Enhancing the QoS in WSN

Ms.Jyothi N[1] Mr. Keshav N kowshik[2] Ms. Meghashree B R[3] Ms. Ragini R[4] Mr.Yogesh N[5]
[1,2,3,4]U.G. Students [5]Assistant Professor
[1,2,3,4,5]Department of Electronics and Telecommunication Engineering
[1,2,3,4,5]VVIET Mysuru, India

Abstract— In recent years, the applications of the wireless sensors networks (WSN) have increased tremendously due to its huge potential of connecting the physical world and the virtual world. It is a trend to deploy large number of wireless portable sensors in the WSNs to have an increased quality of service (QoS). The QoS of WSNs is hugely affected by the failure of the sensor nodes. The portability of failures in sensor nodes is directly proportional to increase in the number of sensors. In order to keep up better QoS under failure conditions, identifying and removing such faults are important. In the proposed method, the faulty sensor nodes are detected by calculating the round trip delay (RTD) time of different round trip paths and comparing them with the threshold value and also some assumptions are made for the node to be faulty. Rerouting is performed using DFS and BFS algorithm. The scalability of this method is checked by simulating the WSNs with a large number of sensor nodes in Network Simulator 3 (ns-3).

Key words: QoS, WSN, RTD

I. INTRODUCTION

The key challenge in wireless sensor network protocol designs is to provide energy efficient communication; many nodes will be deployed in the network. There are chances that node can be faulty. The faulty may be the one which consumes more energy, the one which is situated beyond the threshold distance, the one in which battery drains out or the one which consumes more bandwidth. In many of the WSN applications the nodes will be deployed in the hostile environment where it's not easy for the humans to reach frequently. When the packets come across these nodes there are chances of high consumption of energy and in some cases packets loss occurs and transmission may get terminated. So it is necessary to find those faulty nodes in advance to improve efficiency of transmission

II. LITERATURE SURVEY

Low-Energy Adaptive Clustering is one of the milestones in clustering algorithms. The aim of Low Energy Adaptive Clustering was to select nodes as cluster heads in such a way that every node gets a chance to become cluster head. As cluster head consumes higher energy then non cluster heads, so load is evenly distributed among nodes. So a single node does not go out of energy after a short time span just because it was frequently elected as cluster head [1].

Sensor nodes are prone to failure due to energy depletion and some other reasons in Distributed Sensor Networks (DSNs). In this regard fault tolerance of network is essential in distributed sensor environment. Energy efficiency, network or topology control and fault-tolerance are the most important issues in the development of next-generation DSNs. This paper proposes a node fault detection and recovery by using Genetic Algorithm (GA), when some of the sensor nodes faulty in DSN. The main objective of this work is to provide fault tolerance mechanism, which is energy efficient and responsive to network by using GA which is used to detect the faulty of nodes in the network based on the energy depletion of node and link failure between nodes. The proposed fault detection model is used to detect faults at node level and network level faults (link failure and packet error). We have evaluated the performance parameters for the proposed scheme [2].

In now days, wireless sensor networks applications are frequently used in various technologies for reducing the cost of manufacturing portable wireless sensor nodes. It trend to deploy the large number of portable wireless sensors in WSNs to increase the quality of service (QoS). The QoS is mainly affected by the life time and failure of sensor nodes. If the probability of sensor node failure increase with increase in number of sensor nodes. To maintain the better QoS under failure conditions, identifying and removing such fault sensor nodes are compulsory. In the proposed method faulty sensor node is detected by discrete path selection technique by compare the actual RTT with present RTT. This method is simulated in NS2 on WSNs with eight sensor nodes designed using circular topology [3].

In a wireless sensor network (WSN), random occurrences of faulty nodes degrade the quality of service of the network. In this paper, we propose efficient fault detection and routing (EFDR) scheme to manage a large size WSN. The faulty nodes are detected by neighbor node's temporal and spatial correlation of sensing information and heart beat message passed by the cluster head. In EFDR scheme, three linear cellular automata (CA) are used to manage transmitter circuit/ battery condition/microcontroller fault, receiver circuit fault and sensor circuit fault representation. On the other hand, L-system rules based data routing scheme is proposed to determine optimal routing path between cluster head and base station. The proposed EFDR technique is capable of detecting and managing the faulty nodes in an efficient manner[4].

III. PROPOSED SYSTEM

The proposed system is a stimulated model of a network system which contains multiple sensor node and multiple cluster of sensor node. The clustering of the sensor node helps to reduce the transmission energy required as well as minimizes the network transmission delay. Each of the transmission rounds of the network a CH will be chosen will take control of the transmission of packets happening in the cluster. here we are using LEACH to perform the energy efficient clustering.

The next major objective of the system is to identify the faulty or defective node. Here we can device an approach or an algorithm which takes parameters such as RTD, Network delay, transmission energy, distance and the position of the node. To identify, initially the threshold for

each of the parameters has been determined through several test cases. During the cluster formation calculation for each of these parameters for all the cluster nodes is done. If any of the obtained value crosses the threshold limit the node is considered to be defective and the communication with the defective node is taken of the packet loss calculation.

In most of the network efficiency has been effected majorly due to the presence of defective node, not only finding the defective node is essential taking those data transmission to defective node with the path of lesser transmission energy and shorter distance by using shortest path algorithm to reroute the packets thus achieving the hybrid fault tolerant network with minimized energy and minimized packet loss.

A. Algorithm:

1) Step1: Setting up of adhoc network and creation of nodes.
2) Step2:cluster formation and cluster head selection.
3) Step3:broadcasting of packets is performed by cluster head
4) Step4:setting up the threshold value for selected parameters
5) Step5:calculating the current value for the selected parameters

$$\text{Energy consumed} = \left[\frac{\text{Tx Power} * \text{Packet size}}{\text{Tx Rate}}\right] * \text{packet no}$$

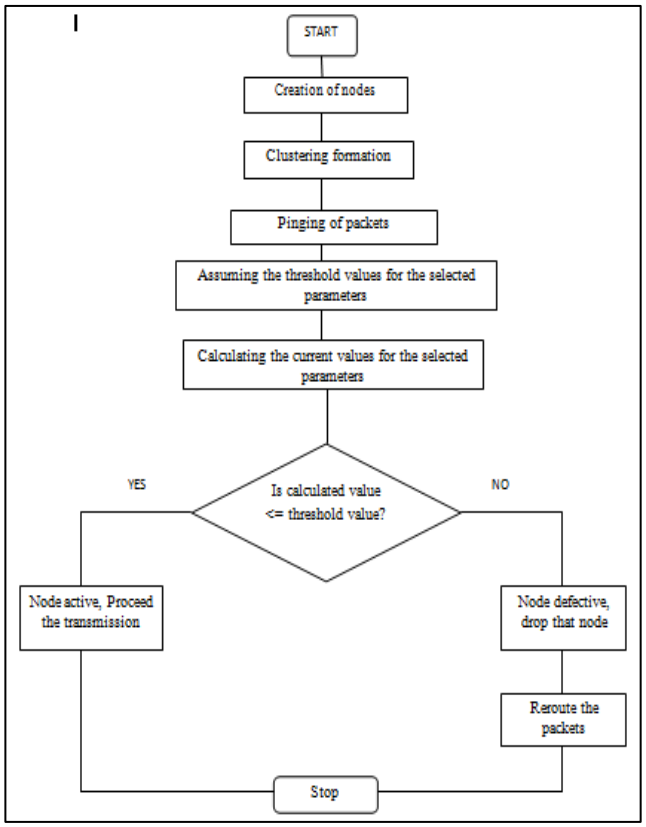
Tx power = The amount of power at which the data transmission takes place.

Tx Rate= The rate at which the data is transmited.

Remaining Energy = Total Energy- Energy consumed

6) Step6:comparing the obtained value with threshold value
7) Step7: if the compared values is greater than threshold value node is said to be defective else continue the transmission

B. Flow Chart:



IV. Simulation Results

Simulator output view of the initial positions of the node It can be seen in the fig 1.

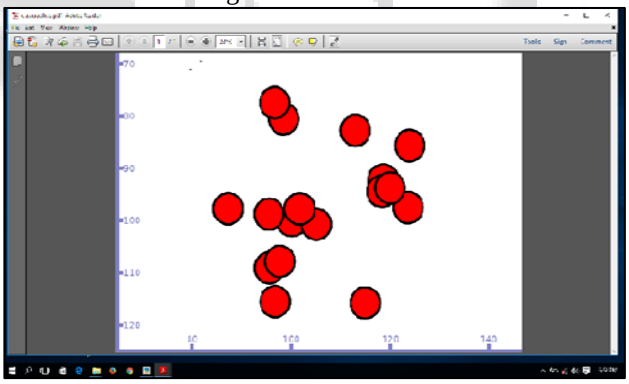


Fig. 1: Basic node arrangement

Fig: 2 below decpicts the cluster head communication with other nodes

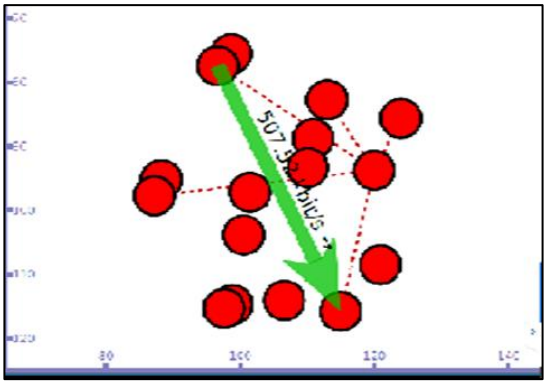


Fig. 2: Transmission of packets

The fig: 3 below shows the fault node detected.

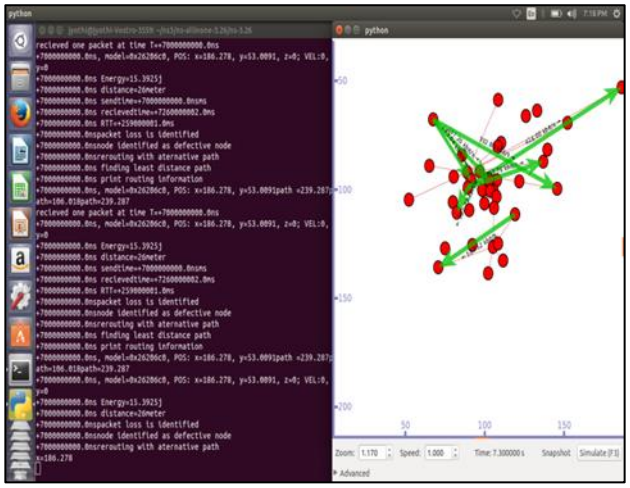


Fig. 3: Faulty node detection

A. Comparison Graphs:

Figure 4 shows the comparison plot between enhanced algorithm and path redundancy algorithm ,where the energy v/s distance graph is plotted.

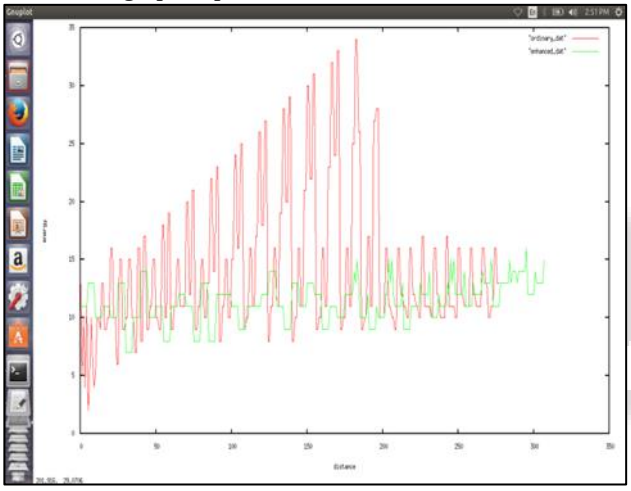


Fig. 4: Energy v/s distance comparison

Figure 5 shows the comparison plot between enhanced algorithm and path redundancy algorithm, where the bandwidth v/s RTT graph is plotted.

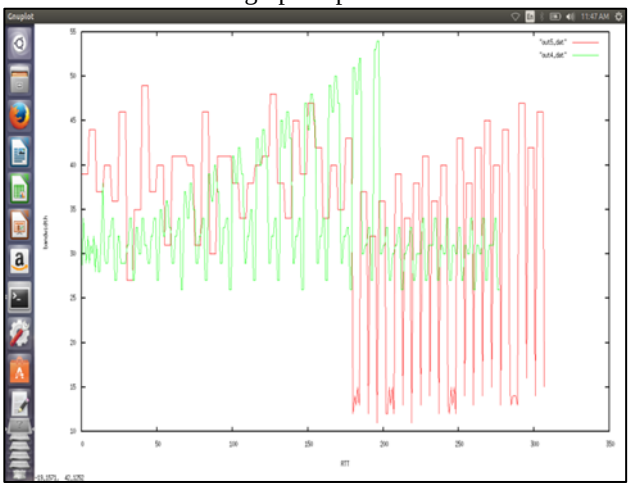


Fig. 5: Bandwidth v/s RTT comparison

As we can see from the comparison as the transmitting distance increases the energy consumption also increased in the path redundancy algorithm, but in the proposed system the energy consumption is reduced to some extent. In the second comparison as RTT increases the overall bandwidth is less in our proposed system.

V. CONCLUSION

In this project, the effective approach is proposed for finding the defective and rerouting the packets using efficient algorithm. Here we consider a node to be defective not only when node runs out of battery but also we considered the parameter like energy consumed for transmission, time delay, and bandwidth. Thus this algorithm will take care of energy conservation.

Generally when the node is defective the time taken for transmitting the packets to the node will be more, hence the energy consumed for transmission will be high. In such situation we cannot change the node because the network will placed in some hostile environment where it cannot be changed manually. Hence in order to increase the battery life the energy conservation will be taken care in more effective manner

In addition we are also combining the rerouting algorithm to reduce the packet loss while transmission. When the fault node is detected, by applying BFS and DFS algorithm we will find the shortest path and we reroute the packets. The simulation results show that the proposed algorithm improves significantly both energy efficiency and delay performance by faulty node detection and rerouting the path to enhance the QoS.

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