



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

Real Time Human Health Monitoring Using Wireless Network

Mosamee G. Sonkhede, Amit M. Rawate

M.E. Scholar, Dept. of Electronics and Telecommunication Engineering, CSMSS, Chh. Shahu Maharaj Shikshan
Santha College of Engineering, Aurangabad (MS), India

Assistant Professor, Dept. of Electronics and Telecommunication Engineering, CSMSS, Chh. Shahu Maharaj Shikshan
Santha College of Engineering, Aurangabad (MS), India

ABSTRACT: This paper is based on monitoring of patients. Designed and developed a reliable, energy efficient patient monitoring system. It is able to send parameters of patient in real time. It enables the doctors to monitor patient's health parameters Blood pressure, heartbeat, ECG in real time. Here the parameters of patient are measured continuously (Blood pressure, heartbeat, ECG) and wirelessly transmitted using Bluetooth. This project provides a solution for enhancing the reliability and flexibility by improving the performance and power management of the patient monitoring system. In the current proposed system the patient health is continuously monitored and the acquired data reading are then transmitted with the help of Bluetooth module. This reading can be accessed in realtime by the doctor's smart phone with the help of android app. An automated SMS is sent to the pre-configured Doctor's smart phone with the help of a standard GSM modem interfaced to the microcontroller.

KEYWORDS: Healthcare system, Sensor, Android smart phone, Bluetooth, GSM modem etc.

I. INTRODUCTION

The design of portable systems for remote monitoring of patients specifically those who are suffering from cardiac diseases are becoming one of the most important fields in telemedicine. This system can be useful especially by patient like senior citizens or having physical disabilities or who are alone. Therefore, this system can be utilized smart phone industry and emerging growth in the usage of mobile applications that range from entertainment and educational apps to simple games, health care apps and more.

The purpose of this paper is to monitor the critical conditions. The sensors at the patient's side monitor and record the readings. These readings can be accessed the doctor's mobile in real time. With advances in mobile communication new opportunities have opened up for the development of healthcare systems that remotely monitor biomedical signals from patients. The availability of a new generation of mobile phones has had an important impact on the development of such healthcare systems, as they seamlessly integrate with a wide variety of networks (such as 3G, Bluetooth, wireless LAN, WCDMA and GSM), and thus enable the transmission of recorded biomedical signals to doctors android smart phone.

The main objectives of the project are:-

1. Real time monitoring of health condition of person.
2. Alerts in emergency to predefined contact numbers.
3. Works anywhere in the world (with GSM availability).

II .RELATED WORK

The idea came to me while searching for my dissertation topic. Basically the reason behind selecting a topic is the personal interest in the field of wireless network.

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

Mrunali M. Lambat, Santosh C. Wagaj has introduced health monitoring system use for chronicle diseases patients who have daily checkup this system as a portable device. Using different platform like microcontroller, ASIC, FPGA, PIC are used to design the system. Different biomedical sensor are used i.e. temp sensor, heartbeat sensor, blood pressure sensor are used to monitor health condition [1].

Zarina Md Amin, Suryani Ilias, Zunuwanas Mohamed has implemented ECG monitoring system using Bluetooth technology. In this system ECG analog signal from sensor converted into a binary bit sequence by using A to D Signal processing ckt. Act as intermediate nodes between ECG sensor ckt. & PC and ECG data is sent to display device via Bluetooth link [2].

S.Gayathri, N. Rajkumar,V.Vinothkumar, has proposed a system Human Health Monitoring System Using Wearable Sensors. In this system real time monitoring of patient health parameter. Get input from sensor and proceed during microcontroller. And for emergency send message [3].

There are several way to monitor human health parameter depending on the application. The research in this project will focus on system which measure human health parameter which involves different sensors are used to measure B.P., Heart beat rate, ECG, from human body. Using Bluetooth the measured signal reading is sent to the doctor's smart phone ,and automated SMS is send using standard GSM modem. Through the concept is not relatively new, it is yet challenge to implement Real time human health monitoring system using Bluetooth & GSM modem. To the best of our knowledge, our work is the first attempt to systematically design the Bluetooth & GSM based Real time human health monitoring system for Medical Application [4].

III. SYSTEM MODEL AND ASSUMPTIONS

Following Figure shows the simplified block diagram with major component of the system and their interconnection.

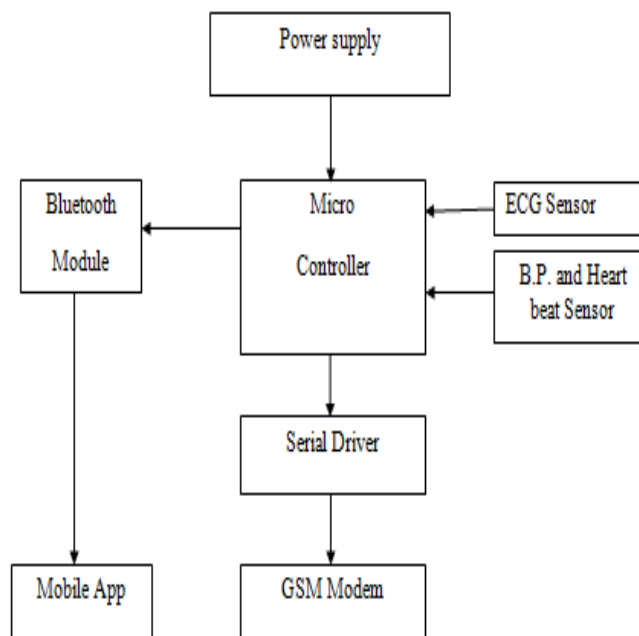


Fig.1 Block Diagram Of System

Various physiological signals such as B.P., Heart beat rate, ECG are continuously monitored with this system. This system basically consist of in three sections, first section is input section which are used for collecting and analyzing the information from human body. Various types of sensors are used to detect bioelectrical signals.



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

To sense the B.P., Heart beat rate using MP3V5050 pressure sensor, because it is small in size, it's sensitivity and accuracy is good and ECG is monitor using the neat little chip AD8232 it is to measure electrical activity of the heart.

Second section is controller part which is used for processing the data, store in memory and forward the data. The controller used is AT MEGA 328P.

Third section is android smart phone which is receiving the controller stored data reading using Bluetooth on android application and message is sent on doctor's android smart phone with the help of standard GSM modem for remote access for the purpose of medical support.

ALGORITHM

1. Different sensors are connected to the patient's body at appropriate position to collect real time data.
2. Initialize the variable & all ports.
3. If data completely received then transmit to Bluetooth module.
4. Send same reading data through SMS via GSM.
5. Check if probe pin data is low. If it is low & probe is connected then received analog data from ECG and transmit it to Bluetooth module.
6. Else probe is not connected then transmit Error condition through Bluetooth.

IV. IMPLEMENTATION OF METHODOLOGY

Following are the hardware used:

A. AVR controller AT Mega 328P

Atmel AVR IS 8-bit microcontroller. The parameters to be monitored are sensed using sensor and data is feed to controller. This unit is heart of the complete system. It will monitor and control all the peripheral devices or components connected in the system.

The basic features of AT Mega 328P controllers are as follows:

1. It is a High performance, Low power. 32 kB, on chip flash memory, 2 kB RAM, EEPROM 1 Kb.
2. Interrupt vector size is 2 instruction words/vector. Support a real Read while writing self programming mechanism.
3. Separate boot loader section and SPM instruction only execute from there. Non volatile memory segment. Two 8-bit timer/counter.
4. One 16-bit timer/counter. Six PWM channels. 8 channel 10 bit ADC in TQFP package.
5. 6 channel 10 bit ADC in PDIP package. Internal calibrated oscillator. 6-sleep modes. ADC noise reduction, power save.
6. I/O packages:- 23 programmable I/O lines, operating range is 1.8 - 5.5 v, temperature range is -40deg to 85deg c. power consumption at 1 Mhz.

B. ECG sensor

ECG is sensing device commonly consists of group of electrode to detect electrical activity of a heart. ECG is primarily a tool used for examination of cardiac diseases. Electrical activity of heart can be recorded with surface sensor pad on the limbs or chest. In this system sensor pad on the left arm, right arm and right leg. Neat little chip used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram. Electrocardiography is used to help diagnose various heart conditions.

Sensor pad placement is shown in fig 2 below. It is recommended that the sensor pads on the leads before application to the body. The closer to the heart the pads are, the better the measurement. The cables are colour coded to help identify proper placement. In this system sensor pad cable are Black, Blue, and Red in colour. Black on right arm, Blue on left arm, Red on right leg.

Cable Colour	Signal
Black	RA (Right Arm)
Blue	LA (Left Arm)
Red	RL (Right Leg)

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

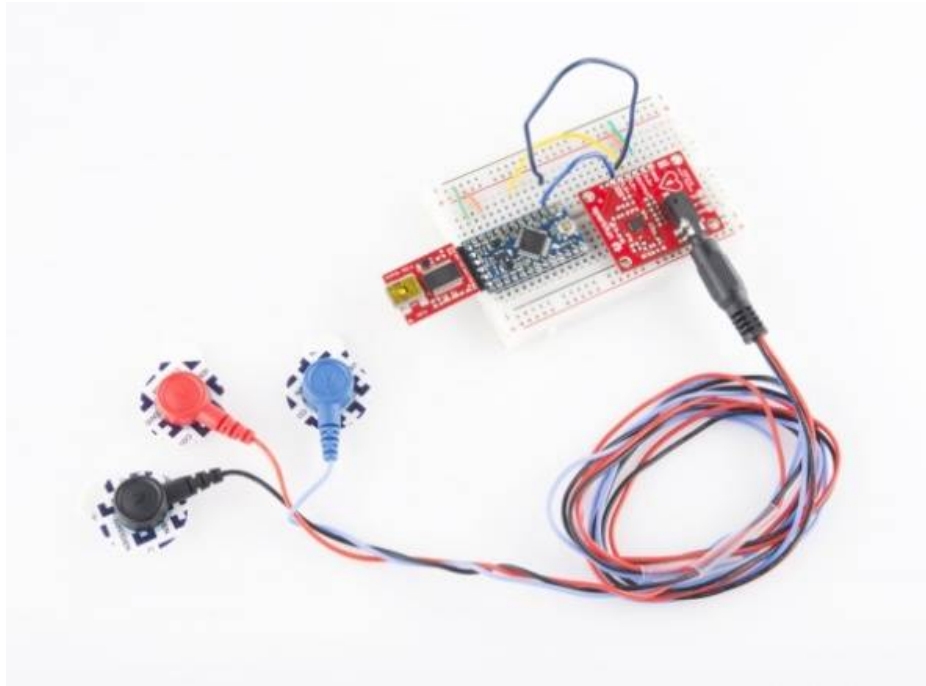


Fig.2. Sensors connected to Heart Monitor

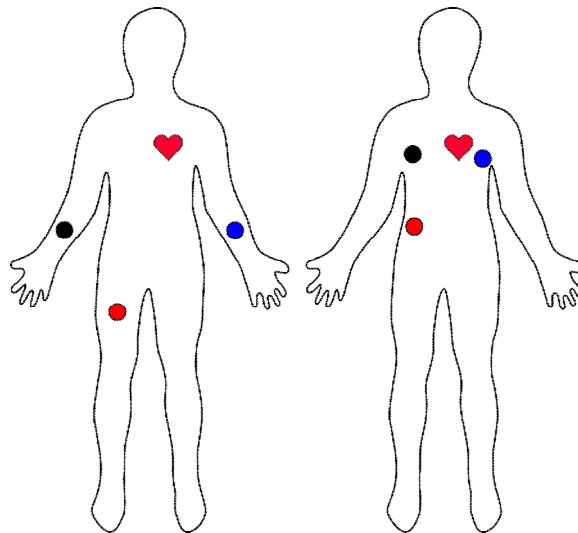


Fig. 3. Typical Sensor Placement

C. B.P. & Heart Beat Sensor

Heart beat sensor measures the heartbeat of a person Heart beat rate measurement is one of the very important parameters of the human cardiovascular system. The heart rate of a healthy adult at rest is around 72 beats per minute (bpm). The heart rate rises gradually during exercises and returns slowly to the rest value after exercise.

The rate when the pulse returns to normal is an indication of the fitness of the person. Lower than normal heart rates are usually an indication of a condition known as bradycardia, while higher than normal heart rates are known as tachycardia. It will check the heart beat pulses and the same data will be given to Microcontroller. B.P. monitoring fundamentals in this Arterial pressure is the hydrostatic pressure exerted by the blood over the arteries. Systolic arterial pressure is the higher blood pressure reached by the arteries during systole (ventricular contraction), and diastolic

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

arterial pressure is the lowest blood pressure reached during diastole (ventricular relaxation). In a healthy young adult at rest, systolic arterial pressure is around 110 mmHg and diastolic arterial pressure is around 70 mmHg.

D. Blood Pressure monitor Operating Principle

Blood pressure monitor operation is based on the oscillometric method. This method takes advantage of the pressure pulsations taken during measurements. An occluding cuff is placed on the left arm and is connected to an air pump and a pressure sensor. Cuff is inflated until a pressure greater than the typical systolic value is reached, then the cuff is slowly deflated. As the cuff deflates, when systolic pressure value approaches, pulsations start to appear. These pulsations represent the pressure changes due to heart ventricle contraction and can be used to calculate the heartbeat rate. Pulsations grow in amplitude until mean arterial pressure (MAP) is reached, then decrease until they disappear.

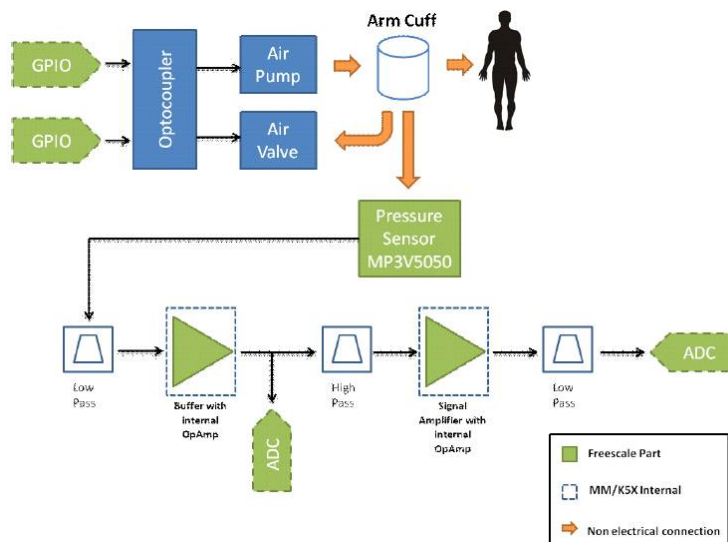


Fig. 4. MED-BPM block diagram

E. Bluetooth Module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup.

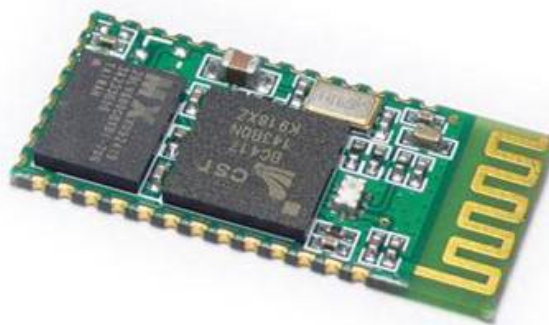


Fig.5. Bluetooth Module

Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm.

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

FEATURES OF HC-05 are as follows:

Typical -80dBm sensitivity ,Up to +4dBm RF transmit power, Low Power 1.8V Operation ,1.8 to 3.6V I/O, PIO control UART interface with programmable baud rate, With integrated antenn

F. GSM MODEM

GSM (Global System for Mobile Communications) is a global digital mobile communication system, whose coverage is the most widely and reliability is very high. SMS (Short Message Service) is a kind of short message service, by which the limited data or text message can be transmitted.

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

A GSM modem can be an external device. GSM is the most popular standard for mobile phones in the world. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate with a edge connector.

V. RESULT AND DISCUSSION

This system is based on wireless technology using Bluetooth and GSM providing low cost effective solution. This system provides continuous monitoring of vital signal of the patient over long periods of time. Following Fig. 6 shows the result obtained from the device which is displayed on mobile.

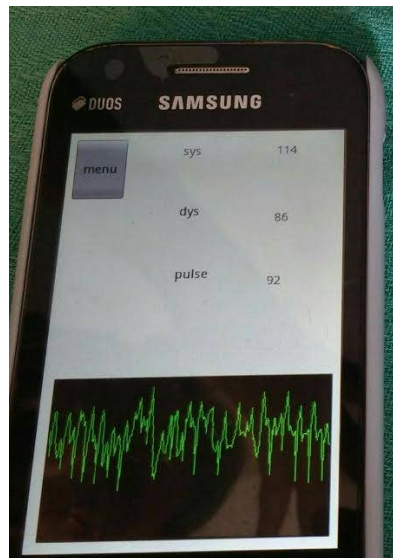


Fig.6. Software Output via mobile app

In future may include more number of sensors in a single system to provide flexibility. The main purpose of this system is to develop a patient health monitoring system to alert .so that immediate care is provided to patient.

The proposed technique has following advantages

More Accurate :- In the system database is update time to time.

Easy and Reliable for Doctors:- This system may be strain for the doctors who have to take care of people.

Increase efficiency:- This system increases efficiency.



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

VI. CONCLUSION

The system is design to provide continuous monitoring human health parameter such as B.P., Heart beat rate, and ECG monitoring and inform through wireless communication. The goal of the project is to reduced the hospitalization and assistance cost. This proposed system with low complexity, reliable, low power consumption, and highly portable to monitor human health parameter in real time. The use of wireless technology is to increase the functionality of the whole system. By sending the irregularities of the patient's health .It also beneficial in reducing or minimize to avoid human error, to maintain past data.

REFERENCES

1. Mrunali M. Lambat , Santosh C. Wagaj, 'Health Monitoring System' , International journal of science & Research, vol. 4, Issue 10, pp. 247-250 2015.
2. Zarina Md Amin , Suryani Ilias, Zunuwanas Mohmad , 'Electrocardiogram(ECG) Monitoring system using Bluetooth technology' , monograph :ECG study.
3. S. Gayathri , N. Rajkumar , V.Vinothkumar, 'Human Health Monitoring System Using Wearable Sensors' , International Research journal of Engineering and Technology ,vol.2, Issue 08, pp. 122-126, 2015.
4. Chaya Khandelwal S., Manish Patil M., "Implementation of Patient Monitoring System Using GSM Technology", 4(1), pp. 18-24, (2013).
5. Purnima, Neetu Rout , Rahul Tiwary, Renuka Bhandari, 'Zigbee & GSM based patient health monitoring system' International journal of advanced Research in Electrical ,Electronics & Instrumentation Engineering , , vol.3, Issue 1, pp. 6664-6669, 2014.
6. S.A. Manjushree & Y.M. Rajashri, 'Remote Health Monitoring of Elderly Using GSM', International journal of Innovative Research in Technology & Science, Vol 2, number 4, pp.40-43.

BIOGRAPHY

Mosamee G. Sonkhede is a M.E.(EXTC) research scholar in M.E. Scholar, Department of Electronics and Telecommunication Engineering, CSMSS, Chh. Shahu Maharaj Shikshan Santha College Of Engineering, Aurangabad (MS), India. Her research interests are Computer Networks (wireless Networks), Algorithms, etc.

Amit M. Rawate is a Assistant Professor and Head of the Department (EXTC) in Department of Electronics and Telecommunication Engineering, CSMSS, Chh. Shahu Maharaj Shikshan Santha College Of Engineering, Aurangabad (MS), India. His research interests are Computer Networks (Wireless Networks), Algorithms, VLSI, etc.