International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 03 | Mar-2018 www.irjet.net p-ISSN: 2395-0072

Heart Rate Monitoring System Using Finger Tip through IOT

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Abstract - *Technological innovations in the field of medical science has played a vital role in disease prevention and diagnostic. One such advancement is heart rate monitoring system. Heart rate is an important health parameter that is related to the human cardiovascular system. Fluctuation of blood can be detected through an optical sensing mechanism placed around the fingertip or on ears. The signal can be amplified and is sent to Arduino and then processed with the help of serial port communication. The pulse can be felt from those areas where the artery is close to the skin. It is based on the principal of photophelthysmography (PPG) which is non-invasive method of measuring the variation in blood volume in tissue using a light source and detector. This paper describes a technique of measuring the heart rate through a fingertip and show the heart beat on LCD and display the results over the net using local server as well as globally over Thingspeak site.*

Key Words*: *Pulse sensor, Heart rate measurement, Arduino Software, Sensor Based System (SBS), IOT using Wi-Fi module, data transmission to remote areas.

1. INTRODUCTION

Due to the advancement in Technology in the field of Medical Science it has become much easier to determine different parameters of a patient through electronic machine-like Heart rate, temperature etc. One such electronic device is Heart rate monitoring System. In this project we will measure different parameters of a patient and display them on LCD. These parameters can be shown on global as well as local server. The component required are Arduino Uno, lcd, analog heart beat sensor and a WIFI module. Heart rate is simply measured by placing the thumb over pulse sensor for few seconds till the analog value is received by Arduino. Heart rate is then taken for 5 seconds to calculate heart rate per second. Then these value is multiplied by 60 to get heart rate in bpm (beats per minute). This method although simple, is not accurate and can give errors when the rate is high.

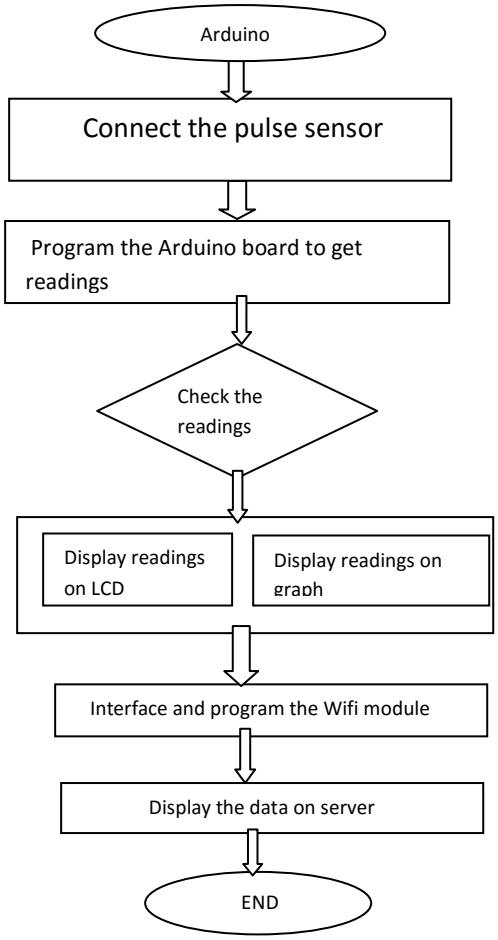

Fig1. Flow Chart of Heart Rate Monitoring System

2. LITERATURE SURVEY

Different researchers used different methods and technologies to carry out the process of heart rate monitoring. Some of the important research works are reviewed in this paper.

In this research paper heart-rate signals were collected from finger or ears using IR TX-RX (Infrared Transmitter and Receiver pair) module which was amplified in order to convert them to an observable scale. A low pass filter was used to filter inherent noise. These signals were counted by a microcontroller module (ATmega8L) and displayed on the LCD. Microcontroller is programmed with an algorithm to run the proposed heart rate counting system. The results obtained using this process when compared to those

obtained from the manual test involving counting of heart rate was found satisfactory. The proposed system is applicable for family, hospital, community medical treatment, sports healthcare and other medical purposes. Also, fit for the adults and the paediatrics. However, this method in the developed system needs further investigation and need more functionality, which may be useful to consider advance in future research [1].

This paper includes working on a wirelessly display of Heart beat and temperature based on a microcontroller ATmega328 (Arduino Uno). Most monitoring systems that are used in today's world works in offline mode but our system has been designed in such a way that a patient can be monitored remotely in real time. This system consists of sensors which measures heartbeat and body temperature of a patient which is controlled by the microcontroller. Both the parameters are displayed in LCD monitor. The transmitted data is wireless and is send through microcontroller. Heartbeat is counted through pulse sensor in Beats per Minute while the temperature sensor measures the temperature and both the data are sent to the microcontroller for transmission to receiving end. Finally, the data are displayed at the receiving end. This system could be made available at a reasonable cost with great effect and accuracy. [2]

This research paper shows GSM enabled real time heart rate monitoring system. GSM system is used for communicating the abnormalities in heat rate values. Unusual change in the values of any of these parameters from their set point values will be immediately sensed and local help is sought from the nearby people. If any help is not available, this system sends SMS directly to home, doctor or care taker's mobile phone. Heart rate is the number of heat-beats per unit of time, simply expressed as beats per minute (bpm). An attempt is made to design and develop a system that uses a simulator circuit to diagnose abnormalities in the heart rate which includes Tachycardia and Bradycardia conditions. It is a two-directional communication system in which the care taker or Doctor, can also send SMS to know the present parameter status of the person or patient [3].

In this research paper implementation of heartbeat monitoring and heart attack detection system using Internet of things is shown. These days we saw an increased number of heart diseases & heart attacks. The sensor is interfaced to a microcontroller that allows checking heart rate readings and transmitting them over internet. The user may set the levels of heart beat limit. After setting these limits, the system starts monitoring and as soon as patient heart beat goes above a certain limit, the system sends an alert to the controller which then transmits this over the internet and alerts the doctors as well as concerned users. Also, the system alerts for lower heartbeats. Whenever the user logs on for monitoring, the system also displays the live heart rate of the patient. Thus, concerned patients may monitor heart rate as well get an alert of heart attack to the patient immediately from anywhere and the person can be saved on time. [4]

In this research paper, the design and development of a microcontroller based heartbeat and body temperature monitor using fingertip and temperature sensor is shown. The device involves use of optical technology to detect the flow of blood through the finger and offers the advantage of portability over conventional recording systems. Wireless body area network based remote patient monitoring systems have been presented with numerous problems including efficient data extraction and dynamic tuning of data to preserve the quality of data transmission. Evaluation of the device on real signals shows accuracy in heartbeat measurement, even under intense physical activity. This paper presents these challenges as well as solution to these problems by proposing an architecture which allows a network to be formed between the patient and doctor in order to enable remote monitoring of patient by analyzing the data of patient. The device consists of sensors which are used to measure heartbeat as well as body temperature of a patient and it is controlled by a central unit. The readings from these sensors are further processed and sent via GSM module to a remote location where it is displayed on cell phone. The optical heartbeat sensor counts the heartbeat per minute and temperature sensor measures the temperature from the body and both the measured data are sent to a receiving end utilizing wireless technology where the data is displayed in a cell phone for further processing and patient care. This device is shown superior in comparison to traditional systems [5].

In this research paper, it is shown that the heart rate can be measured by monitoring one's pulse using specialized medical devices such as an electrocardiograph (ECG), portable wrist strap watch, or any other commercial heart rate monitors. Despite of its accuracy, somehow it is costly, involve many clinical settings and patient must be attended by medical experts for continuous monitoring. For a patient whom already diagnosed with fatal heart disease, their heart rate condition has to be monitored continuously. This paper proposed an alert system that able to monitor the heart beat rate condition of patient. The heart beat rate is detected using photo plethysmograph (PPG) technique. This signal is processed using PIC16F87 microcontroller to determine the heart beat rate per minute. Then, it sends SMS alert to the mobile phone of medical experts or patient's family members, or their relatives via SMS. This will also alert the family members to quickly attend the patients. [6]

3. HEART RATE MONITORING SYSTEM IMPLEMENTATION

Components:

A. Wifi Module (NodeMcu)

NodeMcu is a very good Wi-Fi module for IOT platform. It includes firmware which runs on the ESP8266 Wi-Fi

SoC from Espressif Systems, and hardware which is based on the ESP-12 module.

Fig. 2 NodeMCU

NodeMCU development board is an open source board based on ESP8266EX microcontroller with integrated Wi-Fi transceiver. Programming and uploading in NodeMCU from any computer via microUSB port is very easy as it supports several programing languages. This makes NodeMCU a smart choice for IoT.

B. Pulse Sensor

Pulse sensor has three pin and connection of it with Arduino is very easy. Connection is made through 5V supply provided by Arduino, the ground pin of the pulse sensor is connected to the ground of the Arduino and the signal pin to the A0 of Arduino.

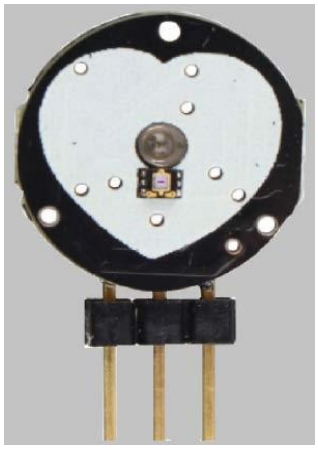

Fig. 3 Analog Heart Beat Sensor

C. Arduino Uno, LCD and pulse sensor Interfacing

Connect pin 1 (VEE) of the LCD to the ground.

Connect pin 2 (VCC) to the 5V.

Connection of pin 3 (V0) is made with middle pin of the 10K potentiometer and then other two ends of the potentiometer to the VCC and the GND. The potentiometer is used to control the contrast of the LCD. Potentiometer of values other than 10K will also work.

Pin 4 (RS) is connected to the pin 12 of the Arduino.

Pin 5 (Read/Write) is connected to the ground of Arduino.

Connection of pin 6 (E)is made to the pin 11 of the Arduino. The RS and E pin are used to send data and characters and act as control pins.

The following four pins are data pins which are used to communicate with the Arduino.

Pin 11 (D4) is connected to pin 5 of Arduino.

Pin 12 (D5) is connected to pin 4 of Arduino.

Pin 13 (D6) is connected to pin 3 of Arduino.

Pin 14 (D7) is connected to pin 2 of Arduino.

Connection of pin 15 is made to the VCC through the 220-ohm resistor. The resistor will be used to set the back-light brightness. Larger values will make the back light much darker.Pin 16 is connected to the Ground

A complete circuit of heart beat monitoring system is shown below fig 4

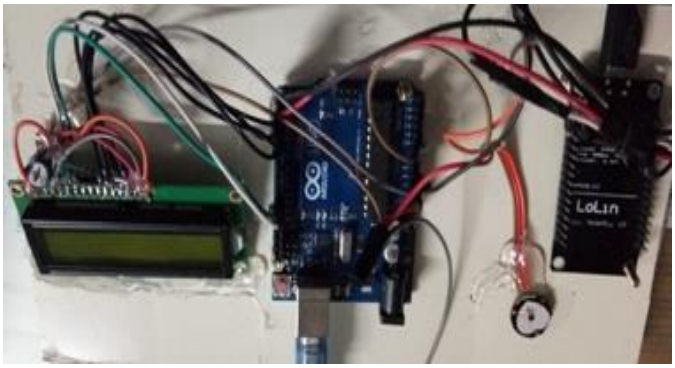

Fig 4 Heart Beat Monitoring System

4 RESULTS & DISCUSSION

First, we need to attach the Pulse Sensor to any organ of body where it can detect the pulse easily like finger, ears etc. Then the Pulse Sensor will measure the change in volume of blood, which occurs when every time heart pumps blood in the body. This change in volume of blood causes a change in the light intensity through that organ. The Arduino will then convert this change into the heart beat per minute (BPM). The LED connected at pin 13 will also blink according to the Heart Beat.

The ESP8266 will then communicate with the Arduino and will send the data to Thingspeak site which can be made by creating account on it. The ESP8266 will connect the network to router that will provide in the code and will send the data of the sensor online. This data on the Thingspeak will be shown in a Graph form showing the past readings too and can be accessed from anywhere over internet. The LCD connected will also show the heartbeat in BPM.

Fig. 5 Graph representing heart beat with respect to time on Thingspeak

Fig. 6 LCD showing heart beat in BPM

5. CONCLUSION

In our heart rate monitoring system through IOT, data related to patient's heart rate is collected via finger print sensor through Arduino board. This data is transferred on both Global as well as local server. A local server is created by html page and global server is connected via Think Speak software. Think speak provides a good platform for storing and analysing data through Wi-Fi module. Since a normal heart beat of a person is 72 approx if it is less than 60 then it will show Bradycardia and if it is greater than 90 then it will show Tachycardia. The heart beat is shown in the form for graph where x axis represents time and y axis represent heartbeat.

6. REFERENCES

1.A microcontroller based automatic heart rate counting system from fingertip Mamun AL, Ahmed N, AL Qahtani (JATIT) Journal OF Theory and Applied technology ISSN 1992-8645.

2. Heartbeat and Temperature Monitoring System for remote patients using Arduino Vikram Singh, R. Parihar, Akash Y Tangipahoa D Ganorkar (IJAERS), International Journal of Advanced Engineering and Science eissn-2349-6495.

3. A GSM Enabled Real time simulated Heart Rate Monitoring and control system Sudhindra F, Anna Rao S.J, (IJRET) International Journal of Research In Engineering And Technology, e ISSN 2319-3163.

4. Heart beat Sensing and Heart Attack Detection Using internet of things: IOT Aboobacker sidheeque, Arith Kumar, K. Sathish,(IJESCE) International Journal Of Engineering Science and Computing, April 2007

5. A Heartbeat and Temperature Measuring System for Remote Health Monitoring using Wireless Body Area Network Mohammad Wajih Alam , Tanin Sultana and Mohammad Sami Alam International Journal of Bio-Science and Bio-Technology Vol.8, No.1 (2016)

6. Heartbeat Monitoring Alert via SMS 2009 IEEE Symposium on Industrial Electronics and Applications October 4-6, 2009, Kuala Lumpur, Malaysia. Warsuzarina Mat Jubadi, Siti Faridatul Aisyah Mohd Sahak Dept. of Electronics Engineering University Tun Hussein Onn Malaysia Batu Pahat, Johor, Malaysia

7. BIOGRAPHIES

Varun Goel is currently pursuing his B. tech degree in Electronics & Communication stream from IMS Engineering College, Ghaziabad. He is a final year student. Born and brought up in Muzaffarnagar. Varun did his schooling from S D Public School, Muzaffarnagar.He has a keen interest in electronics field and he aspires to work within an electronics firm after his graduation.

Sharad Srivastava was born in 1996 in Varanasi. He did his schooling from St. john's School, DLW, Varanasi. Presently, he is a final year B. tech student. He is pursuing his degree in Electronics and Communication stream from IMS Engineering College, Ghaziabad. He wants to get a reputed job after his graduation.

Dharmendra Pandit is studying in IMS Engineering College, Ghaziabad. He is pursuing his B. tech degree in Electronics & Communication branch. His hometown is Delhi and he completed his 10th and 12th from Rajkiya Pratibha Vikash Vidyalaya Delhi. His field of interest is to work in electronics domain where he can apply his knowledge and skills to explore and develop himself.

Dhirendra Tripathi, is born and brought up in Gorakhpur. He was born in the year 1997.He did his schooling from Army public school, Gorakhpur. He's currently pursuing his B. tech degree in Electronics and Communication stream from IMS Engineering College, Ghaziabad. He is a final year student. He wants to work in a good organization after completing his graduation.