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FAULT DETECTION TECHNIQUES IN WIRLESS SENSOR NETWORK

Amanpreet Kaur[*1] and Gaurav Banga[2]

[*1]Research Scholoar, Master of Technology, ECE Department, GIMT, KKR, India
[2]Assistant Professor, ECE Department, GIMT, KKR, India

ABSTRACT

Overloading of electrical system is one of the factors that affect the satisfactory operation of electricity supply of a housing estate. Overloading is a fundamental error at design stage of electricity supply which can be averted if a right approach is used to estimate the electrical needs prior to the specification and installation of electrical equipment.. In this paper, the electrical requirement of a housing estate is calculated, then the relevant regulations of Institute of electrical and electronics engineers (IEEE) for safety and economic reasons are applied and the sizes of electrical equipments are specified. The main objective is to prepare a computer program in object oriented programming language to be able to estimate the electrical load for any housing estate with a click of few buttons on computer interface. The developed program was tested with the data of Palmarium Estate at Karudu Commercial Layout Amac, Abuja. Also, it can be easily modified to accommodate changes if the need arises.

Keywords: *Electrical Equipment, Housing Estate, Overloading, Visual Basic.*

I. INTRODUCTION

Wireless sensor networks (WSN)

A wireless sensor network (WSN) is typically designed to extent in a large field for data collection. Data delivery is usually reached with multi-hop transmission through a sequence of nodes. Most of the routing protocols that are multi-hop have been implemented in sensor networks for data gathering and they are usually achieved with special path estimation metrics to select "good" paths for data packets delivery. With recent intensive research in this area, wireless sensor networks have been practical in various areas, such as environment and habitat monitoring, equipment maintenance on condition basis, disaster management, and emergency response. Due to the low cost and the deployment of a large number of sensor nodes in an unrestrained or even harsh or hostile environment, it is usual for the sensor nodes to become faulty and unreliable. The networks must eliminate the faulty sensors to ensure the network quality of service[14]Basically, sensor networks are defined by the combination of miniaturized sensors with communication technology[14]

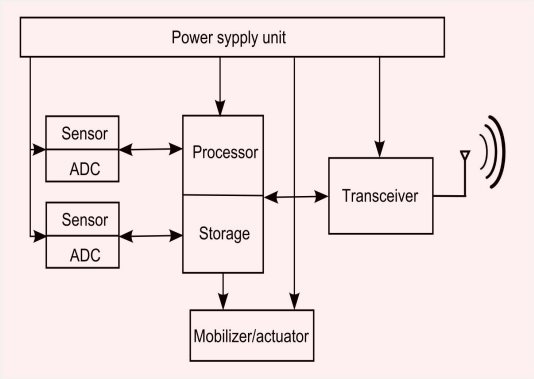

Fig. 1. Typical sensor node.[15]

II. MANET

A mobile ad hoc network (MANET) is an autonomous system of mobile nodes linked by wireless links [16]. Wireless links provide lower bandwidth and higher error rates equated with fixed networks. MANETs can however be organized quickly and without large infrastructure investments in order to complete allotted tasks e.g., military operations, emergency situations, sensory environments, etc. The nodes may be resource constrained, have narrow

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battery power, and because of flexibility must continuously monitor and react to changes in their transmission neighborhood[16].

In Mobile Ad Hoc Network (MANET), a gathering of wireless nodes of mobile are formed as a transitory/short-lived network without any stable infrastructure. In MANET all the nodes are free to move arbitrarily and then organize themselves. Each node can act both as a router and as a host even the topology is changing suddenly [12]. Ad hoc networking is used wherever the infrastructure is tiny or without any physical statement or the existing infrastructure is very costly or problematic to use. It lets the devices to reservation networks to the network and also to add or remove a device

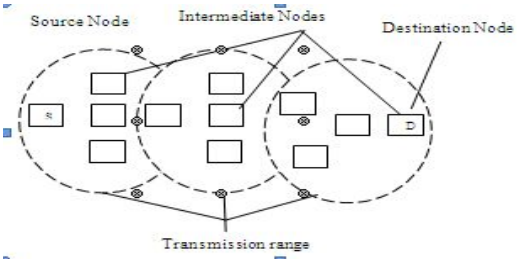

Fig 2 Manet[12]

to and from the network. There are several set of applications for MANETs, ranging from large- scale, mobile, highly dynamic networks to minor and still networks which are having partial power sources[12].

III. LITERATURE REVIEW

1.Jie Wu wireless sensor networks, named clustered agreement time synchronization (CCTS). This algorithm is developed on the base of the distributed consensus time synchronization (DCTS) algorithm clustering technique is included into the algorithm. The CCTS includes two parts: 1) intra cluster time synchronization and 2) inter cluster time synchronization. In the intra cluster time organization, the better DCTS is applied[6].

2.Ravindra Navanath Duche The proposed method of fault detection is based on RTD time size of RTPs. RTD times of discrete RTPs are compared with threshold time to determine failed or malfunctioning sensor node. The conventional approaches to sensor network routing include the directed diffusion (DD) algorithm and the grade diffusion (GD) algorithm. [9].

3.Zijian Yang Fault diagnosis in networks comes from the equipment fault diagnosis, and was first presented in the 1960s. There are four central protocols for managing in network fault diagnosis i.e. the Internet Engineering Task Force Internet (IETF) defines the Simple Network Management Protocol (SNMP) ; and International Organization for Standardization (ISO) defines the Common Management Information Protocol (CMIP); Transaction Language 1 (TL1)[11].

4.Geetha Jayakumar Mobile ad hoc networks (MANET) represent complex distributed systems that comprise wireless mobile nodes which can freely and dynamically self organize into arbitrary and temporary ad hoc network topologies, allows people and the devices to work seamlessly with internet in areas with no preexisting communication infrastructure e.g., disaster recovery environments. The goal of the routing protocol is to have an efficient route establishment between two nodes, so that the messages are delivered in a timely manner[3].

5.Pravin Ghosekar A mobile ad hoc network (MANET) is sometimes called a mobile mesh network. It is a self-configuring network of mobile devices connected by wireless links. The Ad hoc networks are a new pattern for wireless networking for mobile hosts. Unlike traditional mobile wireless networks, ad hoc networks do not rely on any fixed infrastructure[8].

6.**D.Ben Khedher et al** Node failures and message losses are frequent in MANETs. Nodes usually form a self organizing overlay network that is over laid on the physical network. Heartbeat protocols are used widely for the detection of failure in network systems In these protocols, a node periodically sends a heartbeat message (“I am alive”) to any of the detector node. If the time between consecutive heartbeat messages exceeds a timeout value, then the node is considered to be failed. Heartbeat architectures are used in many areas: system diagnosis, network protocols, reaching an agreement, and fault detection in computer networks[2].

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IV. FAULT DETECTION TECHNIQUES

In this section, discussion is done about various algorithms and protocols that are used to offer the quality of service by identifying the fault node obtainable in the Wireless device network, Failure of nodes occurs frequently due to several reasons and because of this disappointment nodes in some safety application will lead to main problems, to avoid this situation a survey is done on numerous existing methods. Some methods are Cluster Heed Failure Recovery algorithm, Distributed Fault Detection algorithm, Energy-Efficient Fault Tolerant Protocol (EFP), Decentralized Fault Management Mechanism for WSNs based on cluster (DFMC) and Round Trip Delay and Analysis of paths, etc[16].The goal of fault detection is to verify that the services being provided are working properly, and in some cases to predict if they will continue to function properly in the near upcoming. The humblest way to perform such a duty is through visual observation and manual removal of incorrect values [12]. The fault discovery element is often responsible for generation of residual signals, which are sensitive to the liabilities of the scheme. The remaining signals are then analyzed to make appropriate alarms. The fault isolation module determines the type and location of the faults[18].

A. Cluster Heed Failure Recovery Algorithm

This algorithm (Akbari*et al*., 2011) is used mainly to maintain the cluster structure when failure arises due to energy-drained nodes. Originally cluster is secondhand to collection the neighbor nodes to maximize the energy of the nodes. The nodes which have full remaining vigor in the cluster will be nominated as cluster heed and the subordinate cluster heed will be the second maximum residual energy. Cluster members will be alert of cluster heed and subordinate cluster heed. When the energy in the cluster head beads below the beginning value, a communication will be show to other cluster members and also to secondary cluster head as a suggestion for the secondary cluster head to action as a new cluster head. The existing cluster heed will develops as an associate in the cluster. The entire member will track the secondary cluster heed as the new cluster head. Therefore, this procedure usages a backup secondary cluster heed to exchange the cluster heed in the case of disappointment. The benefit of this algorithm is to increases energy efficiency by frequently revolving the cluster heed among sensor nodes with equal probability[15].

B. Distributed Fault Detection Algorithm

The Distributed Mistake discovery algorithm (VenniraSelvi and Manoharan, 2013) is used to sense the failure nodes by equating the result of the noticing indication with the neighboring nodes to enhance the correctness of diagnosis. Some faults in communication and sensor reading may occur which can be tolerated to some extend by using time redundancy. To decrease the delay in period severance the interval in the sliding window is increased. Sensor nodes that are forever failed in the network are recognized with high accuracy. This algorithms works well if the node is permanently failed[16].

C. Energy-Efficient Fault-Tolerant Protocol (EFP)

Energy-Efficient Fault-Tolerant Protocol (EFP) is a power adaptive protocol (ZohreArabi and Roghayeh Parikhani, 2012) to decrease energy consumption of sensor nodes. In this protocol cluster head will be selected aimlessly in the first phase which is related to LEACH protocols. The residual energy and space to the base station is calculated for the casually chosen cluster head. These two parameters are equaled with other nodes. If any node has high residual energy and measurement then that particular node will become the cluster-head and the residual nodes will reselect this node as the key cluster-head. This protocol is a top fault tolerant technique where the cluster head is selected based on power and measurement and there is more efficient and trustworthy communication is sure between the sending and getting sensor node. This vigor driven method is to monitor the node status for sensing energy that is dissipated from each sensor node [16].

We simulate a synthetic environment, where sensors are deployed in a 50 by 50 to monitor temperatures. The faulty sensor rate (shortened as faulty rate) is the ratio of the number of faulty sensors and the total number of sensors deploy. Each sensor will information noisy readings according to the parameter noise_ prob. A faulty sensor always information faulty readings and thus noise probe is set to 1 or faulty sensors.

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V. PERFORMANCE OF SENSOR BASED ALGORITHM

First, we evaluate the performance of these sensor based algorithms. The length of reading vectors for a sensor node is set to 150 and the similarity threshold is set to 0.6.

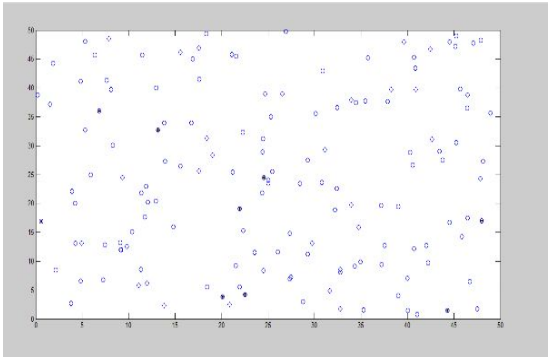

Fig3 Fault Detection Rate

A. Simulation Parameters

We now examine the impact of the number of iterations to WSN based and MANET based algorithm.. The length of reading behaviors is set to 5 and the similarity threshold is set to 0.6 and 6.

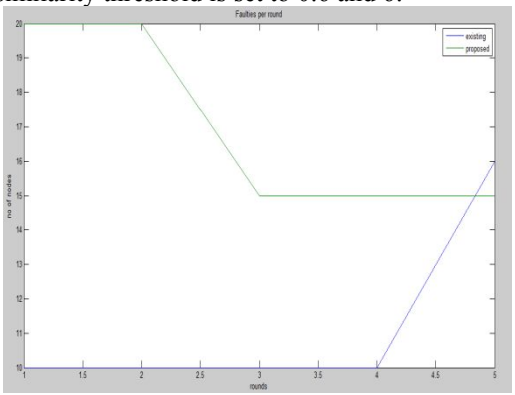

Fig4 Faulty per round

The experimental results are shown in Figure 4 and Figure 5 . It can be seen in Figure 3 when threshold value increases, the faulty detection rate will increase. This is due to that with a larger number of iterations, Sensor Rank is able to have more neighboring information. Therefore, Hi-ADSD is able to precisely identify faulty readings. Furthermore, with the number of iterations increases, the false positive rate declines.

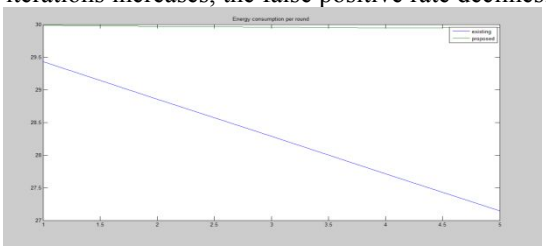

Fig5 Energy Consumption per Round

VI. CONCLUSION

In the actual wireless sensor networks, the sensor nodes use battery power supplies and thus have limited energy resources. With the addition of routing, it is important to research the optimization of sensor node replacement, reducing the cost, In this paper the author has purposed WSN and MANET's failure detection technique. One of the

basic building block that has been recognized for such fault tolerant systems is the failure detection service which aims at provided that some information on which hosts have crashed.

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