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Clustering AODV Algorithm for the Body Area Sensor Networks Based on IEEE 802.15.4

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Abstract

The development of wireless medical sesnsor networks for health care application has made patient monitoration more feasible. Recently, several wireless health care researchers have developed many techniques for the sole purpose of incessant monitoration of patients, monitoring in hospitals and clinics, monitoring in ambulance, and free environmental monitoring. There is particular standard which is used for low power devices for their operations inside human body for different application in healthcare. Wireless body area network is subfiled of WSN. WBAN play very crucial role in patient monitoring to fetch data from human body with help of sensors and send back to destion point or base station. There are different challenges like size of sensor, antenna design, power backup and many more in WBAN to meet desired result. In this paper AODV clustering algorithm implemented and in reference work D-MAC protocol used. After making a deep analysis we found that proposed clustering algorithm has better result in term of networking parameters like energy consumption, throughput, end to end delay, packet delivery ratio, received packet using IEEE 802.15.4. Further we can add security mechanism so that data cannot be accessed by unauthorized person.

Keywords: WBAN, WSN, D-MAC, Clustering, PAN, Sensors

1. Introduction

WBANs is defined by IEEE 802.15.6 as a communication standard designed for low power insturments requiring little power for their operation, inside/outside human body for serving many diverse applications like medicalcare, consumer electronics / individual leisure along with others. Deprecated low power consumption devices and biosensors being used inside the human body or that can be worn out can be linked utilizing WBANs.

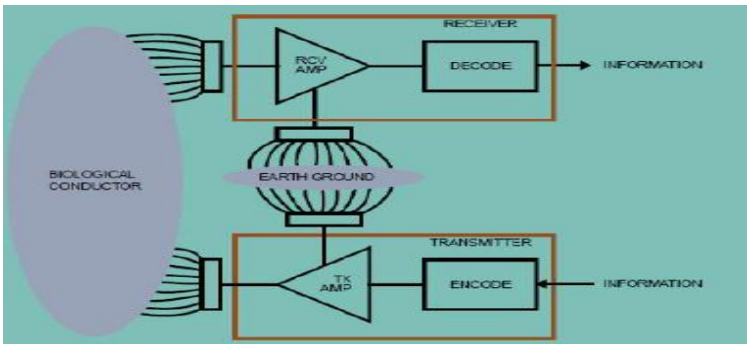

Figure 1 Block diagram of a PAN system

The concept of data trade in-between automated devices kept inside or nearby human body was firstly presented by Zimmerman in 1995 as Wireless Personal Area Network (WPAN). For reducing power consumed, minimizing intrusion, and securing communication from eavesdroppers, a low carrier regularity (fc<1MHz) is utilized. Figure 1 depicts how the battery-driven WPAN communicaion systems work when these are operated around human's body [1]. A displacement current flows in human body whenever a biological conductor gets created. The ground is utilized for preventig the shortage of transmitter and reciever system. The word WBAN was used when communication amid electronic devices were enacted inor out human body. WBAN sensing devices can become wearable, embeddable and convenient; may be incorporated on diverse types of wireless communications motes [2-3]. The sensing nodes practically have limited battery output that is only sufficient for computation and communication. The body implantable and wearing sensing device transmits its informarion at central level operational apparatus called BANC. BANC is computationally much prevailing system than body sensing devices. The BANC transfers the sensors information to target node in a reliable way. Rising research trend of WBANs collects and mutually processes genetic information for incessant monitoring of healthcare circumstances. There are various compenents of WBAN which are listed below:

- Energy Source
- Processor
- Memory
- Sensors
- Transceiver
- Actuators
- Operating System

2. Wireless Medical Sensor Network

Wireless Sensor Networks (WSN) has immense effect in major facets of society including military requirements and also household applications. Applying WSN in medical care can have major pros to gather medical information for having a clear view about patient condition. SN provides real-time data and telemetrices for clinic holders for responding to any medical situation and emergencies.

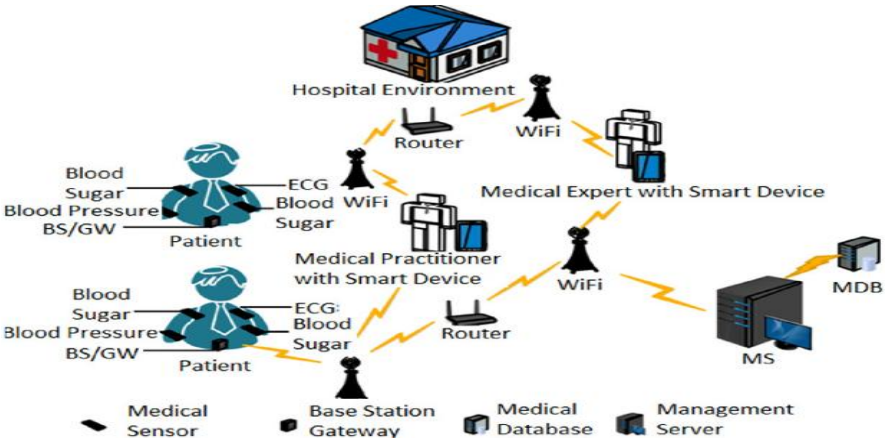

Figure 2 wireless medical sensor networks application in healthcare

Wireless Medical Sensor Networks (WMSN) are networks having medical sensing devices kept in or out of human bodies for sensing patient's vitals and transmitingt the sensed information to any other section without humane interference. A MWSN will trail diverse demeanor of patients that includes movement inside/outside, their temperature and also provides bio-medical data like oxygen saturation level. The telemetry helps in reducing expenditure for health related facilities [4]. It allows clinicians to remotely monitor patients instead of physical presence requirement. If the patient has to be monititored for long time after return from hospital then it can be done with the WMSN. The medical facilities can also provide medications timely depending upon the sensor information. The doses of the medications can be regulated with the help of wireless communications [5]. So the main reqirements of security and integration is very crucial at this stage. No mistakes can be tolerated in the rquirement of the timely mediaction fot the patients.

3. Methodology

In the paragraph, the AODV routing protocol is dissuced in brief; due to performance analysis for the broadcasting schemes already discussed and tested by being outfitted with familiar routing protocol. In the midst of the aforementioned reactive procedures, the AODV is most accepted and extremely researched MANET routing protocol. The AODV routing protocol supportsdynamic route conditions, it has minimum memory overhead.

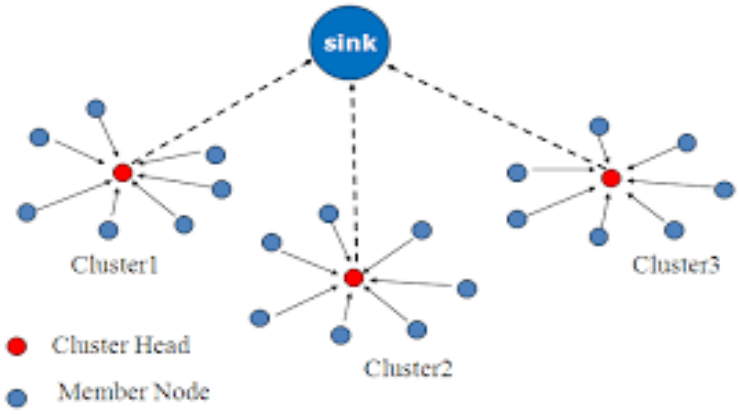

Figure 3 Communication of Cluster

AODV needs small processing and network usage. When nodes want to communicate packet to another node in the same network only then search for shortest path.These techniques are deployed where battery backup play dominant role [7-8]. Besides this path are updated with help of sequence number. Implemented protocol self initiating, loop free and can accommodate huge number of sensor nodes. In AODV protocol each node update his table about respective location of other sensor node and all prime information which is required to communicate between nodes and with CH. In route designing of implemented AODV protocol there are two parts:

- Route discovery
- Route maintenance

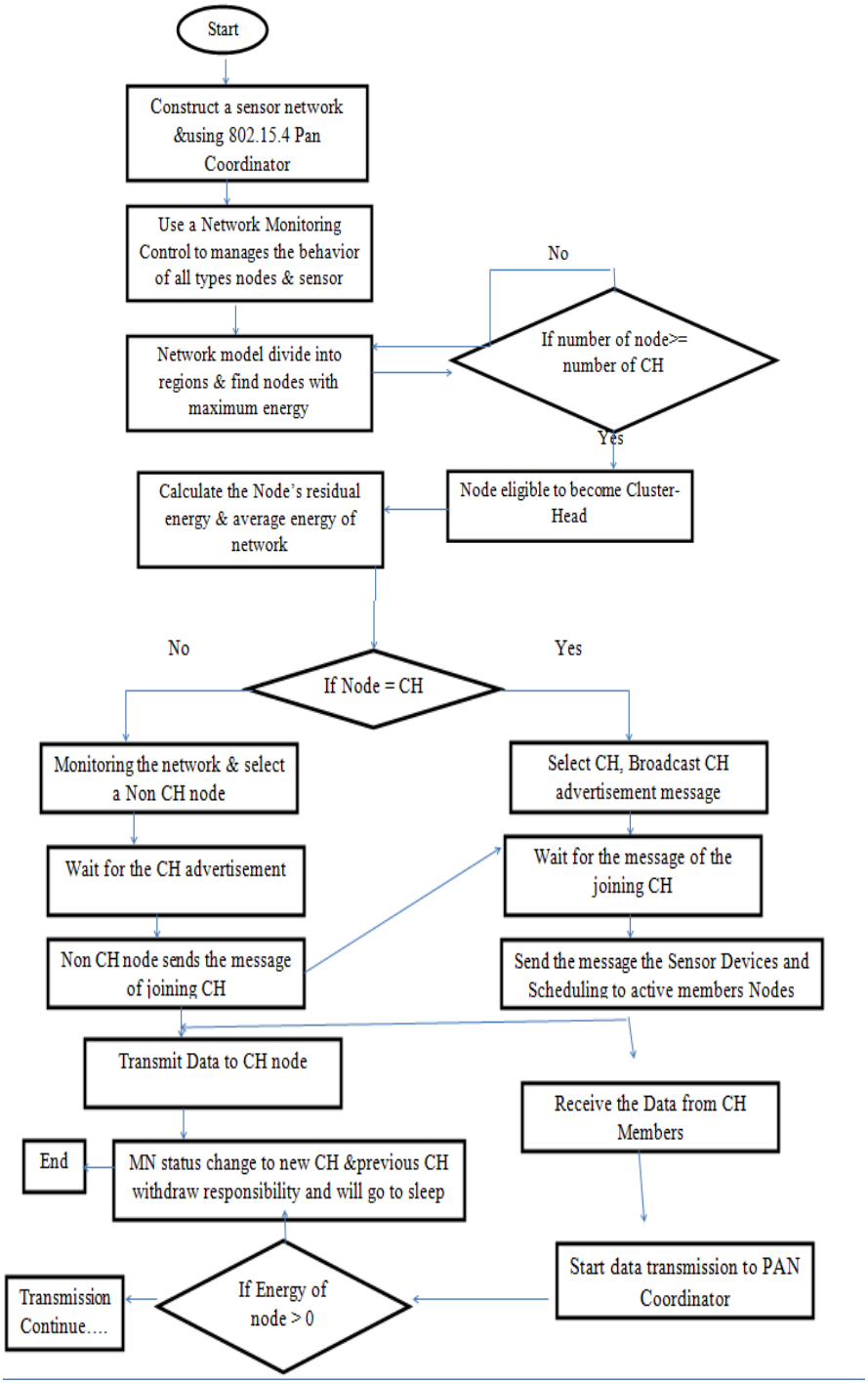

Figure 4 Flowchart of Propsed Work

4. Simulation Result

There are diverse simulation tools exist for detecting pattern of a wireless network environment for example NS-2, J-Sim, OMENT++, MATLAB, and GloMoSim. We have chosen NS-2.35 (Network Simulation) as our tool in simulating the proposed protocol. Ns2 tool is very efficient for networking simulation and easy to analyze.

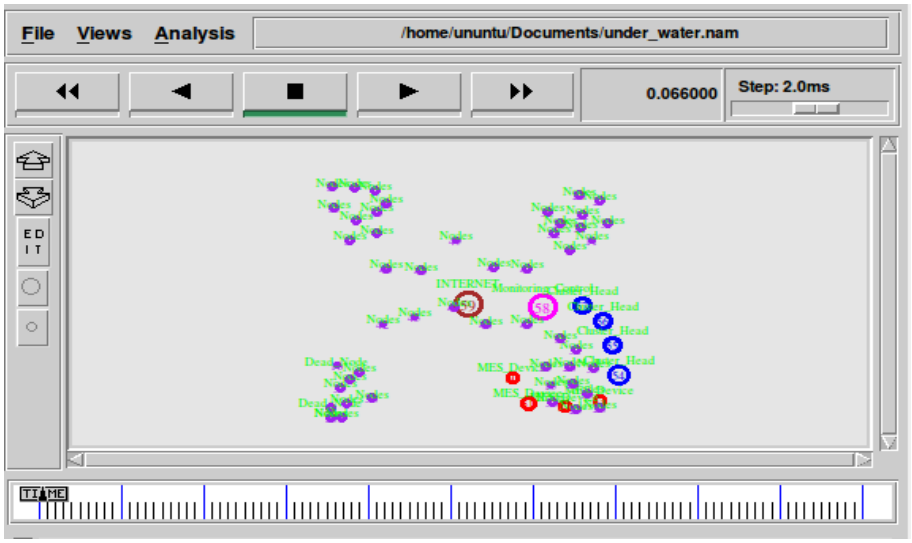

Fig. 5 Clustering forming process

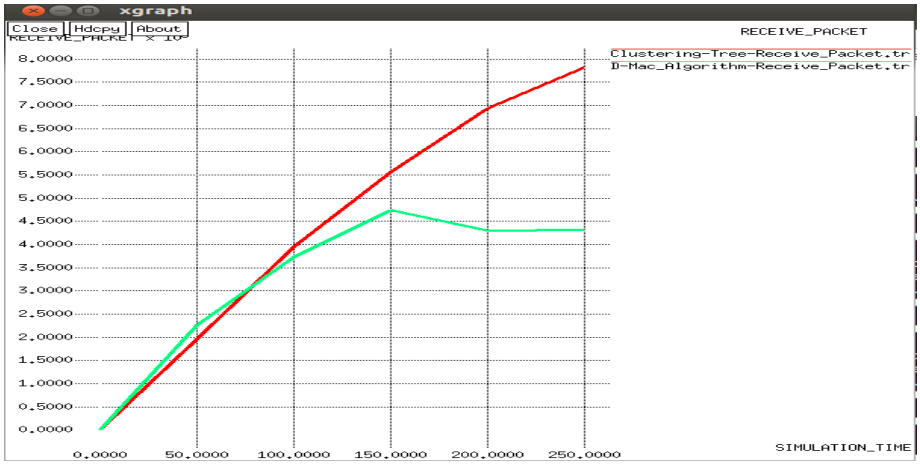

Fig. 6 Communication Process b/w sensor nodes

Total numbers of packet successfully transmitted from transmitter end to receiver end is known as throughput

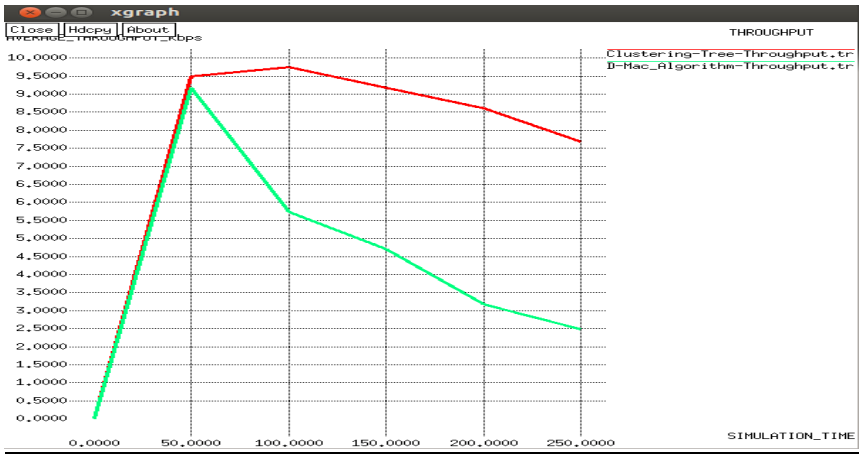

Fig. 7 Received packets in WBAN

Average End-to-End Delay –When data is sent from transmitter to receiver end via various nodes through optimum route then data takes some time to reach at destination. Average E2E delay include delay in the network for example delay induced by routing protocol activities, buffer Queue, transmission delay and

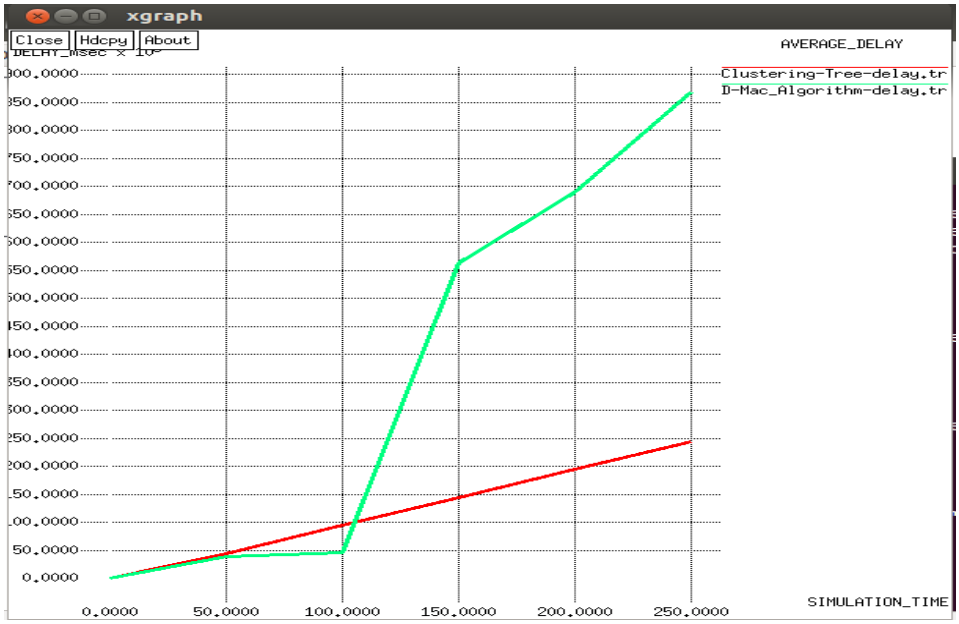

Fig. 8 Average end to end delay

Energy consumption: In transmitting packets energy consumed by sensor nodes and energy consumption varies depend upon weather nodes are transmitting node, cluster head node or receiving node. When the value of energy consumption is low, it means the algorithm achieves high energy efficiency which is good for the Routing protocol.

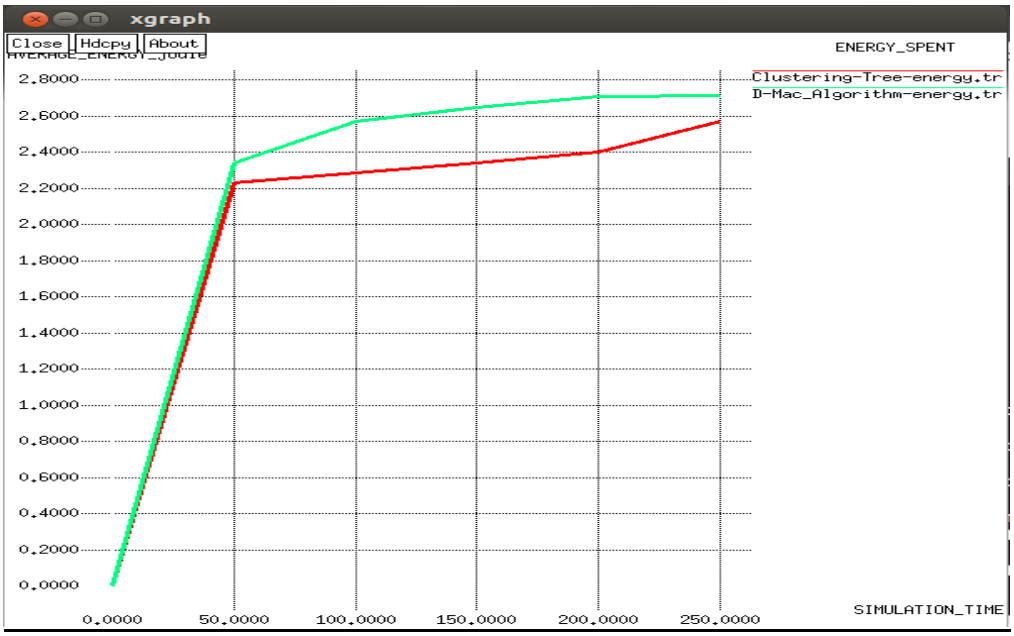

Fig. 9 Energy Consumption

Packet Delivery Ratio (PDR) – It depicts optimized throughput that network can gain. For any network high average packet delivery ratio is required for high efficiency. PDR is

the ratio of numbers of packets delivered to the receiver and total number of packets sent by the source.

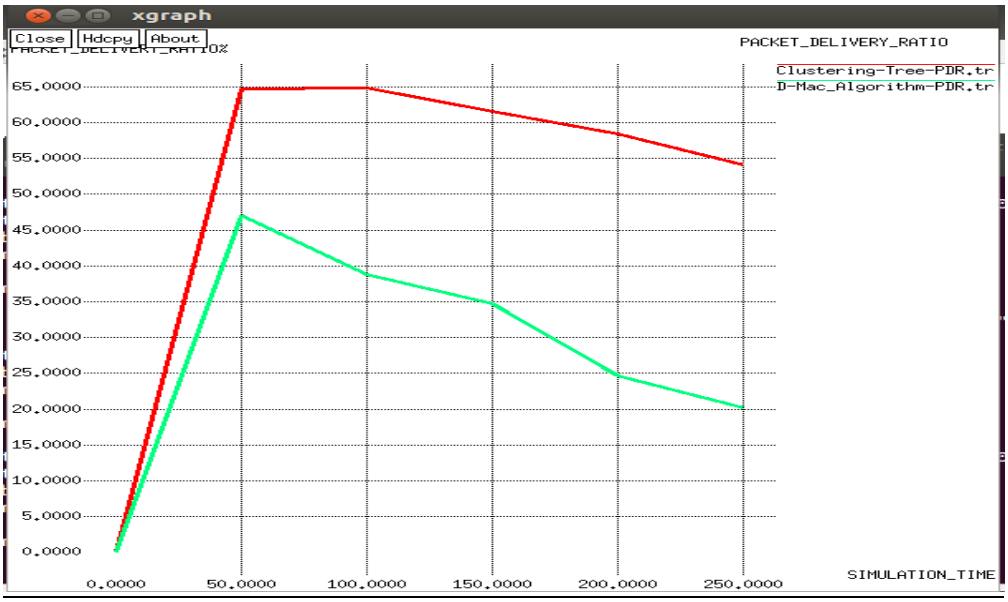

Fig. 10 Packet Delivery Ratio

5. Conclusion

WBANs is defined by IEEE 802.15.6 as a communication standard designed for low power insturments requiring little power for their operation, inside/outside human body for serving many diverse applications like medicalcare, consumer electronics / individual leisure along with others. With time there is fabulous development in filed of networking. WSN is vast area and WBAN is small part of wireless sensor network. In WBAN small sensors are deployed insde the body of human being and sensors collect vital information of patients and send back to destion point or base station but there are different challenges like size of sensor, antenna design, power backup and many more in WBAN to meet desired result. In our dissertation reference work D-MAC protocol and proposed clustering algorithm both implemented and after making a deep analysis we found that proposed clustering algorithm has better result in term of networking parameters like energy consumption, throughput, end to end delay, packet delivery ratio, received packet using IEEE 802.15.4

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