Android Based Health Care Monitoring System

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Abstract— **Generally in critical case patients are supposed to be monitored continuously for their $SP0_2$, Heart Rate as well as temperature. In the earlier methods, the doctors need to be present physically or in several cases SMS will be sent using GSM. In the earlier case the history of the patient cannot be displayed, only current data is displayed. In the current paper, we are using a novel idea for continuous monitoring patient's health conditions. The health care scheme is focus on the measurement and Monitoring various biological parameters of patient's body like heart rate, oxygen saturation level in blood and temperature using a web server and android application, where doctor can continuously monitor the patient's condition on his smart phone using an Android application. And also the patient history will be stored on the web server and doctor can access the information whenever needed from anywhere and need not physically present.**

Index Terms— **Heath care system, Android smart phone, web server**.

I.INTRODUCTION

Health monitoring systems are gaining their significance as the Fast-growing universal elderly population increases demands for caretaking. In ICU there is needed to continuous monitoring there health conditions. In so many cases patients released from the hospital still they are strongly advised to be under rest and observation some period time then these cases the system is very much helpful.

Monitoring and recording of different physiological parameters of patients in the outside clinical environment is becoming increasingly. A wireless Machine to Machine healthcare solution [1] that uses IPv6 techniques to check the health condition of the patients. The M2M devices are designed and used for the measurement of biomedical signals and transmitted to server machine through IP-enable internet and the visualization module of the server program graphically demonstrate the recorded biomedical signals on android mobile. The tele medical systems focuses on the measurement of health care parameters based on two different designs of a Body Area Network connected to Android Smartphone [2] in the first design a ZigBee based method sensor nodes acquire the Physiological parameters and performs signal processing to a controller node and second devise Sensors are linked via cable to an embedded system. The ZigBee based wireless patient monitoring [3] designed by using multi hop ZigBee devices, through ZigBee device to find fall monitoring, which integrate fall finding, covered position and ECG monitoring etc. When triaxial accelerometer of a device
finds fall detection then the present location of the patient is transmitted to an emergency interior through a ZigBee system.

Web based Real-time Monitoring for Pervasive Healthcare [4] uses the Context Aware instantaneous subordinate healthcare architecture and it provides the remote live monitoring of a patient by healthcare professionals. The essential signs are monitored with wireless BAN sensors that can monitor blood pressure, ECG and blood oxygenation. An Android Based Emergency Alarm and Healthcare Management System [5] implements through GSM and GPS network, the system find the location of the users when they are in trouble and trigger the alarm, and the alarm message receives the doctor or their family then they can instantaneously take actions to rescue the user. An Ultra Low Power Pulse Oximeter [6] Implemented with transimpedance amplifier, photo diode current source and photo detector. In this plan obviates the requirement of digital signal processor and A to D converter, it leads to a small single chip solutions here the majority of power reduction is due to the use of a novel logarithmic transimpdence amplifier.

The personal Healthcare Information scheme [7] main focus is measurement of various parameters like ECG, SpO_2 etc with the use of J2EE and oscilloscope. This system having mainly three modules, these are User Interface, information processing system and data base. The main task for this system is collecting the different application data from different sensor through Oscilloscope and processes them through a predefined diagnosis.

Design and realization of Zigbee based wireless sensor Network for remote SpO_2 monitor [8] is consists of a MCU, Zigbee chip and SpO2 sensor. The SpO2 sensor measures the reading from patient's and transmits in to the router. The router schedule distribution time information to each associated device and PAN controller extracts the acknowledged packages and transmits them to the personal computer. Microcontroller based health care monitoring [9] the method uses ATMEGA8L as essential processing unit and sensor network. The system maintains a threshold value of BP analysis, heart rate and body temperature and if the reading exceeds the threshold value system notifies an alarm.

Our paper organized as follows section II describes a brief discussion of system design, section III describes about experimental results related to the project and section IV describes conclusion.

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II. System Design

This system composed of three parts, they are sensor part for collecting and analyzing the data from the human body, controller part processing the collected data and stored into the memory

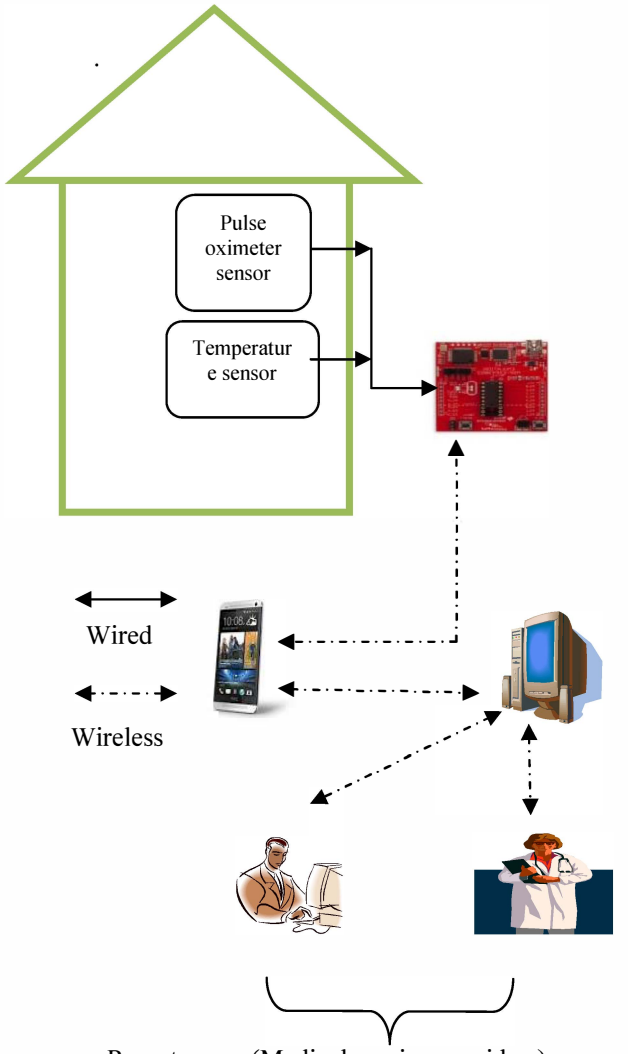

Fig.1: Basic Architecture of healthcare system

An android phone receiving the controller stored data using Bluetooth module at a time upload the receiving data on to the web server for remote access for the purpose of medical support. The overall system architecture shown in Figure 1.

The proposed system architecture composed of various modules and the module specifications are shown in the Table 1.

A.Body Temperature Sensor:

The body temperature can be calculated by putting sensor in contact with body. In the arrangement the body temperature sensor is used LM35.The LM35 is meticulousness integrated circuit temperature sensor, whose output voltage is linearly to the celsius (centigrade) temperature. It can measure the temperature more precisely than the thermistors and it possess low self heating ability and it does not need any outside calibration or trimming.

TABLE 1: Specifications Of Healthcare System

Module	Item	Specification
Pulse oximeter sensor	LED Gain Power	Infrared,LED 100 3.3V
Temperature sensor	Temperature Range Power Output impdence	$-55^0$to -150^0c 4 to 30 V 0.1 W for 1mA load
MSP430	Core architecture Power No.of interrupts peripherals	16 bit 1.8 to 3.6 V 40 10 bit ADC
Bluetooth module	Power Default baud rate Range	3.3 V 9600 bps Up to 10 m
Android phone	CPU OS Connectivity Battery	Intelatom Z350 KitKat Wi-Fi, Bluettoth Li-on 1750mah

B.Pulse Oximetry Sensor:

Pulse Oximetry is fast, non-invansive, easy to use and continuous method for measuring the oxygen saturation ($Sp0_2$) and Heart Rate. Oxygen Saturation means how much oxygen dissolved in blood,based on dection of Hemoglobin and Deoxyhemoglobin and Heart Rate means number of the heart can contracts in a period of one minute.

Two different Light Wavelengths 660nm (red light spectrum) and 940 nm [10] (infrared light spectrum) are used to determine the actual dissimilarity in the absorption spectrum of HbO_2 and Hb. A photodetector in the sensor receives the non-absorbed light from the LEDs. This signal is inverted using an OpAmp and result signal like Figure 2. This signal represents the light that has been absorbed by the finger is separated in a DC and AC component. The DC part represents the light absorption of the venous blood, tissue and non-pulsatile arterial blood. The AC part represents the pulsatile arterial blood.

The pulse oximeter analyzes the light absorption of two wavelengths from the pulsatile-added volume of oxygenarated arterial blood (AC/DC) and absorption ratio using equation 1.

$$R= \frac{(AC660)/(DC660)}{(AC940)/(DC940)} \quad (1)$$

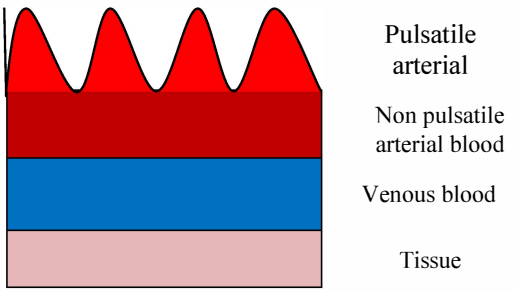

Fig.2: Light adsorption diagram

Another way for calculating SpO_2 is taking only AC component of only the signal and determine the ratio by equation 2.

$$R=\frac{\log_{10}(I_{ac})\ \lambda_1}{\log_{10}(I_{ac})\ \lambda_2} \quad (2)$$

I_{ac} represents light intensity at (660 nm) or (940 nm), where only the AC level is present.
The signal from Pulse Oximeter Sensor is very low current order of μA. So there is a need to amplify to required level with the help of Light Source Amplifier.

Light Source Amplifier:
LM358 Oeration Amplifier is used to amplify very minute amount of current (μA) depending on the intensity of IR and visible RED light.The IR and RED light sensed by the photo diode to 2V to 3V of analog voltage which is converted to digital form by built in ADC of Microcontroller MSP430. In order to convert those numbers to SPO_2 in terms of percentage, the software program is developed in the microcontroller.

D:Bluetooth Module:
In this project data is to be transmitted to remote location as per our main requirement.There are different communication technologies are used for data transmission these are Wi-Fi,Zigbee,GPRS ,GSM and Bluetooth.Because of Low cost and error correction meachanism in this project used Bluetooth.

E. Web server and Android Application

An android is open and comprahensive platform for mobile devices. For development the smartphone are being used with Android 4.4.4.

In android app receving Bluetooth data with help Bluetooth Socket API amd read the data with the help of read stream. This can done through the following code [11]

```
Private BluetoothSocket create
BluetoothSocket(BluetoothDevice bluetoothdevice) throws
IOException
 {
Return bluetoothdevice.create Rfcomm Socket To Service
Record(BT MODULEUUID);
}
```

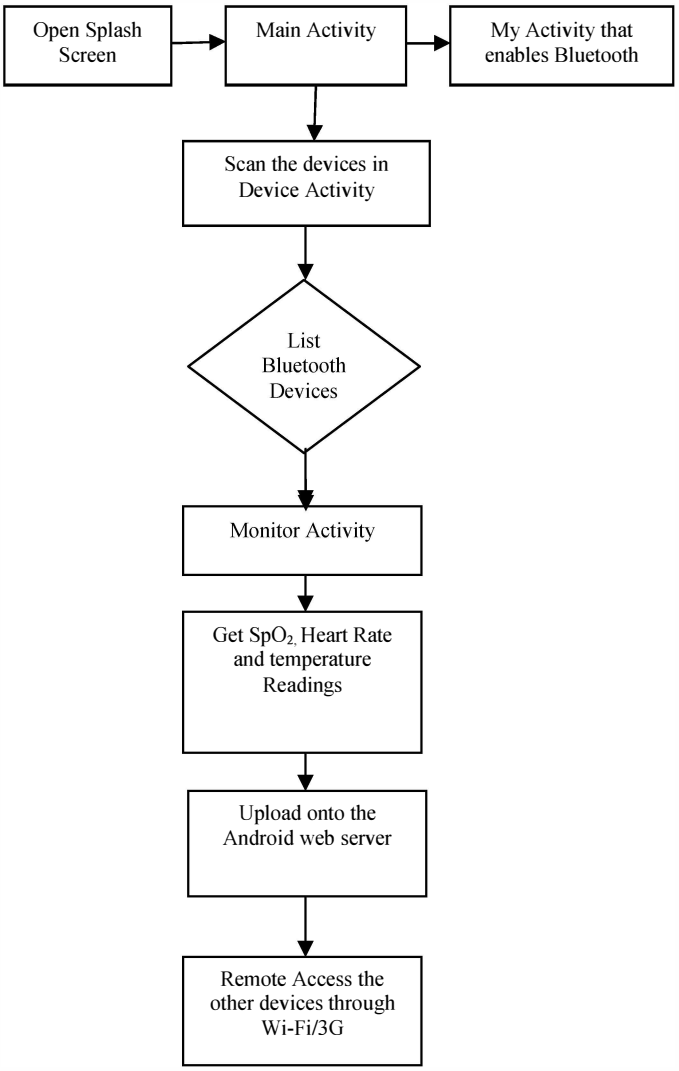

Fig. 3: steps involved to develop android app

III. EXPERIMENTAL RESULTS

Here developed an an android application for receving the medical parameters and displayed on android mobile with the help of Bluetooth Module and at a time uploaded on to the android web server.After opening the android app in mobile it shows the list of bluetooth modules

shows in Figure 4 then connected the required Bluetooth module that is connected with the system hardware.

Fig. 4: List Bluetooth Modules Paired with Android Phone

After connecting the required Bluetooth Module (Figure 5) shows Android app received data from system.

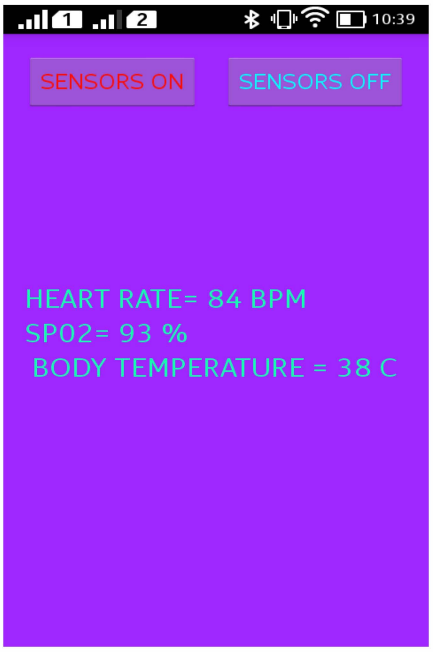

Fig.5: Results read from Android App

At a time received data from android phone is upload on to android server then the doctor can easily access the patient's infromation for that purpose we can developed another app (Figure 6 and Figure 7) shows the reading that are from the server

Fig. 6: SPO_2 reading taking from android server

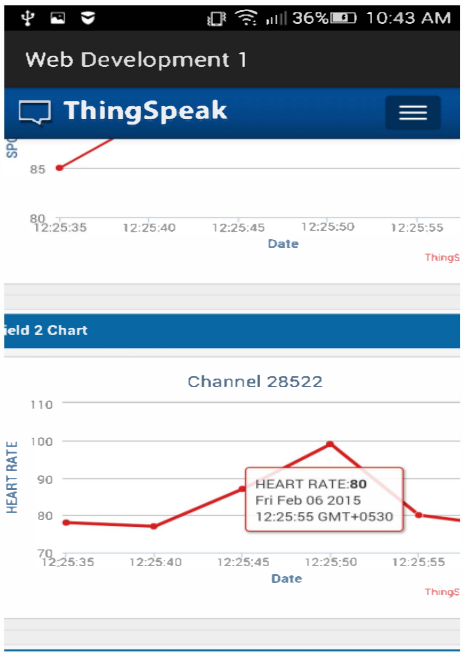

Fig7: Heart rate reading taking from android server

IV. CONCLUSION

This current designed system provides low complexity, low power consumptions and highly portable for health care monitoring of patient's and it can eliminates the need of ultilization of expensive facilities.The doctor can easily access the patient's information at any where with the help of android web server.

In future, we can develop a big data base of all the patients of any hospital and the these health parameters can be monitored continuosly, and also the information is uploaded to the hospital server. These servers keep the information of the patients in the data base, and doctors can have the access of patient's history, when any further consulatcy happens with the doctor.

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