International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 04 Issue: 07 | July -2017 www.irjet.net p-ISSN: 2395-0072

IOT based Patient Health Monitoring System using Raspberry pi 3

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Abstract: *This project is designed to monitor the temperature and heartbeat of the patient using IOT. Through this we can easily send the real time information to many users to and also we can send the alert message to doctor over internet in critical conditions, and the buzzer is turn on in order to alert the caretaker who are available in the premises. Now a day's death rate is increased in India because of heart attacks and the reason behind this cause is that, the patients are not getting the proper check-up during the period of time. In order to provide the proper check-up for patients we need to monitor the health of the patients continuously. In the traditional approach, the doctor needs to visit the patients ward for checking the status of patient health. but it may come across some problems like, the patient should be admitted in the hospital for a period of time and the doctor should be present near the patient all the time. In order to avoid such problems we can make use of the present technology in a smarter way. By this we can save many lives by providing a quick service.*

Keywords: **Raspberry pi3 Board, Heart rate sensor, Temperature sensor (DHT11), Analog-to-Digital converter (ADS1115), Buzzer, Internet of things.**

1. INTRODUCTION

Internet of Things is a network of devices which is built with embedded systems, electronic things, actuators, sensors and network connectivity and which enables these objectives to exchange and collect the data information. Using internet of things objects can be sensed and controlled from existing network. Also direct integration can happens between computer based system and physical network.[1].

The increasing generation needs empowered gadgets by wireless technology which includes Bluetooth, Radio frequency identification, embedded sensors and many more. The normal human life can be change to smart life using the new technologies of IOT. Internet of Things is used to monitor all patients at any situation. Health plays a prominent role in our life. Since from decade the healthcare has draw significant amount of attention. The patients who are suffering from chronicle diseases they need to take check-up daily. Manually it is very difficult to keep track on the heart beat abnormalities of the patient. A normal heart rate for adult's ranges from 60 to 100 beats per minute while for a old person the heartbeat range is between 54 to 91 bpm. The above or below this range of heart beat leads to heart attacks and the normal body temperature is ranges from 97°F(36.1°C) to 99°F to (37.2°C). A temperature over 100.4°F (38°C) it means the person is suffering from fever caused by an infection or illness.

The patients are not well known with the manual treatment which doctors usually prefer for checking the heartbeat. There are several devices available in the market in order to keep track on the internal changes of the body. But there are many limitations in the maintenance due to the size of the device, heavy cost, and the portability of the device. So in patient health monitoring system we are designing a small size, low cost and a portable device in order to provide a continuous monitoring of the patient health.

2. PROPOSED METHOD

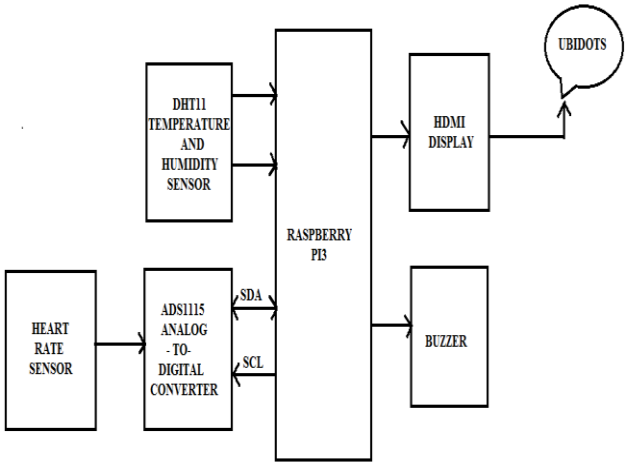

Fig.1 patient health monitoring system– Block Diagram

The diagram of the project consists of Raspberry pi3, Temperature sensor (DHT11), Heart Rate Sensor, HDMI Display, Buzzer, Wi- Fi, Ubidots.

The proposed method of patient health monitoring system is to monitor patient's body temperature, heart rate using Raspberry Pi3. The temperature sensor (DHT11) senses the temperature from the patient's body and send the information to the raspberry pi3. The heart Rate sensor collect the heart beat from the patient, the information

obtained from the heart Rate sensor is in the analog form, in order to convert it into digital form, we are using Analog-to-Digital Converter(ADS1115) the obtained Digital output send to the raspberry pi3 through serial data line of ADS1115 to the raspberry pi3. The output obtained from raspberry pi3 is displayed at the HDMI display which is again sent to ubidots through Wi-Fi. After connecting internet to the Raspberry Pi 3 it acts as a server. Then the server is automatically sends data to the website. Using IP address anybody can monitor the patient's health status anywhere in the world using laptops, tablets and smart phones.

If these parameters are goes to abnormal it will automatically send alert message to the doctors and relatives through ubidots, so that the doctor can instantly take the action on these abnormalities. And simultaneously the buzzer is turn on in order to alert the caretaker who is present in the premises.

3. IMPLEMENTATION METHEDOLOGY

3.1 Hardware Description

A. Raspberry Pi 3:

Raspberry pi 3 is a credit card size single board computer with 40 pin extended GPIO, Broad cam BCM2387 chipset, 1.2GHz Quad-core ARM Cortex-A53(64Bit), 802.11 B/G/N Wireless LAN and Bluetooth 4.1, GPU(Dual Core Video Core IV® Multimedia Co-Processor), Camera connector, Display connector, Memory card slot,1GB LPDDR2 memory, Ethernet port, USB host, Micro HDMI on it. Raspberry pi3 is a general purpose computer usually with Linux OS.

B. Temperature and Humidity Sensor(DHT11):

The DHT11 sensor is digital temperature and humidity sensor. It is very popular because it is very cheap but still providing great performance. The temperature ranges from0 to 50 degrees Celsius with +/- 2 degrees accuracy. And the Humidity range is from 20 to 80% with 5% accuracy. The sampling rate is 1Hz or one reading every second. The operating voltage is 3 to 5 volts, the max current used when measuring is 2.5mA. It includes humidity measurement component in order to measure the humidity and an NTC temperature measurement component for measuring Temperature. It offers excellent quality, fast response, anti-interference ability and cost-effectiveness.

C. Analog-To-Digital Converter(ADS1115):

The ADS1115 is a 4-channel breakout board , it is perfect for adding high resolution analog to digital conversion to the raspberry pi 3. It is also a 4-channel analog to digital converter and it utilizes the I2C proto call with selectable addresses. It has a wide supply ranges from 2V to 5.5V.The current consumption is low 150μA(Continuous-ConversionMode), Operating Temperature Range: −40°C to +125°C. The connection of this ADC with the raspberry pi3 board runs at the Debian based Raspbian operating system. But the reality is we are using the Linux system.

D. Heart Rate Sensor:

The heart rate sensor is based on the principle of photo phlethysmography. It measures the variation in the volume of blood through any regions of the body which causes a change in the light intensity through that region(a vascular region). when the index finger is placed on the heart beat sensor , the variation in an optical power takes place when the light falls on the index finger is scattered or absorbed during the path through the blood as the change in heartbeat.

E. Piezo Electric Buzzer:

The piezo electric buzzer is an electronic device used to produce a sound. This buzzer is prepared by incorporating a piezo electric vibration plate in a plastic case (resonator). In this project, this buzzer is used to alert the caretaker during the critical condition of the patient and the sound obtained by this buzzer indicates that the patient health is in a risk.

3.2 Web server

A. Ubidots:

In our project we are displaying the information about patient health related parameters like temperature and heart rate in the website. Using IP address anybody can monitor the patient's health status anywhere in the world using laptops, tablets and smart phones. Ubidots webpage is used for displaying the information of the project.

4. RESULTS AND OBSERVATIONS

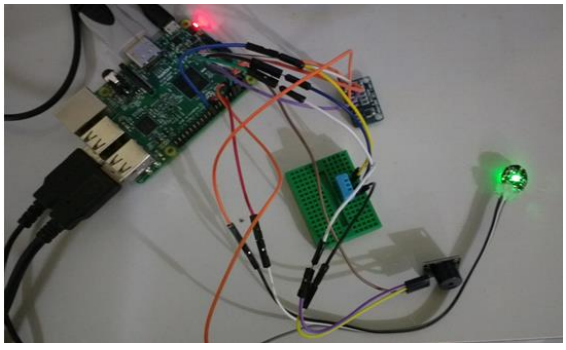

Figure 2: Implemented board

The Figure 2 shows the Implemented board. It consists of Raspberry pi3 board, DHT11 Temperature sensor, Heart Rate sensor, ADS1115 Analog-To-Digital converter and buzzer .

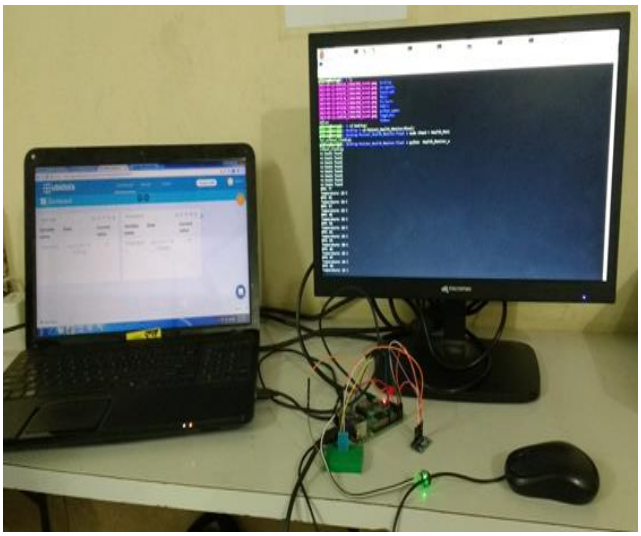

Figure 3: Complete Hardware Result

The Figure 3 shows the representation of IOT patient health monitoring complete Hardware implementation. It consists of Raspberry pi3, DHT11 Temperature sensor, Heart Rate sensor, ADS1115 Analog-To-Digital converter, HDMI Display, ubidots display and buzzer .

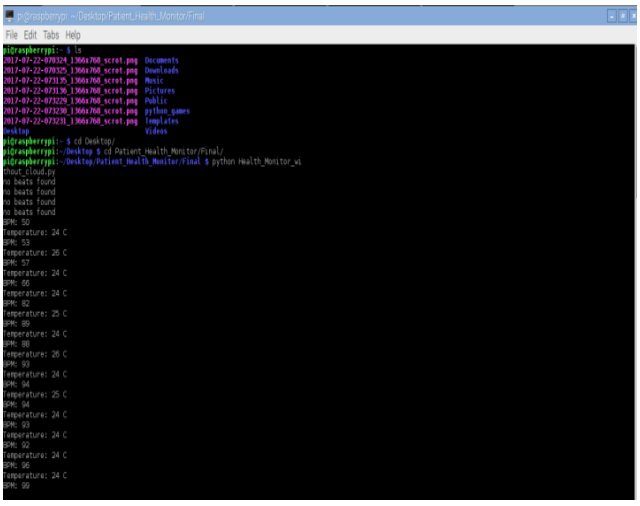

Figure 4: Results of Temperature and Heart Rate in HDMI Display

The Figure 4 shows the Results of Body Temperature and Heart Rate in HDMI Display. The information obtained from temperature sensor (DHT11) and Heart Rate sensor at raspberry pi 3 is visible at the HDMI display.

Figure 5: Display of Temperature and Heart Rate in Web Server.

The Figure 5 shows the Display of Body Temperature and Heart Rate in Web Server . The Heart Rate result in the form of line chart and the temperature result in the form of Indicator gauge.

Figure 6: Display of Heart Rate in the form of line chart in Web Server

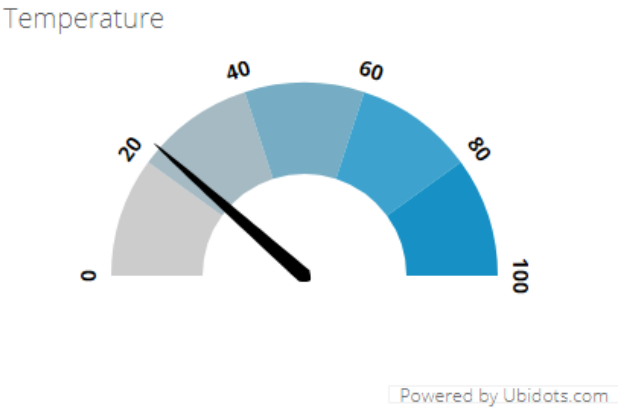

Figure 7: Display of Temperature in the form of Indicator guage in Web Server

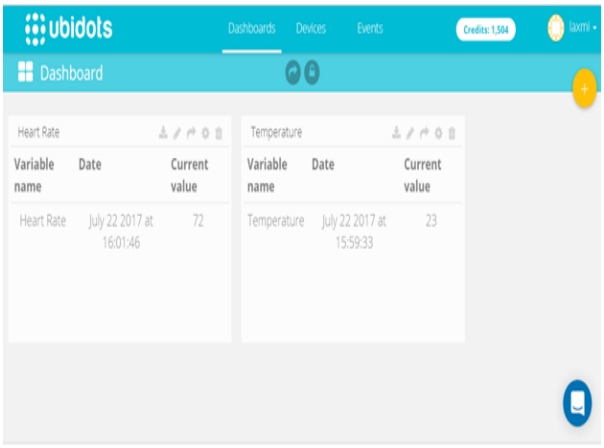

Figure 8: Display of Temperature and Heart Rate in Web Server in the digital form.

The Figure 8 shows the Display of Heart Rate and Body Temperature in Web Server . The Heart Rate result and the temperature result in the form of table along with time and date.

Figure 9: Display of Heart Rate in Web Server in the digital form.

Figure 10: Display of Temperature in Web Server in the digital form.

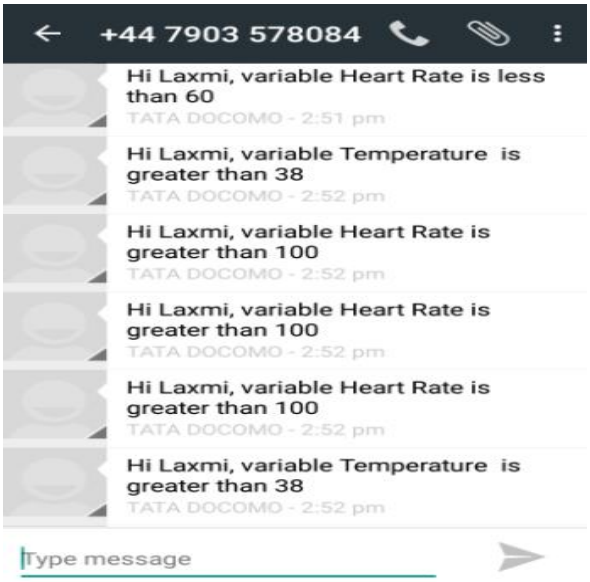

Figure 11: Message obtained from the Ubidots to the mobile.

The Figure 11 shows Message obtained from the Ubidots to the mobile. The result which is displayed in the HDMI display. Based on conditions like, if temperature is greater than 38 then the message should send to the mobile from ubidots . When the heart rate is greater than 100 and less than 60, then the message should send from ubidots to mobile

5. CONCLUSION

With the wide use of internet this work is focused to implement the Internet technology to establish a system which would communicate through internet for better health. Internet of things is expected to rule the world in various fields but more benefit would be in the field of healthcare. Hence present work is done to design an IOT based Patient Health Monitoring system using a Raspberry pi3. In this work the Heart Rate and body of the patient is monitored using Raspberry pi 3 and web server ubidots. So that the Doctor can take simultaneous proper action for the

arrived problem. Hence continuous Patient Health monitoring system is designed.

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