Performance Analysis in Wireless Body Area Networks by Using Zena Analyzer

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Abstract- *Wireless Body Area Network plays a major role in the field of medicine for monitoring the patients. This monitoring helps the patients to recover soon from the illness. Even it can provide precautionary actions to prevent them from diseases. Network Longevity and nodes energy are considered to be the some of the major challenges in the Wireless Body Area Network. In order to increase the performance of the wireless Body Area Networks, the analyzing process should be carried out in the network. For this purpose, Zena Analyzer is used to analyze, so that the necessary requirements needed for the wireless Body Area Network could be improved. This has been implemented in the real time network where the temperature sensor and the heart beat sensor are being considered as the two nodes. The performance of these nodes is analyzed by the Zena Analyzer Software. This software involves the placement of node coordinator which will help us to analyze the network, so that the performance can be improved in terms of network longeviety, energy efficiency of each node.*

Keywords- WBAN-Wireless Body Area Network, BNC-Body Node Coordinator

I. INTRODUCTION

Body Area Networks which is referred to as wireless Body Area Networks, an emerging technology which has helped in many applications. A number of many small sensors could be integrated to form a Wireless Body Area Networks. These sensors are capable of monitoring to prevent any critical risks. The sensors could be placed either on the surface of the human body or it can be embedded inside the human body. The Sensors which are placed on the surface of the human body are referred to as Wearable devices. The sensors which are being placed helps us to monitor the physiological activities Which provides the related information to the external processing unit. This processing unit further provides monitoring information to the doctors or who cares the patients.

Wireless body area Networks supports ubiquitous health care, gaming, entertaintment and other military applications, training schedules for professional athletics, prevention of public accidents, safeguarding of uniform personnel and consumer electronics. In case of health care, the body area networks help the doctors and the care takers to monitor the activities of the patients. These are made to detect the abnormal activities so that the patients can be prevented from the serious issues. Now days, small well equipped sensors are being discovered which has improved the performance in the health care. Since Wired connections are not much more effective, so they prefer wireless body area networks. Since resources are limited and the patients could not afford to stay in hospitals for long days due to economic reasons. So their activities can be analyzed in real time [1] for short time of period. Thus, Wireless Body Area Networks Play a Major role in medical applications.

In WBAN, Network longevity is one of the major challenges which is mainly due to limited amount of energy supply provided by the nodes. This could be improved by placing a coordinator node [2] according to node placement algorithms of wireless body area networks. The node placement algorithms of WBAN have improved the lifetime of the network with low computational Processing capabilities. The Zena analyzer could be used for checking the performance and the actions carried out in the wireless body area networks.

II. RELATED WORKS

The Wireless Body Area Network, an emerging technology helps the patients to be aware about their and also to recover soon from their illness[3].For example, the heart beat rate and the temperature of the human body could be detected so that the patients could be given prior treatment in order to recover soon from their illness. This is considered to be the main motive of the today's wireless body area networking field. In Wireless Body Area Network, the global routing has helped to increase the longevity of the network by providing a balanced condition towards the energy consumption in the network [4].This has been performed by using the Received Signal Strength Indicator method. The power level of any wifi technologies used could be discovered by using the Received Signal Strength Indicator. In WBAN, Network longevity is the major which can also be improved by adding the effect of Relay Network [5].These created relay network will help to control or reduce the energy which was

consumed during the data transmission. This results in prolonging the lifetime of the network. The time division multiple access (TDMA) medium access control (MAC) protocol [6] based on the battery aware of the cross layer prolongs the network lifetime by guaranteeing the reliable message delivery. So that the caring persons can have knowledge about the patients. Even though it can provide better performance results in Quality of Service and also improves the lifespan of the node by using the Bluetooth technologies.

III. IMPLEMENTATION

A. Creation of Temperature Sensor Node

The first main work in this wireless body area network scenario is to create a temperature sensor node. The temperature sensor node is created to measure the temperature of the human body. The temperature sensor which is used is the DSB1820 one wire temperature sensor. The DSB1820, a single wire temperature sensor [7] is a waterproof one which is made up of stainless steel. This is being integrated with the arduino tool kit to measure the temperature of the human body. The normal arduino UNO board uses the Dallas Temperature library [8] for the operation of DSB1820 digital device. The hardware setup of the temperature sensor is shown in figure

Figure 1 Hardware setup of Temperature sensor.

The DSB1820 should be powered between either 3.0v and 5.5v.It is necessary that ground pin should be connected to the 0v and the VDD pin should be connected to the +5v of the arduino board. A 4K7 ohm resistor which is also called as pull-up resistor is used. This pull-up resistor helps to pull up it up to 5V.Thus; the above explanation provides the hardware setup for the temperature sensor.

The programming part is done with the help of the arduino software. The arduino software is used since the hardware setup is integrated with the arduino board. The program for sensing the temperature of the human body is being uploaded to the arduino software. After uploading, the program is saved and the specified communication port should be selected from the tools option. Then the process of compilation is done and the output i.e.(temperature of the human body)will be displayed in the serial port monitor.

B. Creation of Heart Beat Sensor Node

The second sensor node which is used in this scenario of the wireless body area network is the heart beat sensor node. The HSB01 heart beat sensor is used in this scenario for detecting the pulse rate of the human body.HSB01 uses the optical sensors to detect the heart beat rate.

For the creation of the heart beat sensor nodes, the arduino UNO board, the heart beat sensor and connecting wires. The heart beat sensor [10], HSB01 consists of three pins .Data , ground and VDD pin are the three most important pins in the heart beat sensor. The data pin of the heart beat sensor is connected to the analog pin A_0 of the arduino UNO board. The data is red through the analog pin. The ground pin of the heart beat sensor is powered to 0V and the VDD pin is powered to 5V.The above mentioned is the procedure for the connection setup of the heart beat sensor, HSB01.The hardware setup of the heart beat sensor node is shown in the figure

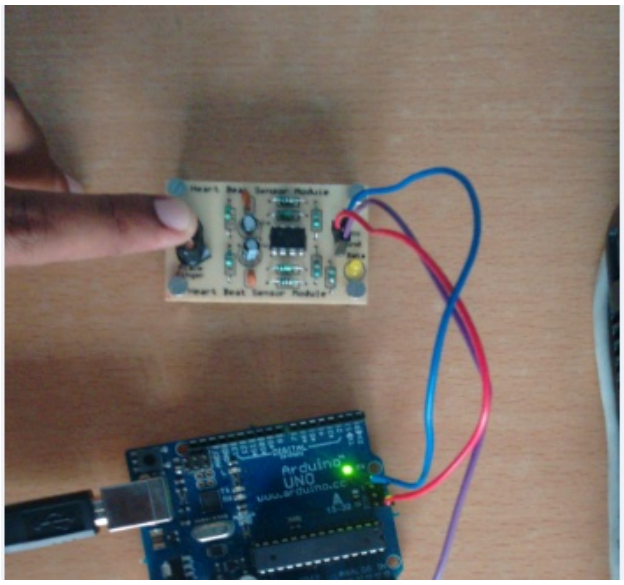

Figure 2 Hardware Setup of Heart beat Sensor

The heart beat sensor, HSB01 measures the volume of the blood by placing the tip of the finger on the sensor. With each heartbeat rate, the volume of the blood alters which could be detected at the tip of the finger. The photodiode can sense the portion of the reflected light when IR LED transmits the infra red light into the tip of the finger .Depending upon the reflected light, the volume of the blood could be detected. This in turn provides us the variation in the heart beat rate which will be detected by the photodiode. The variation in the amplitude of the reflected light could be converted into pulse rate which in turn is counted by the microcontroller to produce the absolute heart beat rate.LM358, the operational amplifier is used to boost the weak signal which is detected by the photo diode and then converts them into pulses. When the heart beat is detected, the LED blinks which shows the signal that the heart beat rate is detected.

The program for the detection of the heart beat rate is now uploaded to the arduino software. Then it is saved and the specified communication port is selected.Finally, the process of compilation is done and the output will be displayed in the serial port monitor.

C. Integration of The Sensor Nodes And Connection Establishment

The Wireless Body Area Network Scenario could be provided by integrating the above two mentioned sensor nodes. The two sensor nodes used in this scenario are heart beat sensor node and the temperature sensor nodes. The two sensor nodes are integrated in order to provide the display of the human body temperature and the heart beat rate in a single communication serial monitor. Here, instead of normal arduino UNO board, the arduino BT device is used in order to provide connection establishment by means of Bluetooth [11].The peripheral board is used since to avoid the wiring connection confusions for both of the sensor nodes. The peripheral board is powered by using 12V supply. The program for the display of both the temperature of the human body and the heart beat rate is uploaded to the arduino software. The hardware setup of the integration of sensors and connection establishment is shown in the figure

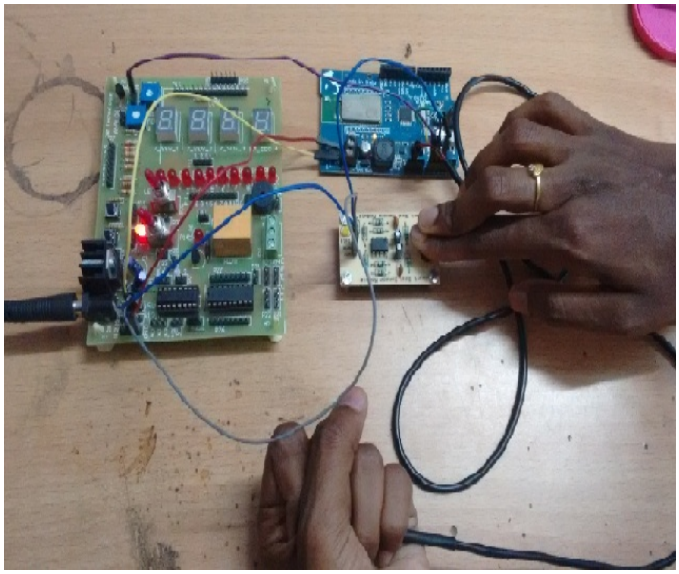

Figure 3 Integration of Sensor nodes.

The person whose temperature and the heart beat rate should be calculated is done by placing these two sensors. The one wire temperature sensor should be held to the palm of the person in order to detect the temperature of the human body. To measure the heart rate of the person, he/she should place the tip of the finger on the sensor. According to the blood flow volume,the heart beat rate will be displayed along with the temperature of the human body in the serial monitor or in putty window of the person who is in need of information by using Bluetooth connection establishment. Thus the output could be obtained either by the Bluetooth terminal of the mobile phones or by the putty terminal of the laptops or PC's.

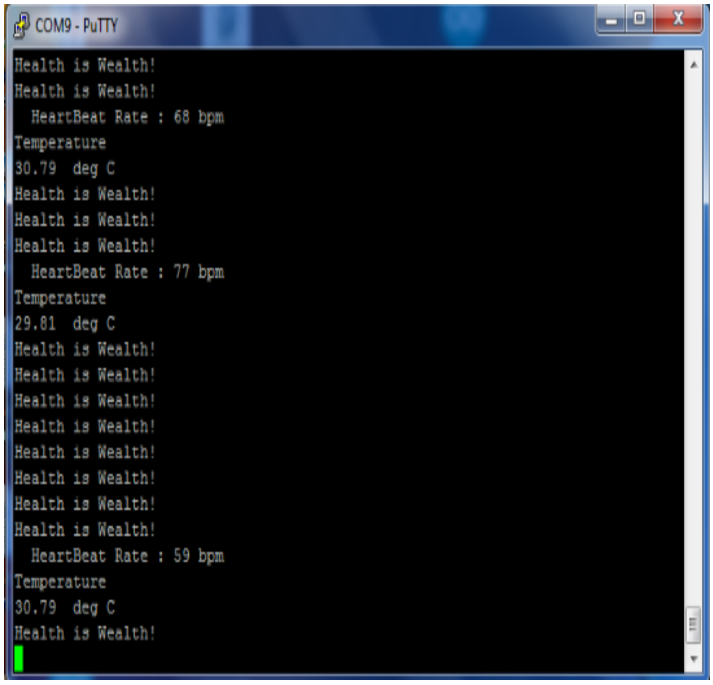

Fig 4: Output on Integrating the Sensor nodes.

D. Placement of Node Coordinator

The node coordinator is placed in order to analyze the performance of the network. In order to perform this, the hardware and software of Zena wireless network analyzer [12] is used.

The Zena wireless network analyzer requires the mini USB cable and the coordinator node which consists of integrated temperature and heart beat sensor. The temperature and the heart beat rate of the human body will be sensed and detected. The measured temperature and the heart beat rate value of the human body will be passed to the care takers or the doctors through Bluetooth connection. The data (temperature and heartbeat rate of the human body) will be received by the doctors or the care takers through the blue tooth connection either in their laptops or mobile phones.

The Zena wireless network analyzer software should be installed in order monitor the performance of the wireless body area network. From the installed Zena wireless network analyzer software, select network traffic monitor field from the tools option. The network traffic monitor window opens, select the particular channel and the speed limit for the process of transmission. In the network traffic monitor window, the transmission of messages and the configuration details can be inspected and examined .In order to proceed with the process of analysis; the start button of the operation should be clicked. The operation starts by analyzing the transmission of messages and the information regarding the network that could be analyzed .Thus this is the work of the Zena Wireless Network Analyzer.

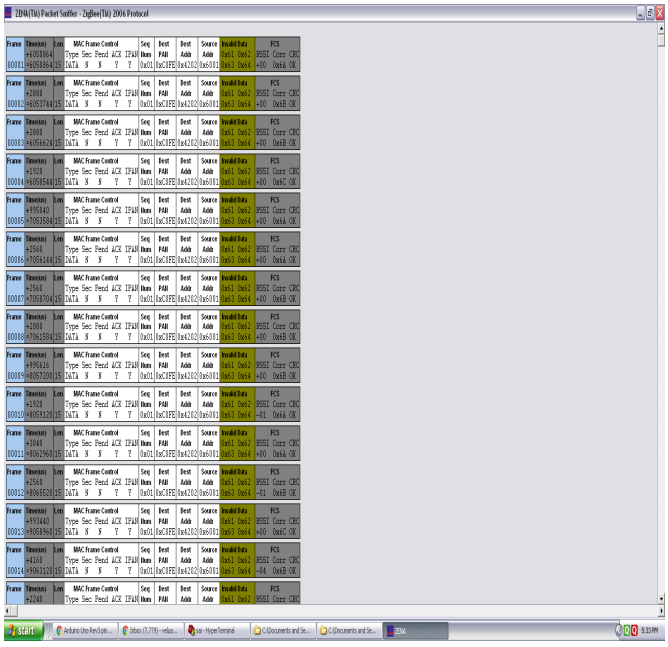

Fig 5: Analysis done by Zena Analyzer

Based up on the output produced by the Zena Wireless Network Analyzer, the lifetime of the network could be increased. The efficiency could be made higher to the temperature sensors and the heart beat sensors which are considered as the nodes. These two sensor nodes are coordinated by the node coordinator which is being integrated with the hardware of the Zena Wireless Network Analyzer. Thus the performance of each nodes could be analysed which further helps us to do modifications to the Body Area Network. Based upon the efficiency and the performance measurements of each node analysed, the lifetime of the network could be recognized. The lifetime of the network is a very important issue.

IV. CONCLUSION

In this paper, the placement of node coordinator by using Zena Analyzer has played an important role in analyzing the performance of each node. This has helped to focus on the maximizing the lifetime of the network. The temperature sensor and the heart beat sensor have been taken as the real time example in measuring the temperature and the heart beat rate of the human body. The output is obtained and is transferred via Bluetooth. This transformed information is analyzed by using the Zena analyzer software. Thus the performance of the wireless body area network is analysed which will provide an idea to improve the performance and the other requirements.

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