Relay Node Based Technique for Path Recovery in Wireless Body Area Network

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Abstract- Wireless sensor networks comprises of many individual nodes which interconnect to form a system that operates as one. A WBAN consist of portable, miniaturized, and independent sensor nodes for monitoring body function for health, sporting, emergency and entertainment, applications. It provides long term health monitoring of patients under natural physiological states without constraining their normal activities. To recover fault author proposed scheme for relay nodes which extra nodes deployed with the sensor nodes. When sensor node gets dead or battery of the sensor node gets degraded, relay nodes are responsible to redirect the sensor node traffic. The proposed algorithm reduces the chances the chances of fault in the network. The proposed and existing algorithms are implemented in NS2 and results are analyzed in terms of certain parameters. It is analyzed that energy consumption is reduced, network throughput is increased and delay is reduced in the proposed technique as compared to existing technique.

Keywords- WBAN, Link recovery, relay nodes, Ns2

I. INTRODUCTION

Wireless sensor networks comprises of many individual nodes which interconnect to form a system that operates as one. These sensor nodes play the main task of sensing the environmental conditions and maybe control them too. We need a collaboration of large number of such sensor nodes as it is not possible for a single node to cover large geographical areas. Sensor networks perform two main operations; they are data dissemination or spread of queries throughout the network and second is the data collection or gathering from individual sensor nodes and pass it on to sink [1]. The nodes use wireless communication, mostly wireless radio, to connect with each other and also with base station. The data collected is rarely processed by the nodes due to memory and battery limitations; hence it is passed on to remote device where it is analyzed, processed upon or stored. The sensor nodes may differ in their physical size but the cost of these depends upon the complexity of each node. The wireless sensor networks have emerged as an important part of our lives as they are known to support a wide variety of applications in day-to-day life; also because of their property of flexibility they pose as a research challenge [2]. Every WSN has its individual set of requirements; thus no one size fit solution is possible as all situations are unique. BAN is latest technology in wireless field which is uses in number of application for monitoring of health and fitness, device control and emergency response. In this network there are some low profiles, low power devices that are interconnected in this way so that it creates sensor nodes consist of one and more sensor device known as microcontroller unit (MCU) and one radio transceiver that get rid of wire to make connection with coordinator nodes to transfer data from one node to other [3]. The coordinator node functions in two ways either as a gateway to transfer data to an external health care monitoring system and as a local monitoring and self control hub. In these days wireless MCU has been introduced. Basically sensors devices operate at access low level interface by loading MCU interfaces as a return it obtain data from actual sensor devices. It contains all the necessary instructions fetch from actual sensor devices. It also converts raw data into information which can be interpreted using logical information by using radio chip. These wireless nodes are worn and wrapped around human body [4]. A WBAN consist of portable, miniaturized, and independent sensor nodes for monitoring body function for health, sporting, emergency and entertainment, applications. It provides long term health monitoring of patients under natural physiological states without constraining their normal activities. In body sensor networks it allows communication between implanted devices and remote monitoring [5]. It is mainly used in Medical Application. Several routing protocols were proposed for WBAN. In Mobility-supporting Adaptive Threshold-based Thermal-aware Energy-efficient Multi-hop protocol (M-ATTEMPT), high data rate nodes are placed near the human sink. Nodes are placed away from the sink when they have low data rates. The protocol operation applied on the different phases. Hello messages are broadcast in initialization phase. This contains information neighbour and from sink in terms of hop count. In the routing phase, routes with minimum hops are selected for data transmission from nodes to the sink. If routes are available with minimum hop counts is selected [6]. The low data rate nodes send their data to the nearest high data rate nodes which send the aggregated data to the sink. In M-ATTEMPT, single hop and multi-hop communication to enhance network lifetime. TDMA slots are assigned to the nodes after route selection. In SIMPLE (Stable Increased Throughput Multi-hop protocol for Link Efficiency in WBAN), eight nodes are placed at different location of the

body and having sink at the waist. SIMPLE protocol is divided into different phases. In the initial phases sink broadcasts information packet of short length to the other nodes to inform its position on the human body. Every node contains a node ID, residual energy value and its location. In the next phase, a forwarder node is selected which route the data of other nodes with saving energy [7]. The forwarder is selected based upon its distance from sink and its residual energy. FEEL (Forwarding Data Energy Efficiently with Load Balancing in WBAN) is a protocol to improve stability period and throughput. Total eight numbers of nodes are deployed on the human body. Node 8 is for ECG and node 7 for glucose level sensor. Mostly two types of topologies have been used for sink deployment. First of all sink is deployed on the chest and in second case it is deployed on the wrist.

II. LITERATURE REVIEW

Sana Ullah et.al (2010) represent [8] that MEMS, integrated circuits and wireless communication have allowed apprehension of WBAN. WBAN provide best services in medical fields to identify patient disease and provides real time updates for patient disease. Moreover it can be used for military as well as healthcare applications. This paper represents infrastructure of WBAN which provide solutions for on demand, normal and emergency traffic. This paper also focuses on antenna design for low power and low profile MAC protocol for WBAN. They help to provide in body and on-body sensor networks for power efficient protocol. Limitation of Low power antenna design has been discussed in this paper.

Sergio Gonzalez-Valenzuela et.al (2012) introduces [9] BAN which is subcategory of wireless sensor network for monitoring internal activities of the humans and animals. WBAN also introduce number of challenges which are arisen due to paucity of hardware and software resources. In this paper they have discussed about deployment and design of the BAN. They also discuss issues related to the deploy sensor node, interference with external infrastructure. The main challenges and issue which are being faced by the WBAN discussed in this paper. The main technology, enabling software and hardware, as well as future trends and open research issues in BANs has been limelight.

Rui Pan et.al (2015) explains [10] that sensor node and body worn coordinator is harmful and poor to conditions of channel. This happens due to variations of sensing condition between sensor nodes and coordinators. The main solution of this problem is relay node where direct transmission is not possible. In this paper two hop relay mechanism is proposed in IEEE 802.15.6 standard and divide it into relay node election, channel assessment, data relaying process. The main constraint of this process is it is initiated at different time interval which becomes reason of failure of data relaying. After this a predefined data relaying mechanism has been proposed to overcome data relaying failure problem. In this process predefined relaying node is activated without election. Experimental result shows that predefined relaying process improves 50% of packet delivery rate. Moreover network lifetime is also extended to 8%. In future to improve packet delivery rate more, dynamic scheduling algorithm can be used.

Aashima Arya et.al (2014) reveals [11] that there are basically three types of wireless body area network which are attached on clothes, on body and under skin. In this paper they have discussed various protocols of MAC protocol and current technologies for WBAN. They have discussed that how anyone can get benefits from WBAN as well as human beings also. They also focused on the technique that how health can be improves using multiple nodes. In this paper they have given an idea to improve health care system of India using Telecommunications and technology with the help of wearable and implantable body sensor nodes without effecting mobility of the patient.

Amit Samanta et.al (2015) explains that [12] link quality between accesses points of WBAN varies due to the interface of the coexisting WBAN. Further link quality of the WBAN also affects its performance. WBAN wants to send its real time data to the sink node and its corresponding links quality drops below its threshold value to main network performance. In this paper they have proposed link-quality aware resource allocation scheme in WBAN to address the situation and maximize its overall performance. This scheme has two schemes temporal link quality measurement and sub-channel allocation among the WBAN's. They also predict correlations among different link quality. Furthermore sub-channel allocation phase divides available bandwidth into number of sub-channel to main network quality. There are number of parameters metrics on the basis of which performance of the network is evaluated. The performance metrics are path loss, throughput, and number of dead nodes. The experimental results show that if link-quality-aware resource allocation is made between WBAN and available APs.

M. M. Sandhu et.al (2011) proposes [13] a flexible, energy efficient and high throughput routing protocol for wireless body area networks. In Forward Data Energy Efficiently with Load Balancing protocol, a forwarder node is there which become helpful and reduce transmission time to save energy from source to destination. In an efficient manner, nodes consume energy for longer period. After that they calculated ECG and glucose level and send data directly to have minimum delay. Experimental results show that FEEL protocol has better throughput and stability period. It also helps for continuously monitoring of patients in WBAN.

III. RESEARCH METHODOLOGY

The wireless body area network is type of network which is used to sense the body conditions. The sensors are deployed in

such a manner so that efficiently sensed data can be transmitted to transmitter. The communication in the wireless body area network is multi-hop communication. In this type of communication source node establish shortest path to destination. When source node is transmitting data to destination in between some sensor nodes get faulty or battery of the sensor nodes degraded due which fault may arise in the network. The relay based technique used relay nodes for fault recovery in the network.

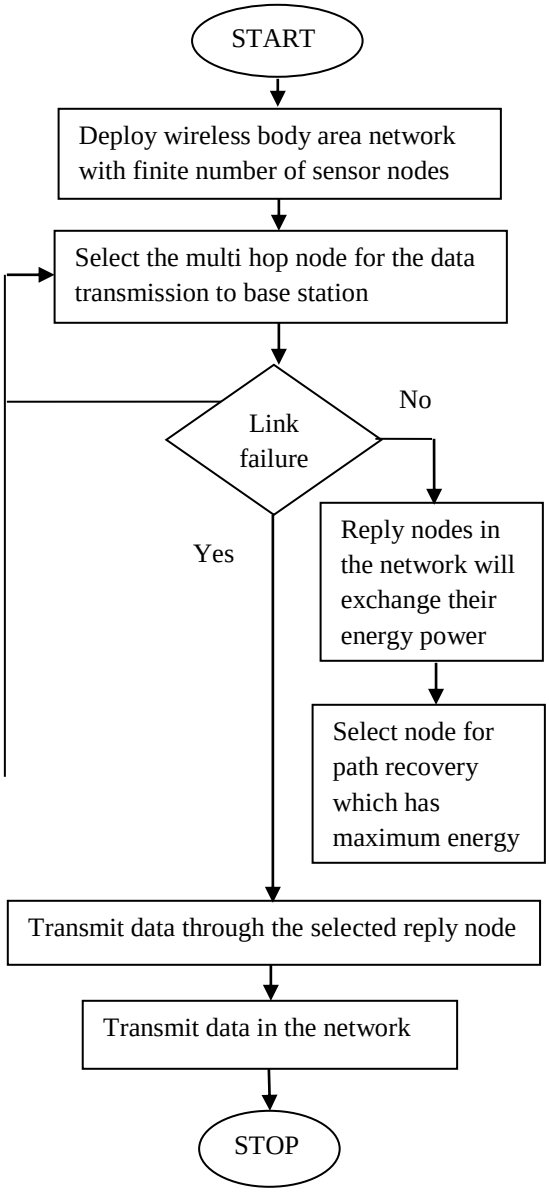

Fig.1: Flowchart of Proposed Technique

In this work, further improvement will be proposed in relay based network to reduce network complexity. The proposed enhancement will be based on dynamic routing. In this routing, multiple paths will be established from the source to destination. When battery of any sensor node reduced to threshold value, new path will be automatically chosen for data transmission. This technique may leads to reduce in network complexity, reduce network delay, reduce energy consumption and increase network throughput. There are number of nodes deployed in the network. Sink is also available in the network. Nodes transfer data through intermediate node to the sink. Node which wants to communicate with sink, data is transferred through intermediate node. During data transmission or forwarding data faults may be occurred at intermediate node in the network. Due to fault, network performance degrades in terms of throughput, packet loss, delay and energy. Transmission of data also affected due to fault occurrence.

IV. EXPERIMENTAL RESULTS

The proposed technique has been implemented in NS2 and the results are evaluated by making comparisons against proposed and existing techniques in terms of different parameters.

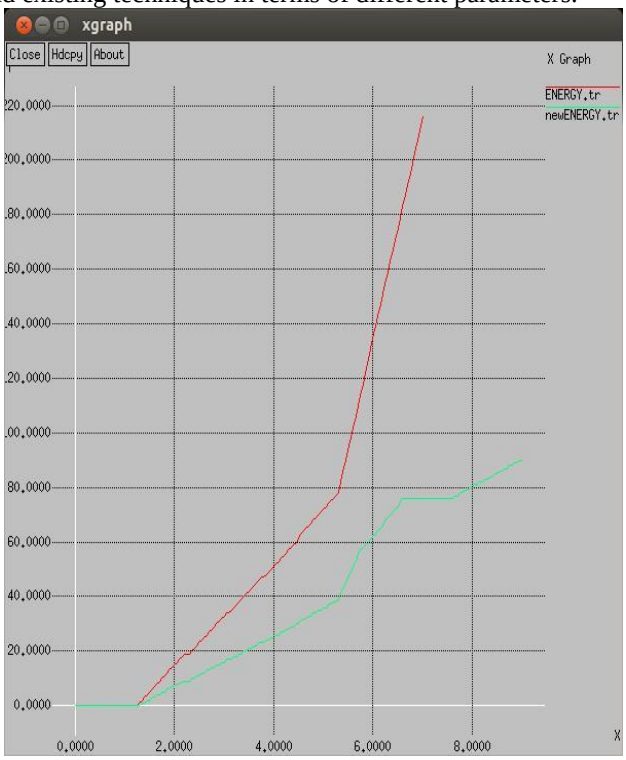

Fig.2: Energy Graph

As shown in figure 2, the energy comparison of proposed and existing scenario is shown and it is been analyzed that energy consumption of the proposed scenario is less and compared to existing scenario due to fault recovery in the network.

Fig.3: Packetloss Graph

As shown in figure 3, the packetloss comparison of the proposed and existing scenario is shown. In the existing scenario packetloss is high due to fault in the network. The packetloss is reduced in the proposed scenario due to fault recovery in the network.

V. CONCLUSION

The wireless sensor networks is the type of network which is used to sense the environmental conditions like temperature, pressure etc. The wireless body area network is the type of network which is used to sensor the body conditions. In the wireless body area network seven sensors are used with sense the whole human body conditions. These sensors sense the conditions and pass information to transmit. The transmitter receives sensed information and performs required actions according to human body conditions. The main problem which occurs in the wireless body area network is of fault. The fault may occur due to failure of sensors and due to battery degradation of the sensors. In the proposed technique, a fault recovery technique in wireless body area network has been discussed. To recover fault author proposed scheme for relay nodes which extra nodes deployed with the sensor nodes. It helps to improve network performance in terms of energy and packet loss.

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