

## Health Monitoring system using IoT

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### ABSTRACT

The healthcare monitoring systems has emerged as one of the most vital system and became technology oriented from the past decade. Humans are facing a problem of unexpected death due to various illnesses which is because of lack of medical care to the patients at right time. The primary goal was to develop a reliable patient monitoring system using IoT so that the healthcare professionals can monitor their patients, who are either hospitalized or at home using an IoT based integrated healthcare system with the view of ensuring patients are cared for better. A mobile device based wireless healthcare monitoring system was developed which can provide real time online information about physiological conditions of a patient mainly consists of sensors, the data acquisition unit, microcontroller (i.e., Arduino), and programmed with a software. The patient's temperature, heart beat rate is monitored, displayed and stored by the system and sent to the doctor's mobile containing the application. Thus, IoT based patient monitoring system effectively monitors patient's health status and save life on time.

**Keywords—Health monitoring system, controller, pulse sensor, temperature sensor, IOT.**

### 1. INTRODUCTION

In the recent years wireless technology has increasing for the need of upholding various sectors .In these recent years IoT groped the most of industrial area specially automation and control. Biomedical is one of recent trend to provide better health care. Not only in hospitals but also the personal health caring facilities are opened by the IoT technology. So having a smart system various parameters are observed that consumes power, cost and increase efficiency .In according to this smart system, this paper is reviewed. In traditional method, doctors play an important role in health checkup. For this process requires a lot of time for registration, appointment and then checkup. Also reports are generated later. Due to this lengthy process working people tend to ignore the checkups or postpone it. This modern approach reduces time consumption in the process. In the recent years use of wireless technology is increasing for the need of upholding various sectors .In these recent years IoT groped the most of industrial area specially automation and control. Biomedical is one of recent trends to provide better health care. Not only in hospitals but also the personal health care facilities are opened by the IoT technology. So having a smart system, various parameters are observed that consume power, cost and increase efficiency .In accordance with this smart system, this paper is reviewed.[3]Medical scientists are trying in the field of innovation and research since many decades to get better health

services and happiness in human lives. Their contribution in medical area is very important to us and cannot be neglected. Today's automotive structures have the root ideas coming from yesterday's basics. Also early detection of chronic diseases can be easy with these technologies. The body temperature, heart rate, blood pressure, respiration rate are prime parameters to diagnose the disease. This project gives temperature and heart rate values using IoT

## 2. EXPERIMENTAL

There are two types of components that are required in this work to form this device are Hardware components and software components. This IoT Based Health Monitoring System using ESP8266 and Arduino. Pulse Sensor and LM35 Temperature Sensors measures BPM & Environmental Temperature respectively. The Arduino processes the code and displays. ESP8266 (Wi-Fi module) connects to Wi-Fi and sends the data to IoT device server. The IoT server used here is ThingSpeak. ThingSpeak is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. Then using IFTTT software creates action and reaction pairs based upon the threshold values of the sensors detected. Finally the data can be monitored from any part of the world by logging into ThingSpeak channel. So, the components are as shown in the table(1)

Module	Item	Specification
Controller	Operating voltage, digital pins, Flash memory	5V, 14,32 KB
Temperature sensor	Temperature range, power, output impedance	-55C to 150C,4-30V,0.1W for 1mA load
Pulse sensor	LED, gain, Power	Infrared LED,100,3.3 V
WIFI module	Power ,bound rate ,range	3.3V,9600BPS, Up to 10m

Table(1)

## 3. RESULTS AND DISCUSSION

In our project we are designing such type of device which is used for continuous monitoring of patients in hospital. We introduce "IOT Based Patient Monitoring System". In previous research we have seen that either the data is monitoring in simple screen or send it by GSM, but in our project the new thing is that we can continue monitor the Heart Rate and human body Temperature and we can also analyze his/her health condition using ARDUINO software, which is used as the integrating platform for acquiring, processing and transmitting data and it has provide graphical platform to analyze. This project discusses the acquisition of physiological parameters such as heart rate, body temperature, ECG and displaying them in graphical user interface for being viewed by the doctor. So here is the block diagram of the device as shown in the figure (1). The designing IoT Based Patient Health

Monitoring System using ESP8266 & Arduino, assemble the circuit as shown in the figure (3) and figure (4).As using ThingSpeak site, we can monitor our data and control our system over the Internet, using the Channels and web pages provided by ThingSpeak. So first you need to sign up for ThingSpeak. Then create the API keys. This key is required for programming modifications and setting your data. Then upload the code to the Arduino UNO by assembling the circuit shown above figure(1).We can see that the data is stored in the Thingspeak so we can monitor the patient’s data anywhere in the world when we have internet connection so real time monitoring is possible as shown in the figure(5).we can see that the data of the patient parameters are stored in the Google sheets with respect to time and date as shown in the figure(6). Open serial monitors and it will automatically connect to Wi-Fi and set up everything. Now click on channels so that you can see the online data streaming as shown in the figure(7).we can see that notifications are sent to the respective people when the panic button is pressed or when the value exceeds the threshold value mentioned in the Thingspeak as shown in the figure(8).Here the Thingspeak, IFTTT are secured websites only the authorized people who are mentioned in the code like doctors and the patient’s relatives have access to results i.e., IoT Based Health Monitoring System using ESP8266 & Arduino.

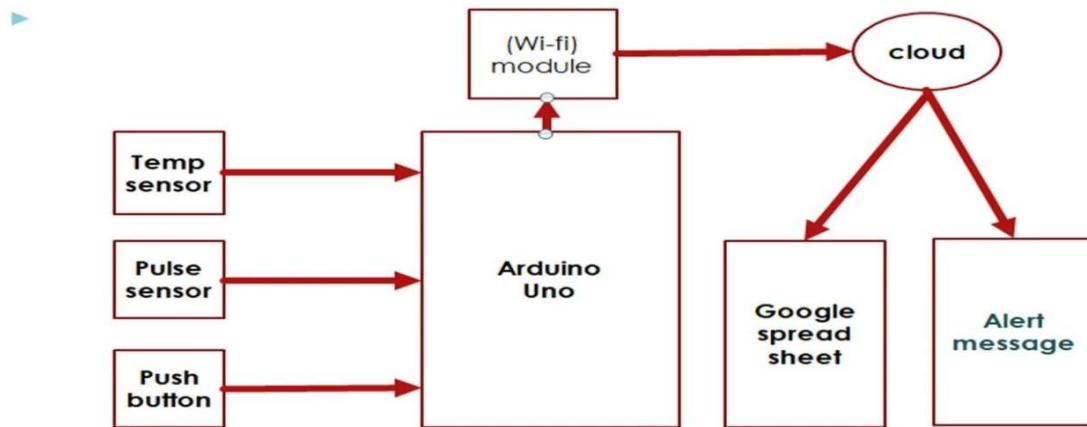
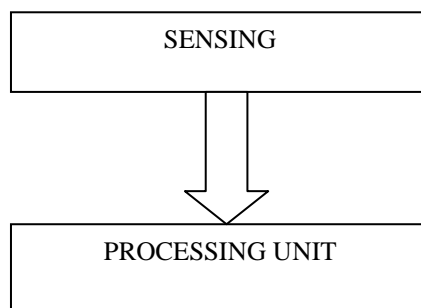
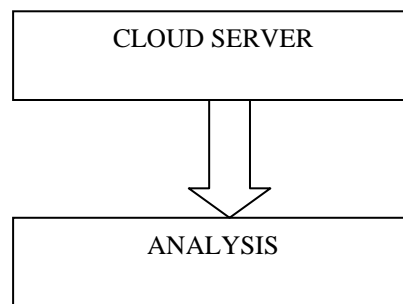
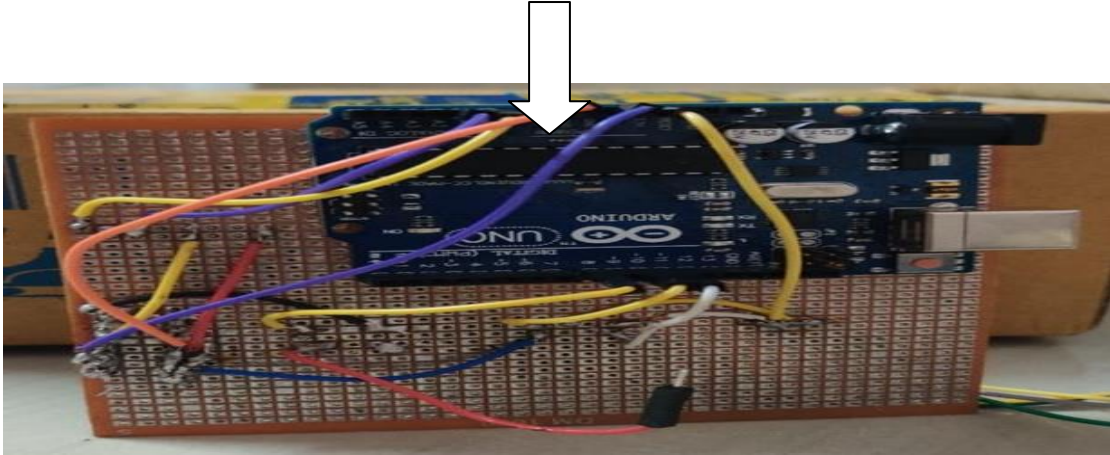


Figure (1) : Block diagram for proposed system

Figure(1) shows the proposed system .The health monitoring sensors are used to collect health related data i.e. for data acquisition. Communication can be done by controller for sending data on internet wirelessly. Data processing has been done at server. All data collected and aggregated at server point. To get health related information in understandable format it can be shown on web page i.e. data management





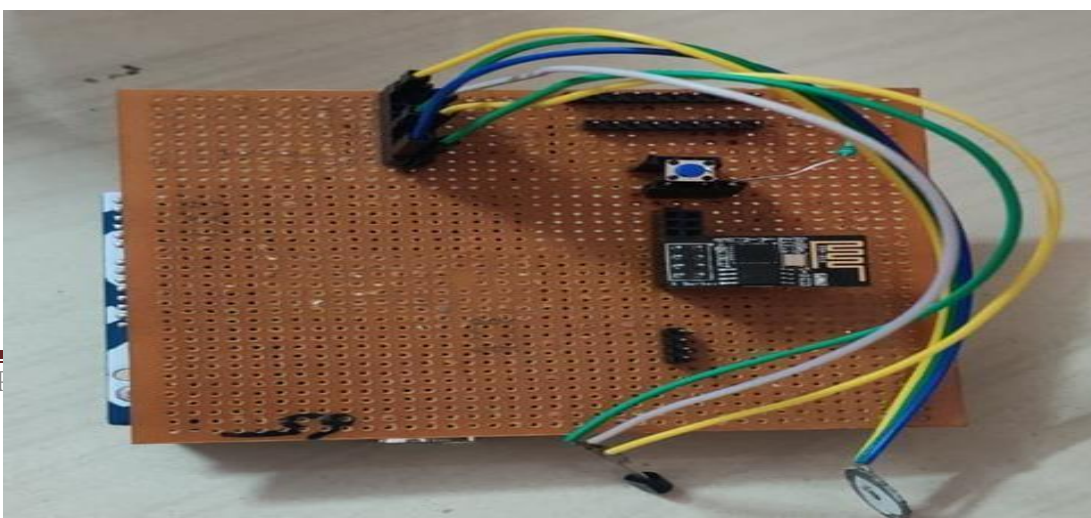
Figure(2): Working of System

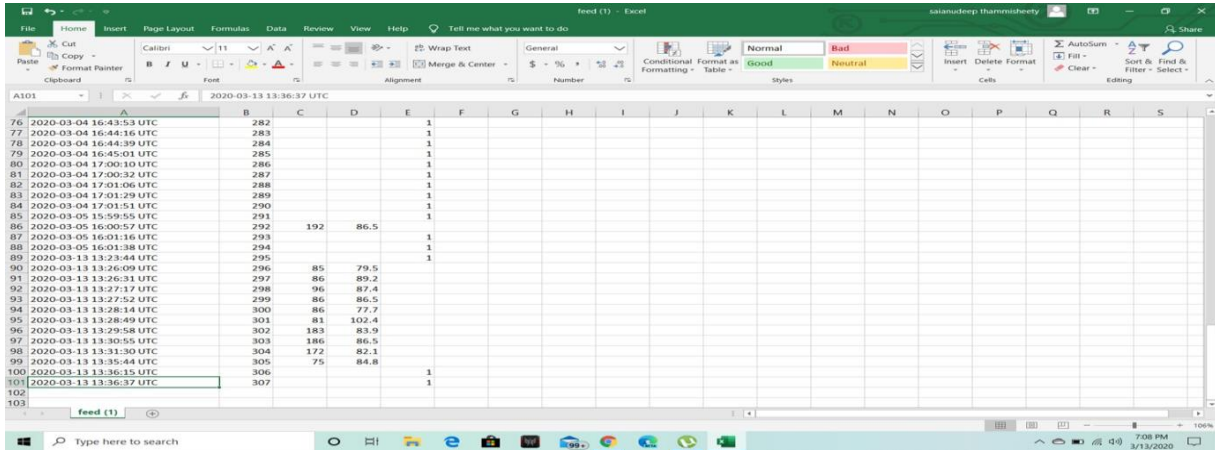
Figure (2) shows the working flow of system. The results collected from sensor are analyzed i.e. if abnormal behavior has been detected , then emergency plan activated to inform the Doctor about patient's health .So it reduces critical conditions in Hospital.

Figure(3) :Front side of the circuit

Connections of figure(3) and figure(4):

Connect Pulse Sensor output pin to A0 of Arduino and other two pins to VCC & GND. Connect LM35





Time	Temperature	Pulse Rate
2020-03-04 16:43:53 UTC	282	1
2020-03-04 16:44:16 UTC	283	1
2020-03-04 16:44:39 UTC	284	1
2020-03-04 16:45:01 UTC	285	1
2020-03-04 17:00:10 UTC	286	1
2020-03-04 17:00:32 UTC	287	1
2020-03-04 17:01:06 UTC	288	1
2020-03-04 17:01:29 UTC	289	1
2020-03-04 17:01:51 UTC	290	1
2020-03-05 15:59:55 UTC	291	1
2020-03-05 16:00:57 UTC	292	192 86.5
2020-03-05 16:01:16 UTC	293	1
2020-03-05 16:01:38 UTC	294	1
2020-03-13 13:23:44 UTC	295	1
2020-03-13 13:26:09 UTC	296	85 79.5
2020-03-13 13:26:31 UTC	297	86 89.2
2020-03-13 13:27:17 UTC	298	96 87.4
2020-03-13 13:27:52 UTC	299	86 86.5
2020-03-13 13:28:14 UTC	300	86 77.7
2020-03-13 13:28:49 UTC	301	81 102.4
2020-03-13 13:29:58 UTC	302	183 83.9
2020-03-13 13:30:55 UTC	303	186 86.5
2020-03-13 13:31:30 UTC	304	172 82.1
2020-03-13 13:35:44 UTC	305	75 84.8
2020-03-13 13:36:15 UTC	306	1
2020-03-13 13:36:37 UTC	307	1

Temperature Sensor output pin to A1 of Arduino and other two pins to VCC & GND. Connect the LED to Digital Pin 7 of Arduino via 220-ohm resistor. Connect Pin 1,3,5 to GND. Connect Pin 2,15 to VCC. Connect Pin 4,6,11,12,13,14 to Digital Pin 12,11,5,4,3,2 of Arduino. The RX pin of ESP8266 works on 3.3V and it will not communicate with the Arduino when we will connect it directly to the Arduino. So, we will have to make a voltage divider for it which will convert the 5V into 3.3V. This can be done by connecting 2.2K & 1K resistor. Thus the RX pin of the ESP8266 is connected to the pin 10 of Arduino through the resistors. Connect the TX pin of the ESP8266 to the pin 9 of the Arduino.

Figure(4): Back side of the circuit

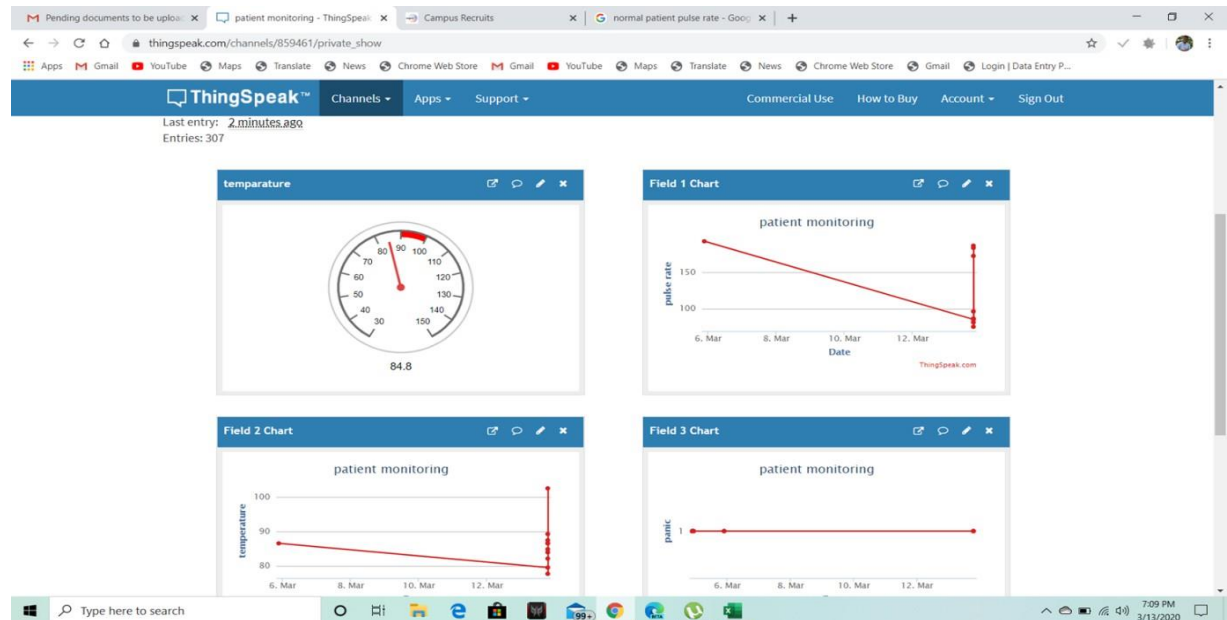
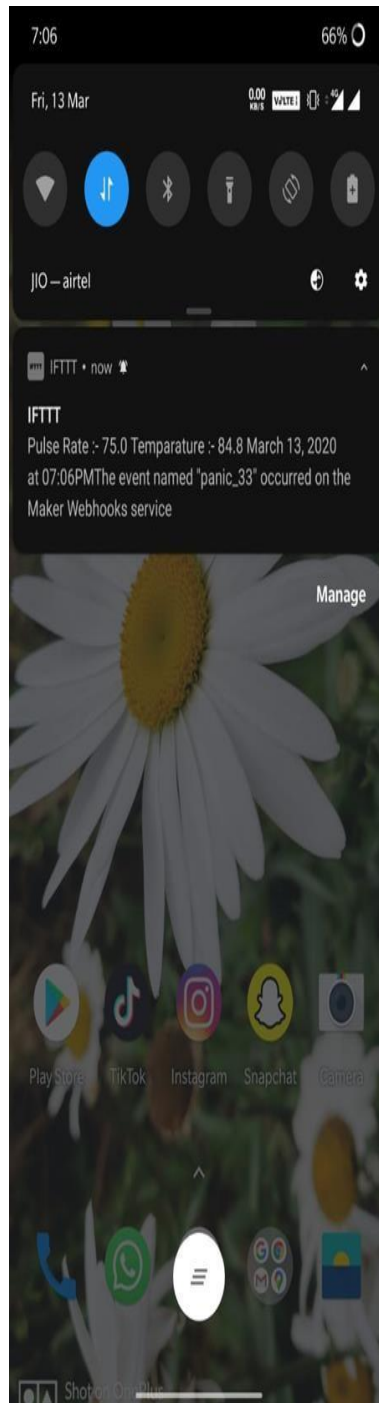


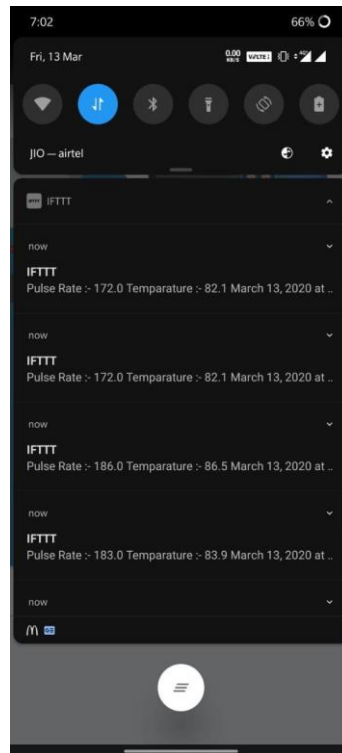
Figure (5): Patient data stored in ThingSpeak gives parameters that is temperature and pulse rate is shown online on IOT platform



Figure(6) : Patient data in Google sheet



Figure(7): Notification is sent to doctor if patient clicks push button



Figure(8): Notification is sent to doctor if pulse rate or temperature of patient exceeds

### 3. CONCLUSION

The progress in bio medical engineering, science and technology paved way for new inventions and technologies. As we are moving towards miniaturization, handy electronic components are in need. New products and new technology are being invented. ARDUINO was found to be more compact, user friendly and less complex, which could readily be used in order to perform several tedious and repetitive tasks. Simulation is performed using Arduino software by placing appropriate sensors like temperature and heart beat rate for sensing the health condition and the results are analyzed under normal conditions and abnormality conditions.

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