Wireless Body Area Network
A Review

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Abstract— **Future communication systems are drawn at the concept of always being connected all time and everywhere. This is not only limited to medication. Wireless medical area communications assist people who work and replacing wires in a hospital are the applying wireless communication in medical health system. The growing number of use of wireless networks and the constant miniaturization of electrical devices has empowered the development of wireless body area networks (WBANs).In these networks many sensors are attached on cloths or on the body that are attached under skin. These devices give continuously health monitoring and real-time reviews to the users or medication assistance. The wireless communication of the network and the variety of sensors provide number of new, practical and unique applications to improve healthcare and the quality of life. The sensor measures parameters of human body, may be externally or internally. This include measures of the heartbeat, body temperature and recording a long-term electrocardiogram (ECG).**

Index Terms- Wireless Body Area Sensor Networks (WBAN), Wireless Sensor Network (WSN), Wi-Fi

INTRODUCTION

A WBAN is a special purpose sensor network that acts as an interface between various sensors in and around the human body and the computer machines. They have several physiological sensors attached to the human body or implanted in the body, that will record and process the physiological changes and measurements, sending these measurements to an external processing unit, which could be then transmitted to other external servers [1][6]. Similar kind of examples include the prevention of ulcers[2], support of rehabilitation[3], or informing doctors at remote locations of the state of patients those are providing at home[4]. Many number of health care applications that use wearable sensors and implantable sensors in WBAN are studied in [7][10]. All the applications mentioned use wireless sensor nodes that measure physiological changes, perform some processing and send data to some Gateway (personal devices) like mobile devices, personal systems or personal digital assistants (PDA) that acts as a sink [5]

The WBAN is capable of connecting to the communication network and provide the data. The sensors contact each other with the local control devices which are either on patient's body or at accessible distance. The local control devices then communicate with remote destination or a monitoring server to exchange data for diagnostic purposes. In emergency, as abnormal the readings accessed by ECG, an alert is sent to the caring group of people. An appropriate action is then taken according to the severity of the alert. WBAN system must also meet a number of security requirements like confidentiality, data integrity etc as mentioned in [7][8].

In this project, the data obtained from multiple heartbeats, temperature and dust sensor is stored and processed using microcontroller, which is then processed to a central unit, for the info of multiple sensors will be display to simultaneously. The efficiency/efficient data transmission is monitored and verification is done. Wireless network is for the sensors been successfully designed to show the active pulse sensor. Besides, the data transmitted and received by the receiving system is accurate and it has been proved through several observations..

Heart beat sensing are used to get the heart rate of the patients. The motto of this sensor is based on the infrared light absorption characteristics of oxygen and deoxygen hemoglobin. Oxygenated hemoglobin soaks more infrared light and allows more red light to pass through it. Deoxygenated (or reduced) hemoglobin absorbs fewer red lights and allows less infrared light to pass through it. Red light is in the 600-750 nm wavelength light band and infrared light is in the 850-1000 nm wavelength light band. After the transmitted red (R) and infrared (IR) signals pass through the measuring site and are received at the photo detector, ratio is calculated. The R/IR is then compare to a "look-up" table. Dust sensor is used to measure the dust percentage inside the ward of the hospital and the temperature sensor is used to measure the temperature of the ward

Once the data is received by these sensors and processed by the microcontroller, the data is forwarded to a main/exact location with the help of Wi-fi. Wi-fi implements a high level communication protocol using low power digital radios. It is mostly used to send periodic data signals over long range with the help of mesh networks. It provides a secure way of networking. The less usage cost allows its wide range of usage and due to low power it can operate longer. Most importantly if the data sent by the sensors to the microcontroller is abnormal, then an automatic message is sent to the doctor so that the patient can be attendant. Each patient is authenticated with a unique ID (identification) number, thus there is no confusion/misunderstanding in attendance of the suffering patient.

II. METHODOLOGY

The working principle for this project is the easy measurement of a patient's vital parameter through a new sensor based device and the communication network provided by the gateway and Wi-fi technology. These two technologies combine to build a fast monitoring system for hospitals and healthcare centers and are very practical.

An optical sensor based device called heartbeat sensor is used to measure both pulse rate and hemoglobin level. It passes the light waves through a thin body part such as finger and a photo-detector at the other end measures the intensity of both. More oxygenated hemoglobin absorbs more infrared light and passes the red light. Deoxygen (or reduced/minimised data) hemoglobin absorbs few red lights and allows less infrared light to pass through it. This information or data is forwarded to the microcontroller which analyzes the infor. Then the info is again sent to the monitoring system (computer in the ward) which collects the data from the patients and then transmits it to the main location. Each such set consist of temperature sensor, dust sensor and heart sensor. The temperature sensor detects the temperature of the existing ward. This combine of the set of AT98S52, temperature sensor, dust particle of this sensor and heartbeat sensor acts as the transmitter part. The data obtained from these sensors are stored in the host computer. The data in the host computer can be Wi-fied anywhere in the network. Here it is wi-fied to a main monitoring server. This exact processed done and setup done constitutes the receiver part. The data transmission is started as soon as all the connections are made and each node of patient has its unique ID number which has been assigned using AT89S51 controller. This ID number is important to difference data, as it is received at the receiver end. N number of data will be judged at the receiver end and will be shown on a individual monitor. This will be easier for the medical practitioner to examine a number of patient/illness people one by one. Thus it will monitor will also view the active heartbeat and temperature sensor. The inactive and idle sensors don't judge them

The monitoring application is designed with the help of Dot net and c hash These tools are system design software that provides engineers and scientists the required tools needed to create and deploy measurement and control systems through unprecedented hardware integration..

The data obtained from the sensors are real time data. If the data obtained from the heartbeat sensors shows any not normal person, automatically sends the message notification is sent to the doctor's mobile also. in that case, the staffs and the nurses who are judging from the monitoring server, will take care & notice this. The mobile also. in that case, the staffs and the nurses who are judging from the monitoring server, will take care.. The other sensors may also show abnormalities, in that case, the staffs and the nurses who are judging from the monitoring server, will take care & notice the scenario
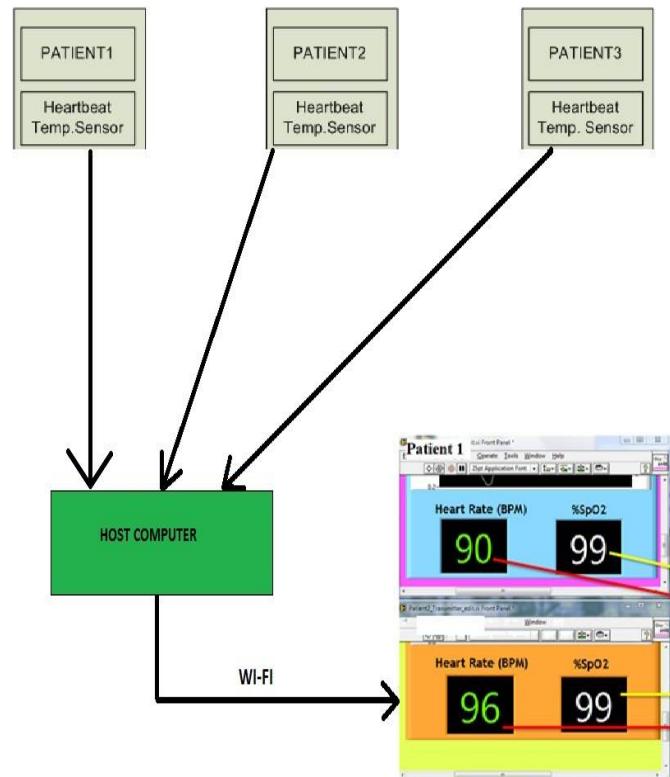

Figure 1: Block diagram for the Centralized Heart Rate Monitoring system

III. RESULTS

The proposed system provides a web application for the observer to monitor the patients simultaneously using internet connections.
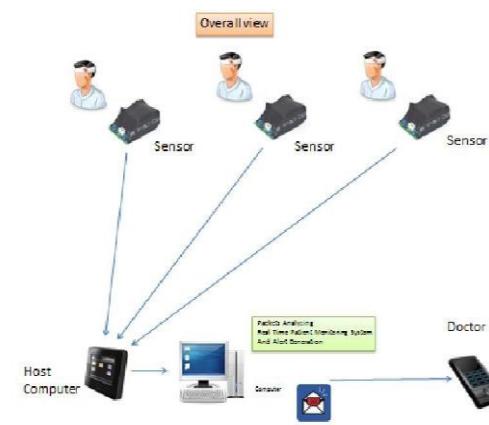

Figure 2: Proposed system architecture

As shown in the above proposed system diagram the observer opens the web application through the web browser. The operations are then selected by the observer. The observer collects the data of the patients from the host computer. The main hosting computer sends the fine/exact/appropriate data through Wi-Fi. The observer then collects the information for the references. If the data received shows any abnormalities regarding the heartbeat rate, not the normalized temperature in the ward or the

abnormal dust particle density of the ward, then an automatic notification is the message format is sent to the head of the doctor through the application to show the deteriorating condition of the patient or the ward

Whenever the system collects the data from the patients, i.e. the host computer, the data can be stored in it and then be transmitted anywhere, where there is an appropriate wireless connection. It is sent/transmitted to a exact place where it is viewed frequently/continuously. The whole staff of the doctors and sisters/nurses are then far away from the patients can simultaneously monitor the patients.

Various test cases were generated and the results were inferred from the test cases. The normal range for the heart rate of a patient was taken. The normal range for the dust percentage in the ward was taken as 005% to 020%.

The reading from patient 1 is taken from the host computer and then wi-fied to the main computer. Figure 3 demonstrates the condition of the patient to be normal
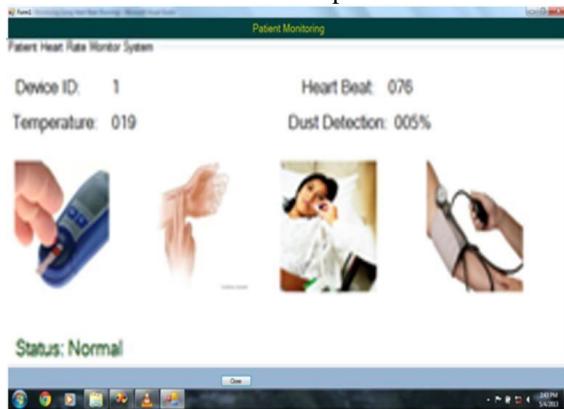
Figure 3: Normal Heart rate and temperature reading from patient 1

The reading from patient 1 is again taken from the host computer and then wi-fied to the main computer. Figure 4.1 at below will demonstrates the condition of the patient 1 is not normal.There is the abnormality of the number of readi of the form in real time is an automatic notification in an alertness form is sent to the mobile phone of the doctor or the health care professional
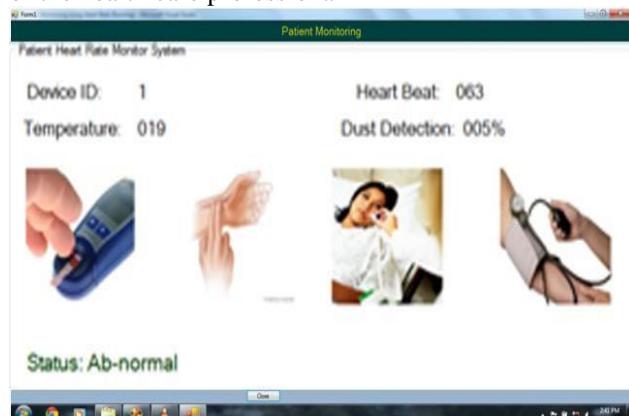
Figure 4.1: Abnormal Heart rate and temperature reading from patient 1

Figure 5: Reading from different patients

IV. CONCLUSION

The recent advances in the WBAN has the ability to integrate technology with existing applications or medical support platforms and deploy large scale systems that operate in not exact locations. The initial perspective of this is to create a wireless body area sensor network for handling real time data from different sensors and forwarding the data received by the host computer in the TTL format to the USB format on the computer from where we are receiving the data. The content that is in the process of transmission and then the receiving is real time data and accurate. These features allow this system to be deploy-able in the hospitals or any institution that provides medical and nursing care. Further improvements on the paper includes expanding the system is connected to the patients who are far away in remote areas, and doctors using wireless body area network.

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