the constrained battery life so it is the fundamental reason of failure in the network. To defeat this kind of failure we utilize the network convention. The network convention has the numerous properties to deal with this kind of failure in the network. Every sensor node in the WSN is depending on the battery and battery has the restricted life time. In the event that the battery time is over then the node failure is happen in the network [4]. In the WSN the node replacement is unrealistic because of some physical constraints. Subsequently in the event that we need that WSN work legitimately we ought to save the battery lifetime. Henceforth the battery lifetime is reached out by decrease the greatest communication among the different nodes in the network. In the WSN utilize caching for store the data or information in every sensor node. Despite the fact that there has been significant research on energy efficient WSNs, a great deal less work has been done on the effects of physical layer characteristics in the deployment architectures and general system design. Modulation scaling and adaptive modulation techniques are introduced where the modulation level is adjusted to reduce the energy per bit [5]. The concept of modulation scaling is proposed where at lower data traffic, target bit error rate is increased to reduce the required energy per bit. The impact of utilizing modulation scaling on packet delivery latency and packet loss is considered. The adaptive modulation is utilized as a part of a unified cross-layer approach keeping in mind the end goal to limit the total transmission energy consumption of the

network by considering that each sensor may require a different bit rate as per its application. In these techniques, one normal modulation scheme is considered across the network and the level is adjusted to accomplish lower required energy per bit. In any case, scaling to lower energies will bring about increment in bit error rate. An expansive number of straightforward low-power sensor gadgets are disseminated in a field keeping in mind the end goal to collect sensing data and transmit it towards the assigned relay node. We concentrate the impact of different modulation schemes on the energy consumption of the sensor nodes and demonstrate how proper selection of the modulation scheme can influence the general distribution of energy consumption in the network and the lifetime of the network. The distance plainly significantly affects the transmission energy dissipation. There have been a few studies in WSN to reduce the distance by different steering and assignment techniques [6]. EAR node placement and sensor assignments have now been performed. Goal is subsequently to reduce the energy dissipation by optimal selection of the modulation schemes for the pre-set sensors. For any modulation scheme, the bit error rate can be described as a function of Eb/N0 which is proportion of the energy per bit to the noise power spectral density.

II. LITERATURE REVIEW

Yu Shaojun, et.al (2017) presented on the basis of the analysis of overall energy consumption rate in the wireless sensor networks, they compared and analyzed number of testing methods used in the power consumption of nodes. They analyzed, the end device process of the transmission data in which they do not specify the analysis on access node at which data is received, poor performance of this test in real time and more consumption of energy for the calculation and analysis of waveform data of the oscilloscope [7]. With the help of sampling of output, it improves the amplifiers with the help of using A/D, on a single-chip microcomputer calculated the power consumption of node at different intervals of time.

Tenager Mekonnen, et.al (2017) presented an emerging research area that is widely utilized in for the exploitation for realization of Cloud of Things and to the integration of present smart objects in the cloud is known as Container-based virtualization. The feasibility of the unning container-based virtualization on low-power IoT nodes is demonstrated efficiently as per study [8]. They also analyzed the running containerized software on the basis of battery-powered IoT devices which causes more overhead. They investigated the Docker based container virtualization and it's overhead on surveillance camera sensor nodes with the help of multi-tier WMSN prototype. More than 13% consumption of power is measured as an overhead on the camera nodes during the process of boot-up and shutdown.

H.Oudani, et.al (2017) presented the major issues faced by the wireless sensor network i.e. energy saving [9]. The major challenges faced by this network are the increase in the lifetime of the network and energy efficiency improvement. They also developed various hierarchical protocols so that present network traffic toward the sink is reduced to greater extent due to which lifetime of the network increases. They presented a new approach which is the advancement of clustering LEACH protocols. As per simulation results, it is demonstrated that the network lifetime of the network can be extended up to 45% as this proposed approach minimizes the rate of the energy consumption and improves the lifetime of the network. In future, this work can be improved so that increases all the aspects of the sensor networks.

M. Kabrane, et.al (2017) presented major challenge faced by the wireless sensor network in the field of urban traffic management is extension of the lifetime of the network. For the simulation of the traffic in more real times, they used SUMO and OpenStreetMap (OSM) techniques as instead of using proposed algorithm only as used in previous papers. As per obtained results, it is confirmed that proposed method confirms the previous method for which they used GLD simulator [10]. Therefore, it is concluded that proposed techniques has better performance and effective as compared to previous methods in terms of solving the issue of energy consumption of sensor nodes. The received data from wsn is processed by this algorithm, it also determine the time of the green light at different channels on the basis of length of queue.

M. Benaddy, et.al (2017) presented applications of wireless senor network in almost every field such as medical, crisis management, environmental, military, transportation, emergency, security applications and many more. They proposed an algorithm in this paper for the reliability of transmitted data in the wireless network [11]. The proposed algorithm is based on multipath principle. It also focused on the energy consumption constraints on the basis of which each node is separated from other node according to the sensor node components and the distance. The proposed algorithm is implemented and simulated for the evaluation purpose and the calculation of performance and also compared with other algorithms in order to check the efficiency of this method.

K. Praghash, et.al (2017) presented cluster head can be defined by which different functions can be performed in order to secure the sections of the networks using clusters. For instance, for the process of filtering they have more processing power in order to store or logs authenticated data or they can also use larger communication range for this purpose [12]. Better performance can be achieved by wireless sensor network with the help of sleeping nodes that increase the lifetime of the network, better latency, and reliability. A temp cluster head mechanism can be utilized by the network,

if it is unable to cluster head mechanism. When new input is not processed by the cluster head in this method it will attach the cluster to activate the nearby node in order to elevate as a cluster head due to which there is decrease in power consumption due to which there is no disturbance in the process of communication.

III. RESEARCH METHODOLOGY

In this work our main concern is reclustering the grids using neural networks. In the present work clustering of grids is static but in our work clustering of grids 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 wastage. The cluster head is also choosing according to the minimum battery consumption by applying election algorithm.

Suppose we have a network in which number of batteries are placed. Each battery has the data send capacity in milliampere. We considered that we have number of batteries available and each battery further forward data from source to destination. AODV algorithm is used in it. We have three clusters in which we have three cluster heads present. Cluster heads choose according to the maximum sending capacity and minimum battery consumption. The battery which satisfies both the above mentioned technique that will be head of that cluster. We assume that we have three batteries which have the capacity of sending data capacity of 8milliampere, 10 milliampere and 12milliampere respectively in a cluster. Now we have to choose cluster head which send which send full data after that become dead. If we choose 12 milliampere battery as a cluster head then it will send our data successfully but cannot be sufficient for another data packet transmission after it. So wastage is there. If 10 milliampere will be choosing then there is also wastage of 2milliampere battery. This battery cannot be used in the transmission of another data packet. We choose battery of 8 milliampere capacity as a cluster head; it can be send data fully without any wastage. Again to choose the best path of those batteries which waste minimum battery and minimum hop count also kept in mind to choose the best route or path. After the transmission of the data, battery will die then re-clustering of grids again starts.

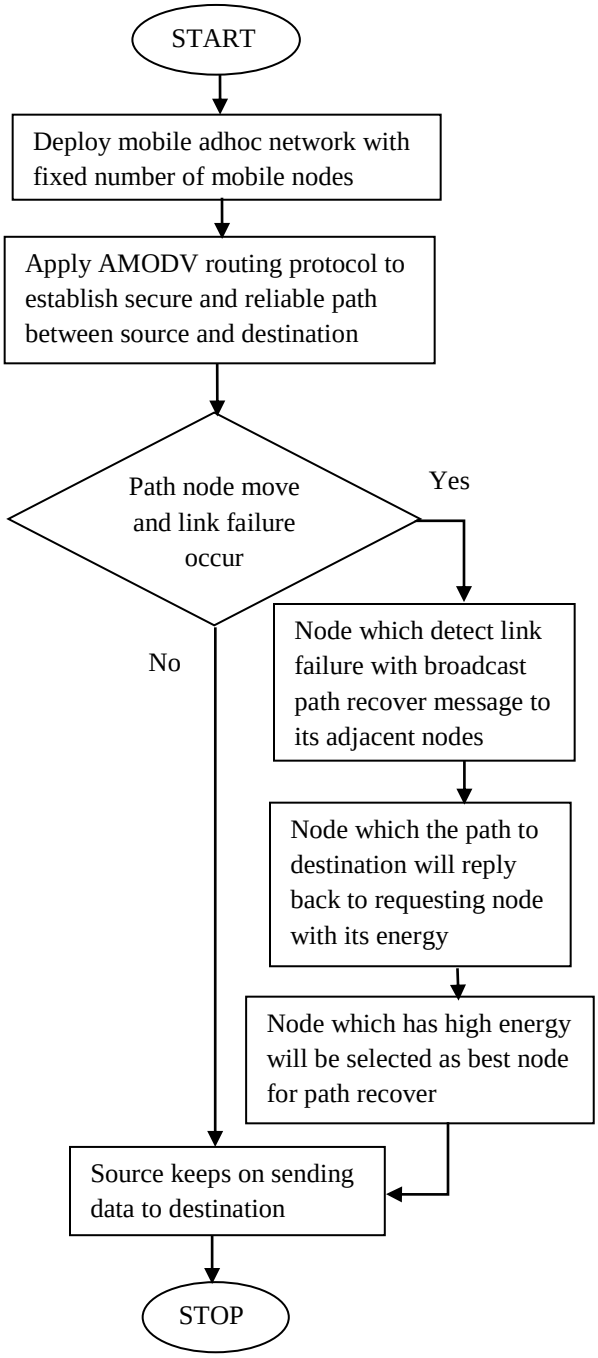

Fig.1: Proposed Flowchart

IV. EXPERIMENTAL RESULTS

The proposed work is implemented in MATLAB and the results are evaluated by making comparisons against proposed and existing in terms of several parameters.

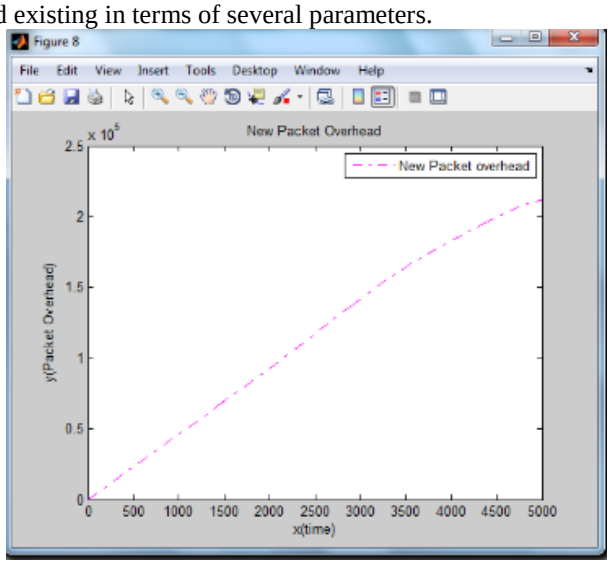

Fig.2: Graph of new pack overhead using Adaptive Modulation

As shown in figure 2, the packet overhead increase with increase of the time using proposed technique for cluster head selection. The x-axis represents the number of rounds and on the y-axis the number of extra packets send is shown.

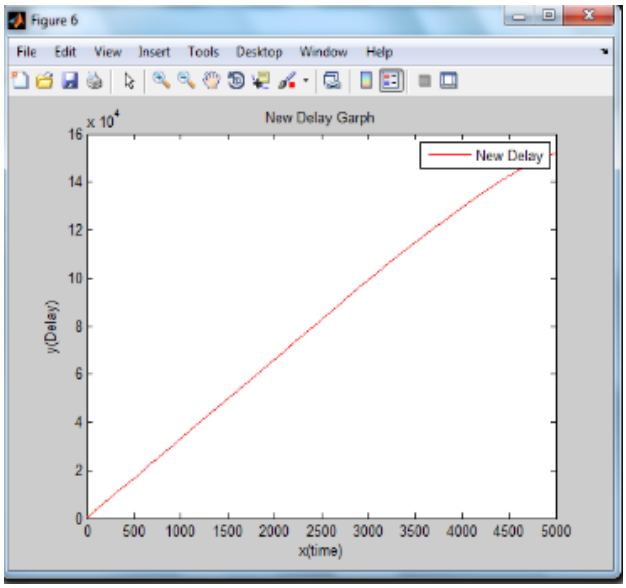

Fig.3: Graph of New delay

As shown in figure 3, the delay of the proposed technique is shown in which on the x-axis the number of rounds and on the y-axis the number of packets delayed are shown. The delay in the proposed technique is less as compared to the existing technique.

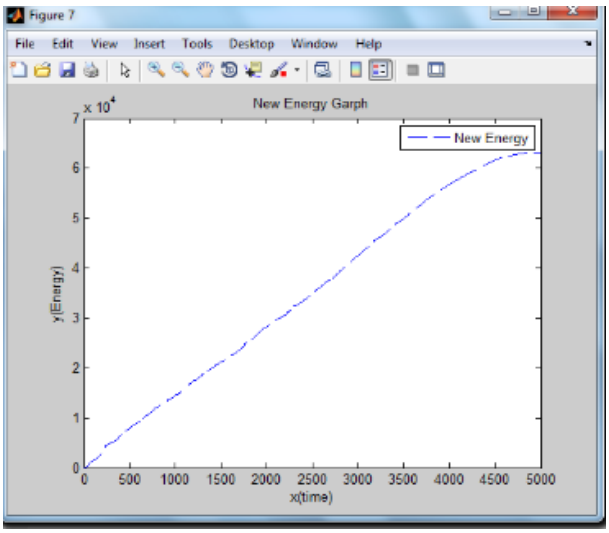

Fig. 4: Graph of new energy

As shown in figure 4, the energy consumption of the proposed technique is shown in this graph. On the x-axis the numbers of rounds are shown and on the y-axis the energy consumption is shown. The energy consumption of the proposed work is less due to implementation of proposed technique.

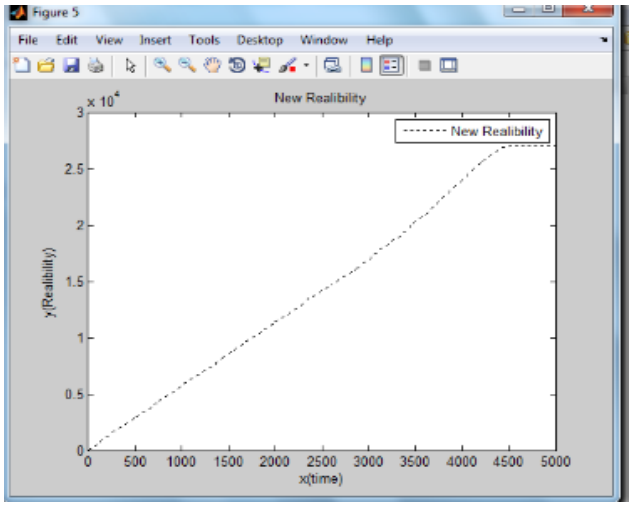

Fig.5: Graph of new reliability

As shown in figure 5, the reliability of the proposed technique is shown in this figure. The x-axis shown the number of rounds and on the y-axis the reliability factors shown. The reliability of the proposed technique is high as compared to existing technique

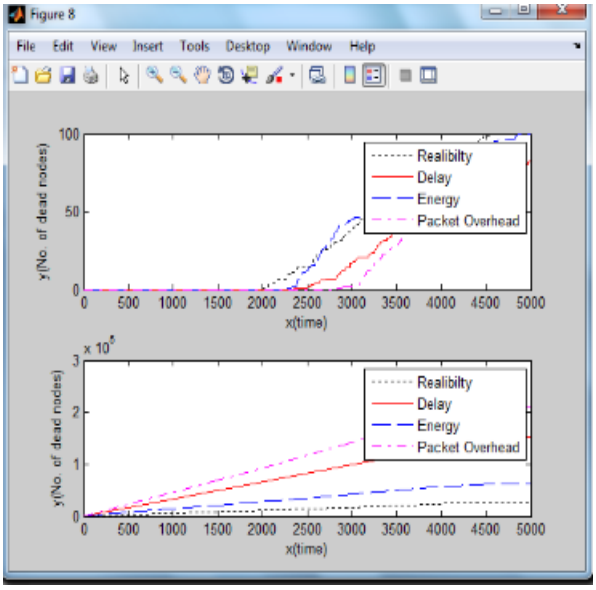

Fig.6: Comparison Graph

Above graph illustrate that second figure shows that it is better in all the parameters. In second figure adaptive modulation is used which shows that it much better than old scenario. The delay, energy, packet overhead and reliability of the proposed technique is better as compared to the existing techniques.

V. CONCLUSION

The improvement is proposed in the network is based on dynamic clustering. The technique of boltzmann learning based neural network is used to select cluster heads to reduce chances of fault in the network and to improve energy efficiency. The proposed protocol and existing protocol are compared in terms of dead nodes, number of packets transmitted to base station, number of alive nodes and throughput. It is been analyzed that proposed protocol performs well as compared to existing technique and offers better energy efficiency and longer network lifetime. The proposed technique has broader scope due to which it can be implemented in transmitting real time data from sensor node to base station. In future the proposed technique can be applied on stable election protocol for analysis of performance in terms of number of dead nodes and packets transmitted to base station.

VI. REFERENCES

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