# PATIENT MONITORING SYSTEM USING IOT

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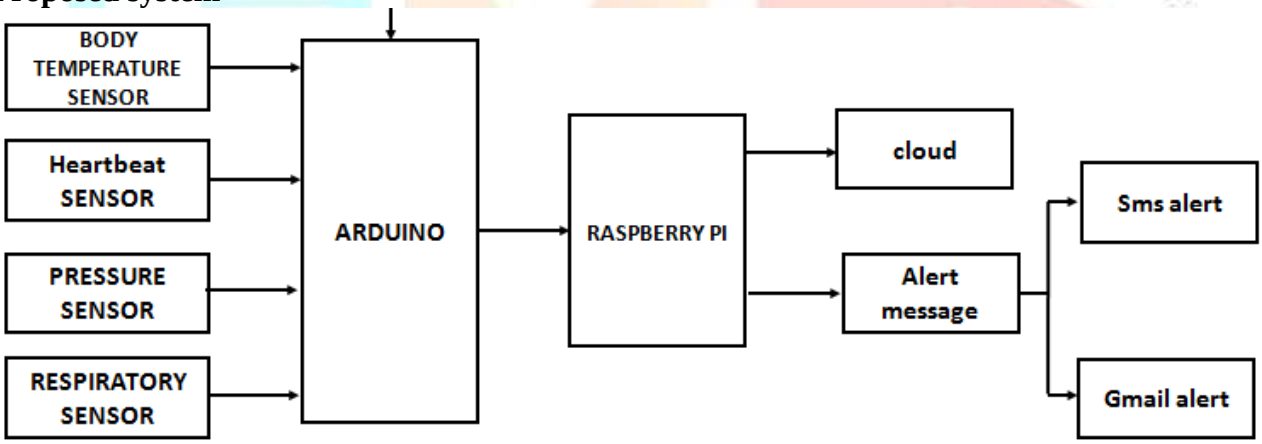
*Abstract:*This is an IOT based project implemented with the help of Raspberry Pi3, arduino nano and physiological sensors such as body temperature, blood pressure, respiratory and heartbeat rate sensors. This project is useful in detecting patient's physiological parameters using sensors and storing those parameter values in the cloud database so that we can view those details from anywhere and at anytime. In case of abnormal condition an automatic interactive alert message and mail will be sent to doctor. Then,, the doctor can give the preliminary consultation to the patient via video conferencing.

**Keywords: IOT, Raspberry Pi3,arduino nano, cloud database.**

**Introduction**

The Internet of things is the network of physical devices, home appliances and other items embedded with electronics, software, sensors and connectivity which enables these objects to connect and exchange data. The IOT creates more opportunities for integrating the physical world with the computer systems. The new technologies of IOT can change human lifestyle from normal to smarter one. A normal heart rate of adults ranges from 60 to 100 beats per minute while for a old person the heartbeat range is between 54 to 91 bpm. Increase or decrease in this range can lead to heart attacks. [2] The normal body temperature ranges from 97 degree Fahrenheit to 99 degree Fahrenheit. Exceeding 100 degree Fahrenheit can lead to fever [2].

## 2.Proposed system




This block diagram consists of Raspberry Pi3,arduino nano, and four physiological sensors. Heart Beat sensor senses the heart rate value. Blood pressure sensor detects the patients bp value. The body temperature sensor reads the temperature value of the patient. The respiratory sensor monitors the respiratory rate of the patient. These values are being stored in a cloud database named UBIDOTS. The patients, doctors as well as the family members can view those parametric values. If the patient gets critical i.e.; if any of the parameter values exceeds the normal range then an automatic interactive alert message and mail will be sent to doctor. The doctor then can contact the patient by connecting with a specific IP address or URL through video conferencing and can give preliminary consultation.

## 3. Implementation Methodology

## 3.1. Hardware Description

### 3.1.1. Raspberry pi

**Raspberry Pi is a mini computer. It is a single board computer with wireless LAN and Bluetooth connectivity with CPU is 1.4 GHz 64/32 bit quad core ARM cortex A53 and memory 1GB LPDDR2 RAM at 900 MHz [1].**

**Figure 3.1.1**

**3.1.2 Arduino Nano**

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. It acts as the microcontroller.[4]

Figure 3.1.2

**3.1.3 Temperature Sensor**

LM35 series are precision integrated circuit temperature sensors. It gives accurate measurements. No output voltage will be needed for amplification[5].

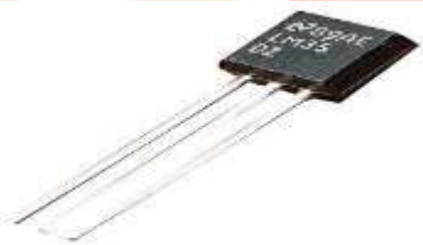


*Figure 3.1.3.*

**3.1.4. Heart Beat Sensor**

It is used to give digital output of heart beat when a finger is placed inside it. The digital output can directly be connected to measure the number of heart beats per minute[2][4].

*Figure 3.1.4. 1*

**3.1.5. Pressure Sensor**

It can be used to measure blood pressure in the arteries. When our heart beats it contracts and pushes blood through the arteries to the rest of our body[4].And it gives the digital output of the patient's blood pressure rate when he place the finger over it.

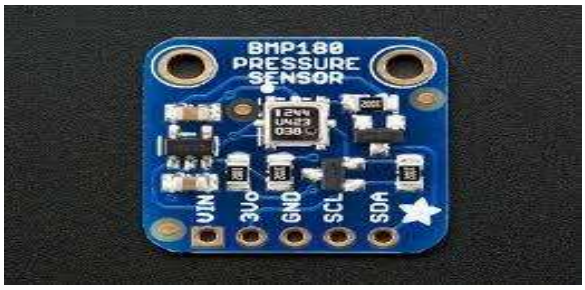



*Figure 3.1.5.*

**3.1.6.Respiratory Sensor**

Breathing rate and breathing patterns are also considered good indicators of underlying medical conditions. Hence this sensor is used to monitor the respiratory rate of the patient.


*Figure 3.1.6*

## 3.2. Softwares used

## Arduino IDE

It makes easy to code and uploading it to the board. It can run on Windows, Mac OS, and Linux.

## Arduino

## Python

### 3.2.1. Cloud Database

In our project Ubidots database is used in which the patients parameter values are being stored. Using specific URL those details can be viewed from anywhere and at anytime.[2]

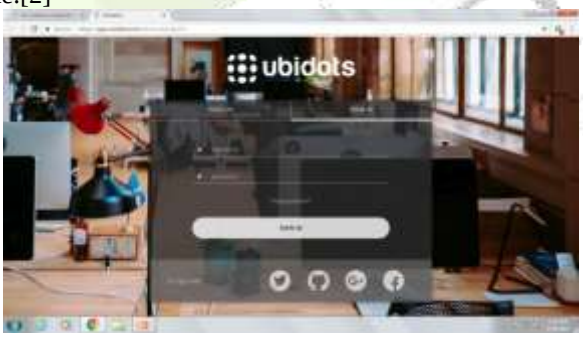



*Figure 3.2.1.*

## . 4. Results And Observations

## 4.1. Experimental SetUp

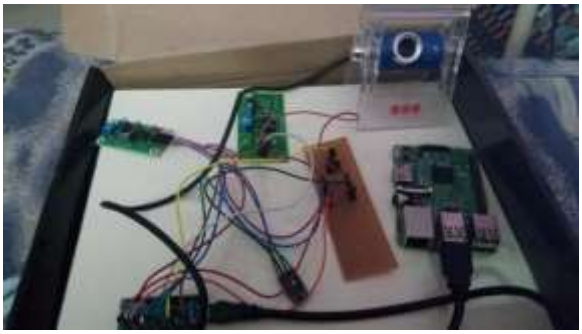


*Figure 4.1.*

The figure 4.1. shows the experimental set up of the sensors. It consists of all four physiological sensors ,Raspberry Pi3, arduino nano board and a webcam that can be used for video conferencing.

## 4.2. Displaying parameter values.

*Figure 4.2.*

This is the recorded and stored values of the patient's parameter values in the ubidots cloud database. These data will get stored after completing the hardware implementation. Figure 4.3.shows the graphical pattern of the stored values.

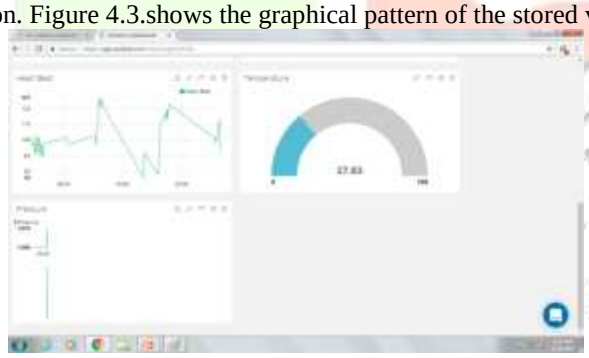


*Figure 4.3.*

### 4.4. Video Conferencing

Figure 4.4. shows the experimentation of video conferencing with patient and the doctor in emergency cases.


*Figure 4.4.*

## 5. CONCLUSION AND FUTURE SCOPE

Sensing devices are in heavy demand due to their functional capabilities such as processing, data fusion, communication, integration, and control in various applications. The concepts such as home diagnostics and home and remote monitoring are being commercialized with the development in the healthcare equipment such as portability, reduced size, and low-cost architecture facilitating disposable equipment.

We followed the Project development life cycle for both hardware and software. So we started a detailed Survey about the existing technologies and analyzed all the prevailing related works. After doing the analysis we were able to list out the limitations we face with the existing system and how to overcome them in our proposed methodology. Then we planned to use Arduino Nano in our project work that act as a gateway to communicate with the physiological sensors.

Although various efforts have been taken to improve healthcare quality there are still some concerns and hence our project will be much useful for improving the quality of healthcare in the future.

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