

Design of Cardiac Activity Monitoring Using Arduino

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Abstract- Recent technologies are mainly concentrating on life saving innovations and in disease prevention. In this paper, we have developed a device for monitoring the cardiac activities of a patient who has been affected by heart diseases. The measurement of biological parameters is very essential for maintaining the cardiac patient's health. Heartbeat sensor was used for sensing heart rate (pulse rate) of a person. ECG sensor was used to measure the electrical activity of heart. Thus we measure the body parameters like heart beat and ECG. The expansion and contraction of the heart forces the blood to flow through the arteries. From this, the pulse rate can be detected by sensing the areas where the artery is close to the skin. The signals from the sensors are send to arduino with the help of serial communication ports. The arduino processes the digital signals from the sensors and performs the heart beat and ECG monitoring. The data has been send to the doctors mobile with the help of bluetooth module. This device is cost effective and it can easily used by the patient who has the risk of cardiac attack.

Keywords- Heartbeat sensor, ECG, Arduino, pulse rate.

I. INTRODUCTION

Electro Cardiography deals with the study of electrical activity of the heart muscle. The potentials originated in individual heart muscles are added to produce the ECG waveform. Electro Cardiogram is the recorded ECG wave pattern. It reflects the rhythmic electrical Depolarization and Repolarization of heart muscles. Any form of Arrhythmia can be easily diagnosed using ECG. The complete waveform is called Electrocardiogram with the labels PQRSTU indicating important diagnostic features. If the PR interval is more than 0.22s, the AV Block occurs. When the QRS complex duration is more than 0.1s, the Bundle Block occurs. Surface electrodes are used with the jelly type electrolyte between skin and electrode. Potential distribution changes in a regular and complex manner during each Cardiac cycle.

Prajakta A. Pawar proposed heart rate monitoring system using IR base sensor and arduino UNO. This system is used to monitor the heartbeat of a person. The measured data is send to the doctor through the SMS with the help of GSM module. The digital signals from the sensors are given to the arduino. The heart beat sensor used here consist of LED which

transmits red bright light and it acts as a transmitting part. A detector is used as a receiving part which absorbs signals from the LED. A finger is placed between the LED and the detector. From this they are calculating the number of times persons heart beats per minute[1].

Slomi S. Thomas , Mr.Amar saraswat, Anurag Shashwat , Dr. Vishal Bharti proposed sensing heart beat and body temperature digitally using arduino. The heart rate and temperature is measured in this paper. The heart beat sensor is used for monitoring the heart rate and the temperature sensor LM35 is used for measuring the temperature of a person. The digital signals from the sensors are given to the serial ports of arduino microcontroller. This device is mainly used for measuring the mean arterial pressure (MAP) in about one minute and the accurate body temperature. The data is send to a mobile phone with the help of bluetooth module. The results will be displayed in the android[2].

G.Vijay kumar, A.Bharadwaja, N.Nikhil sai proposed a Temperature and heartbeat monitoring system using IOT. The temperature and heartbeat of a person is monitored in this paper. The sensors are used for receiving the signals from the physical environment and processes the signal into digital output in the arduino 8051 microcontroller. The results are send to the doctor through the internet of things. In this paper, they have analysed the results of various age group of people[3].

Arulananth.T.S, B.Shilpa proposed a fingertip based heart beat monitoring systems using embedded systems. In this system, they measured the heart rate by using the Photo Plethysmography(PPG) technique. It is a non-invasive method for measuring the blood volume in tissues of a person. It consists of a light source and detector for counting the heart rate. Through optical sensing mechanism, the fluctuation of blood around the fingertip is detected. The amplified signals are send to the serial ports of the arduino. Then the output is displayed in LCD[4].

II. HARDWARE SETUP

1. The Schematic of the experimental setup is shown below. The components of the experimental setup are as follows:

2. A LCD display for displaying the heart rate of the patients.
3. Heartbeat sensor for detecting the heart beat of the body.
4. ECG which is used for the measurement of the heart pulses in the body.
5. ARDUINO for interfacing the ECG signal to the electrical output.
6. Bluetooth setup for sending the message to the mobile phone.
7. Alarm for detecting whenever the patient becomes abnormal.

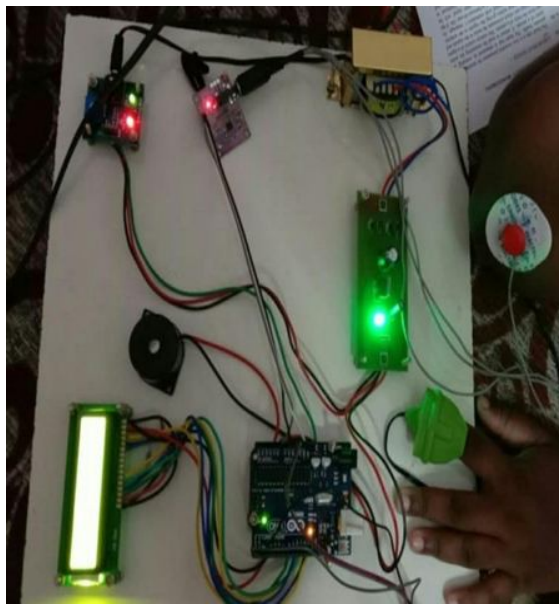


Figure.1

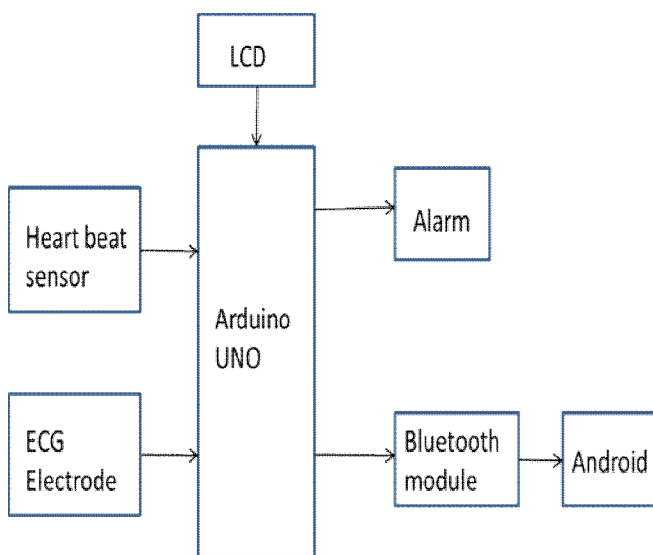


Figure.2

III. CARDIAC ACTIVITY MONITORING

A. HEARTBEAT SENSOR

The heart rate is a very essential parameter for monitoring the patient’s health. The heart rate is measured by counting the pulse of a person. A sensor is used for measuring the pulse rate from the body of a patient. The sensors consist of a signal conditioning unit which eliminates the noise in the signals and amplifies the signal before giving the signals to the arduino. The arduino is programmed with embedded C language. As the normal heart rate of a person is between 60 and 100. If the range exceeds the normal limit, an alert signal will be produced. The range of heart beat is continuously displayed in the LCD. With the help of bluetooth module, the data is send as SMS to the doctor’s mobile. Heartbeat is calculated by counting the pulse for a period of seven seconds and it is multiplied with 10. If the value of heart beat is within 60 and 100, it is normal for an adult person at resting state. The change in this value is symptoms of heart diseases.



Figure3

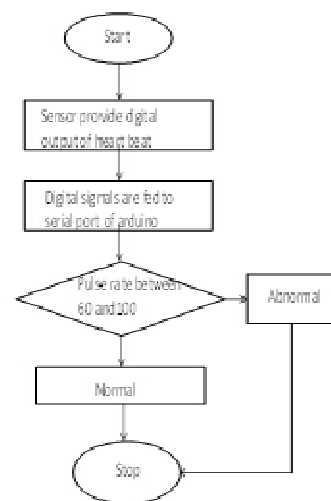


Figure.4 Process flow

Heart beat is calculated by counting the pulse for a period of seven seconds and it is multiplied with 10. If the value of heart beat is within 60 and 100, it is normal for an adult person at resting state. The change in this value is a symptom of heart disease. The master while all the other devices act as slaves. The output data as continuously send to the doctor’s mobile with the help of bluetooth module.

B. ECG ELECTRODE

An electrocardiogram (ECG or EKG, abbreviated from the German Electrocardiogram) is a graphic produced by an electrocardiograph, which records the electrical activity of the heart over time.



Figure.5

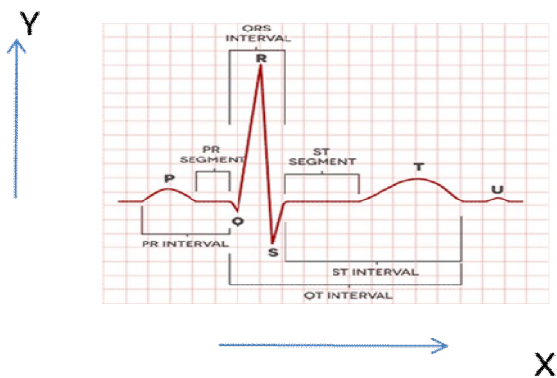


Figure.6

Analysis of the various waves and normal vectors of depolarization and repolarization yields important diagnostic information.

C. BLUETOOTH MODULE

Bluetooth is a telecommunications industry specification that describes how mobile phones, computers, and Personal Digital Assistant (PDA) can be easily interconnected using a short-range wireless connection. A Bluetooth device uses

radio waves instead of wires or cables to connect to a phone or computer . Bluetooth is low power, easy to use and low cost. HC-05 is a embedded Bluetooth serial communication mode. The network ranges from two to eight connected devices. When a network is established, one device takes the role of the master while all the other devices act as slaves. The output data as continuously send to the doctor’s mobile with the help of bluetooth module.



Figure.7

D. ALARM

Buzzer or beeper is a signaling device. This device was based on an electromechanical system which was identical to an electric bell without the metal gong which makes the ringing noise. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which a preset value has lapsed sounds a warning in the form of a continuous or intermittent buzzing or beeping sound is produced. When the heart beat become abnormal alert signal has been produced from buzzer

IV. EXPERIMENTAL RESULTS

The heart beat was measured and the diagnosis of the result is shown in the table I. It is the general pulse rate for people which is used to know about the cardiac health of a person. The heart rate will vary based on their gender, age and their physical fitness.

Table.1

Status	Heart beat(bpm)
Rest/Normal	60-100
Sleeping	40-50
Abnormal	>100

Table.2

Patient ID	Heart rate	Status
P1	40	Abnormal
P2	120	Abnormal
P3	88	Normal
P4	112	Abnormal
P5	77	Normal
P6	98	Normal



Figure.8 Abnormal Heart beat



Figure.9 Normal Heart beat

V. CONCLUSION

This device is very helpful for elderly people for monitoring their health by themselves and to improve their quality of life. This device is simple to use and anyone can use it in an easy manner. The person can monitor their health before the occurrence of any risk. This device is cost effective and consumes very low power.

VI. FUTURE SCOPE

This paper can be taken into next level by adding additional parameters like EEG and BCG. This will help the elderly people and heart patient's for monitoring their health.

VII. ACKNOWLEDGEMENT

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REFERENCES

- [1] Heart Rate Monitoring System using IR base Sensor & Arduino uno. Prajakta A.Pawar.
- [2] Sensing Heart beat and Body Temperature Digitally using Arduino. Salomi S. Thomas, Mr. Amar Saraswat.
- [3] Sai Temperature and Heart Beat Monitoring System Using IOT G.Vijay Kumar, A.Bharadwaja, N.Nikhil.
- [4] Fingertip based heart beat monitoring system using embedded systems. Arulananth.T.S, B.Shilpa
- [5] The Design of Mobile EEG Monitoring System. Jihong Chai, Shenzhen Polytechnic.
- [6] A Wearable Wireless Sensor for Cardiac Monitoring. Jamal Ahmad Khan, Haroon Ali Akbar, Usama Pervaiz.

- [7] Souvik Das The Development of a Microcontroller Based Low HEART Rate counter for health care systems International journal of engineering trends .
- [8] Bhagya lakshmi J.MI Hariharan.R2 Udaya Sri.c3 Nandhini Devi sensor IJSRD-international journal for scientific research and development vol 3,issue09,2015.
- [9] Accessing Differential Measures with a Conjugate Coil-pair for Wireless Resistive Analog Passive (WRAP) ECG Sensors, Mohammad Abu-Saude and Bashir I. Morshed.
- [10] Design of a novel portable ECG monitor for heart health JunLiu, YaqiZhou.