HEALTH MONITORING SYSTEM

A Socially Relevant Project-2 Report Submitted to

Jawaharlal Nehru Technological University Anantapur, Ananthapuramu

in partial fulfillment of the requirements for
the award of the degree of

BACHELOR OF TECHNOLOGY
IN
INFORMATION TECHNOLOGY

Submitted by

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Sree Sainath Nagar, Tirupati – 517 102, A.P., INDIA

2021-2022

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Certificate

This is to certify that, the Socially Relevant Project 2-entitled

"HEALTH MONITORING SYSTEM "

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTARCT

Health monitoring for patients is increasing with the advancements of various types of health related mobile applications. The Pulse rate, blood pressure and temperature are the basic parameters used for calculating patient condition. The designed kit consists of different sensor used for monitoring patients health. The data from healthcare kit is transmitted via the internet to save in a cloud-based server, which helps to monitor the consistent health situation of a patient. The sensing information will be collected constantly over specified intervals of time and will be used to aware the patient about any concealed problem to endure possible diagnosis. The higher and lower range of temperature, blood pressure and heartbeat can be defined by the doctor according to the patient's health. Afterward, the system starts monitoring the patient and sends alert to the concerned. The recorded values are transmitted via internet to the Ubidots and send Notifications to users.

Keywords: Healthcare kit, Blood Pressure, Pulse rate, Temperature.

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Chapter-1

1.INTRODUCTION

Now a days, the expansion of innovations by wellbeing specialists is exploiting these electronic devices. This project is about an IOT-based health monitoring system. In particular for patients, high blood pressure patients, hypertension patients, diabetic patients, etc., In rural areas, the number of doctors is not exactly the same as in urban areas. Medical equipment is not readily available in rural areas, except for government medical centers. The percentage of patients in these clinics is greater than that in government medical facilities. As a person enters old age, it becomes increasingly vital for them to undergo standard medical health check ups. Since it may be time-consuming and difficult for most people to get regular health check up appointments, IOT-based arrangements can be beneficial to individuals for routine health check up. IOT technology has developed into an imperative innovation with applications in numerous areas.

The IOT based health-monitoring platform has provided us with a significant benefit in the advancement of contemporary medicine. IOT devices are widely used in the medical sector. And the technology we are talking about is a patient health monitoring system that uses the IOT. A sensor in this health monitoring system will collect information about the patient's health condition. It is smaller in size, faster, and more affordable. This system can be used to measure the oxygen saturation level, heart rate, and temperature of the human body and display the results on a web-based platform.

Pulse rate, Spo2 and body temperature are the most basic parameters of human health. The pulse rate, also known as the beat rate, is the number of pulses per minute. The normal pulse rate ranges between 60 and 100 beats per minute for typical individuals. The average resting pulse rate for adult males and females is approximately 70 and 75 bpm, respectively. Females over the age of 12 typically have higher pulse rates than men. The temperature ranges between 97.8°F (36.5°C) and 99°F (37.2°C) in healthy adults. Various factors, such as influenza, low temperature hypothermia, and other diseases, may prompt a fluctuation in body temperature. In most diseases fever is a common symptom; therefore, it is essential to regularly measure the body temperature. Oxygen saturation is also an important factor for patients. The normal oxygen saturation (SpO2) of the human body ranges from 95 to 100%. If the SpO2 (oxygen saturation) level of a COVID-19 patient is below 95%, they require emergency medical care.

1.2 PROBLEM IDENTIFICATION

- Health is a very important factor in everyone's life. There are some health parameters which we need to check regularly.
- In order to check this parameters we need to visit the hospital frequently which might not be possible in all times.
- Rising Costs in Healthcare.
- Lack of health care providers in rural areas.

Chapter-2

2.LITERATURE SURVEY

[1] Jorge Gómez, "Patient Monitoring System Based on Internet of Things: A survey", Computer Networks, Vol.54, pp. 2787-2805, 2016.

Jorge Gomez developed a personal health diagnosis based on the symptoms of the patient. A huge amount of collected data is used to analyze the disease and risk of the patients**.** Franca discussed that the innovations of the new generation systems are the development of continuous monitoring features for the patient and the improvement of workflows and productivity of medical personal. He also emphasized the various wireless technologies and the advantages of using those technologies SnehaN.Malokar and Samadhan D. Mali developed a wearable sensor system to monitor the movements of the patients. The system was calibrated to a threshold level less than 5% with the aim of minimizing the error rate of the captured data proposed a detection system to monitor the movements of patients which recognizes a fall and automatically sends a request for help to the caretakers.

[2] Giovanni Baldus, "Design of IOT Based Smart Health Monitoring and Alert System" 2016 Center for TeleInFrastuktur, Aalborg University, Denmark, P.P.

Giovanni Baldus developed an approach to maintain health care data of a patient collected in different geographic locations. The data is available to doctors, hospitals, laboratories etc., to check the medical history of the patients. Intelligent systems, which detect the disinfected articles and alerts the medical staff to wash hands after the contact with the disinfectant articles. Pioggia, IOT techniques can be used to promote healthcare in a better way. The health related information could be interacted with doctors who are in emergency. Even in the absence of the doctor near the patient or in the interacted with doctors who are in emergency. Even in the absence of the doctor near the patient or in the hospital, the doctor can know the patients' status so that the doctor's advice is given in critical cases. Brian Blake commented that the human users could be alerted proactively based on their fitness and historical medical or genetics history.

[3] Franca Delmastro, "Pervasive communications in healthcare", Computer Communications Vol.35, pp.1284-1295,2017

Franca Delmastro: Data sensed and transmitted through the wireless devices are received in the local system that needs to support accessing of data in heterogeneous formats, can be useful in building real time applications. and to be updated in the mobile application of the doctor as well as the user (patients or caregiver). Boyiet. al. presented IOT based system for providing support to emergency medical services system for providing support to emergency medical services by demonstrating how IOT data can be collected and integrated for interoperability. Long et. al. discussed the necessary and requirements details of the software for healthcare and proposed an architecture for healthcare and IOT. He has taken the parameters like ECG, blood oxygen, respiration, temperature etc.

[4] ArunaDevi.S et al. "SMART HUMAN HEALTH MONITORING SYSTEM BY USING IOT/ International Journal of Computer Science & Engineering Technology (IJCSET) ISSN,2017.

ArunaDevi.S et al: With the increasing health related problems and lack of proper solution in healthcare to monitor the patients in the absence of doctor, the patients face serious problems and lost life in critical conditions. Hence to overcome the absence doctor, the patients face serious problems and lost life in critical conditions, and evaluate the status of each patient by the doctor even in their absence in hospital or near the patient

[5] Gennaro et. al, "Design of IOT Based Smart Health Monitoring and Alert System" 2016 Center for TeleInFrastuktur, Aalborg University, Denmark, P.P.

A huge amount of collected data is used to analyse the disease and risk of the patients. Franca discussed that the innovations of the new generation systems are the development of continuous monitoring features for the patient and the improvement of workflows and productivity of medical personal. He also emphasized the various wireless technologies and the advantages of using those technologies for faster communication. Tao et. al developed a wearable sensor system to monitor the movements of the patients. The system was calibrated to a threshold level less than 5% with the aim of minimizing the error rate of the captured data. Stefano et. All proposed a detection system to monitor the movements of patients which recognizes a fall and automatically sends a request for help to the caretakers. Security is a key concern in the IoT

devices management. The four identified requirements are (i)Secure authentication and authorization, (ii)Secure bootstrapping of objects and transmission of data, (iii)Security of IoT data, (iv)Secure access to data by authorized persons. Mohammed discussed that the key distribution is required to secure the e-health applications. He modelled a protocol for key management which allows the captured data to be transferred in a secured channel. An IoT deployment in healthcare needs more security because the data of any patients is more sensible and it should not be misused by any bad elements in the society.

[6] Sneha N. Malokar 1, Samadhan D. Mali2, "Patient Monitoring System Based on Internet of Things using Rasperripy: Key features, application and open issues", Computer Communication, Vol.54, pp., 2016.

Sneha N. Malokar al developed an approach to maintain health care data of a patient collected in different geographic locations. The data is available to doctors, hospitals, laboratories etc., to check the medical history of the patients. Jieran et al. developed a Radio Frequency Identification technology and intelligent systems, which detect the disinfected articles and alerts the medical staff to wash the hands after the contact with the disinfectant articles. IoT techniques can be used to promote healthcare in a better way. The health related information could be interacted with doctors who are in emergency. Even in the absence of the doctor near the patient or in the hospital, the doctor can know the patients' status so that the doctor's advice is given in critical cases. Brian Blake commented that the human users could be alerted proactively based on their fitness and historical medical or genetics history.

Chapter-3

3.SYSTEM ANALYSIS

3.1 Proposed System

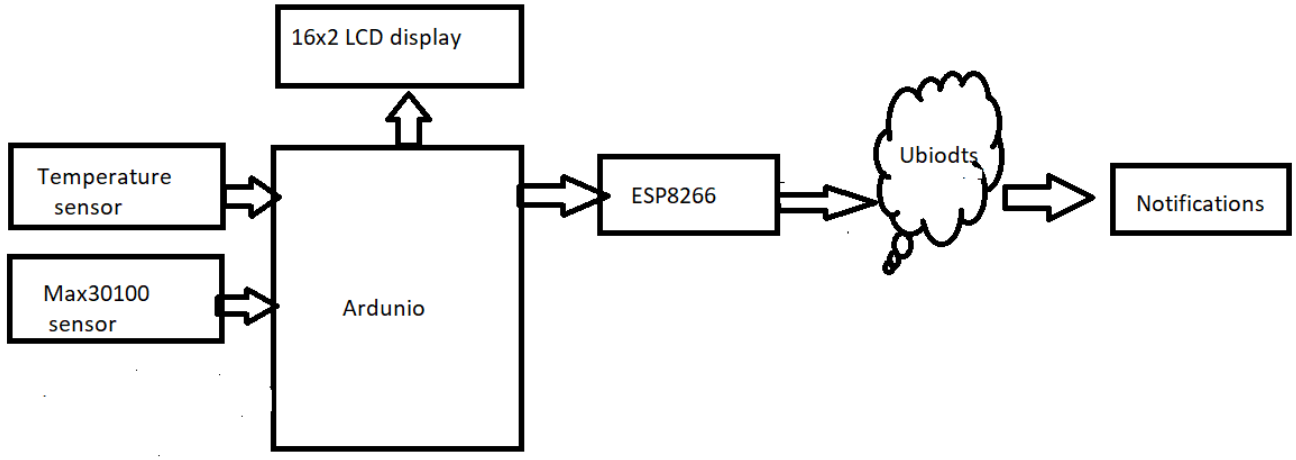

FIG 3.1 Architecture of Patient Health Monitoring System

System continuously monitors patient's vital signs and sense abnormalities. The monitored data is delivered to medical staff. Upon encountering abnormalities, the system alerts the medical staff about the abnormal parameter. Thus, reduces the need for manual monitoring done by the medical staffz. Our Proposed system uses ESP8266 to send data to Ubidots platform. The Ubidots paltfrom is simple to maintain and easy to work with it.Firstly we have a create Channel in Ubidots and Create the Fields Temperature,SpO2,and Pulse Readings.The Max30100 is sends both Pulse readings and SpO2 values and Temperature sensors sends the data from Arduino to Ubidots platfrom. The Ubidots send Notifications to Respective users. With the help of Ubidots we can send data via Mail and also we can send Normal Notifications to Respective user.

Chapter-4

4.SYSTEM DESIGN AND IMPLEMENTATION

4.1 Hardware components

- Node MCU
- Max30100 sensor
- LM35 temperature sensor
- LCD 16 x 2
- Power supply

4.1.1 Node MCU

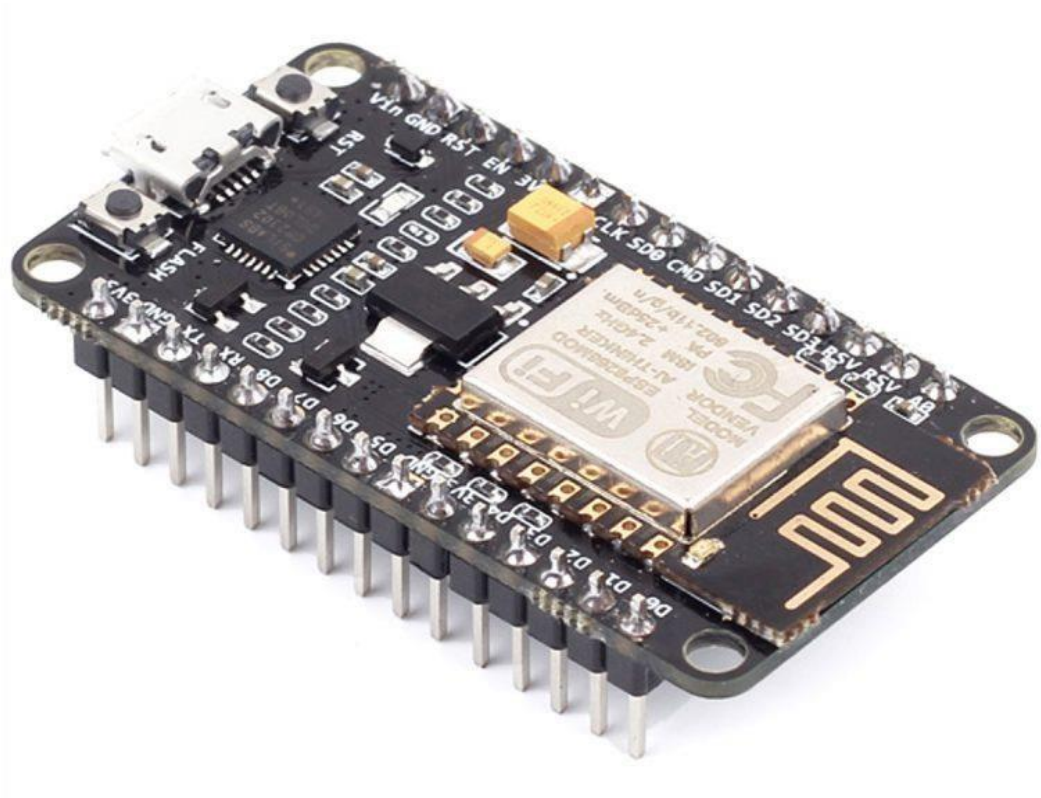

Fig 4.1 Node MCU

Fig 4.1 Showing the Node MCU ESP8266 is a wireless module, because the ESP8266 microcontroller has WiFi capability, and the node MCU has a wireless system that can send data to a server. The node MCU has an asynchronous receiver-transmitter serial communication module, which enables it to communicate. The node MCU ESP8266 microcontroller can

operate with a power supply of 3.3 V operating voltage and 7 to 12 V input voltage. It has a flash memory of 4 Mb and an SRAM of 64 Kb. It has 16 digital input and output pins and one analog input pin. The node MCU wireless module sends the measured pulse rate, oxygen saturation, and temperature to the server. The node MCU is an open-source Lua-based firmware and an advancement board. It is specially designed for IOT-based applications, and this component plays a vital role.

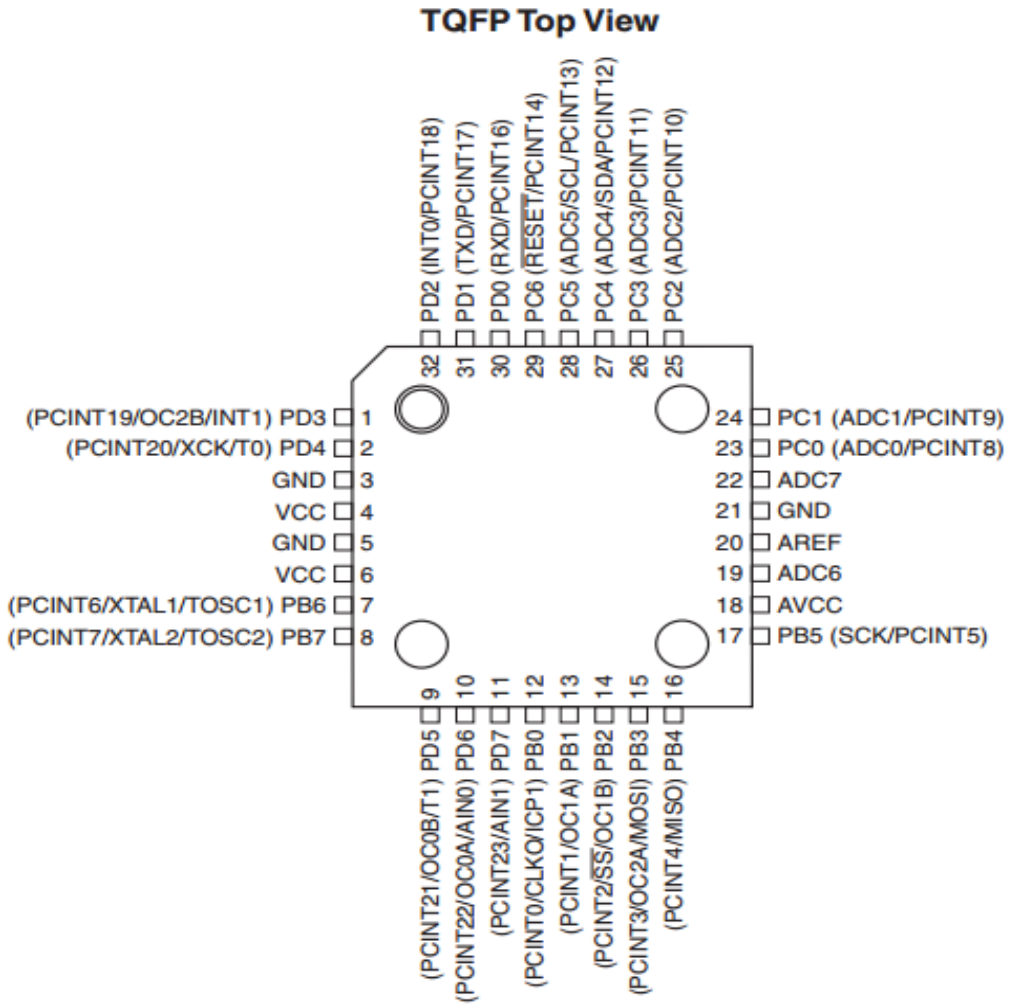

Fig 4.2 Node MCU Pin Configuration T

Fig 4.2 Showing the Top View of Node MCU Pin Configuration. . It has 16 digital input and output pins and one analog input pin. The node MCU wireless module sends the measured pulse rate, oxygen saturation, and temperature to the server

4.1.2 MAX30100 SENSOR

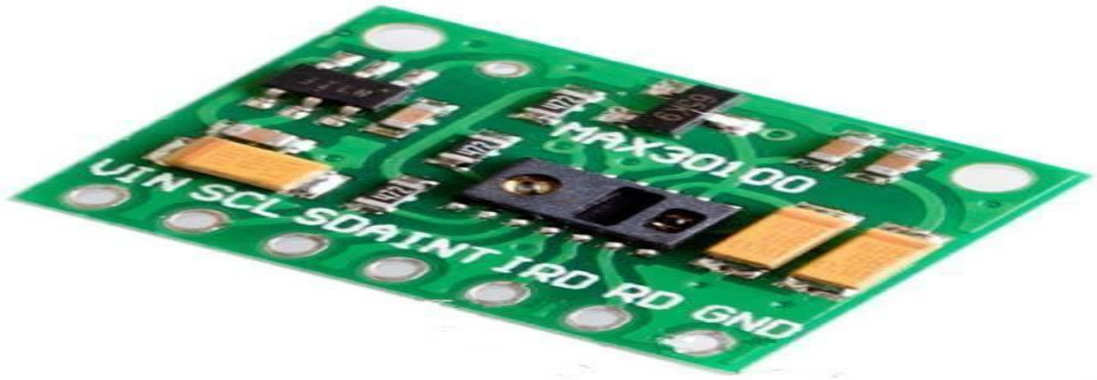

Fig 4.3 MAX30100

Fig 4.3 MAX30100 is a sensor that can measure blood oxygen saturation level and pulse rate. Saturation of peripheral oxygen (SpO2) is a calculation of blood vessel oxygen saturation, which refers to the amount of oxygenated haemoglobin in the blood. In a human body, ordinary SpO2 values range from 90to 100%. In this system, a MAX 30100 pulse oximeter was suitable. It is a coordinated beat oximeter and heart rate sensor arrangement, which provides precise values. This sensor combines two LEDs, a photo detector, optimized optics, and low-noise analog flag handling to identify beat oximetry and heart rate signals.

Number	Pins	Definition of Pins
1	VIN	Power Input 1.8V - 5.5V
2	SCL	IIC-SCL
3	SDA	IIC-SDA
4	INT	MAX30100 INT
5	IRD	MAX30100 IR_DRV
6	RD	MAX30100 R_DRV
7	GND	Ground

Max30100 Sensor Pin Configuration

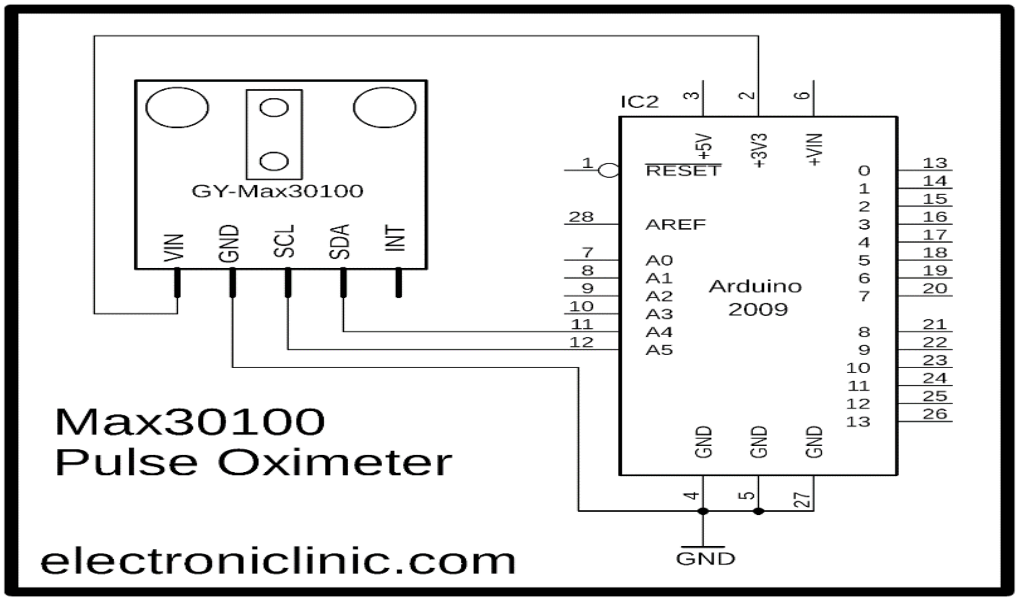

Figure 4.4: Max30100 Sensor Pin Configuration Table

Fig 4.4 Showing the Top View of Max30100 Sensor Pin Configuration Pin Configuration. In a human body, ordinary SpO2 values range from 90to 100%. In this system, a MAX 30100 pulse oximeter was suitable.

4.1.3 LM35 TEMPERATURE SENSOR

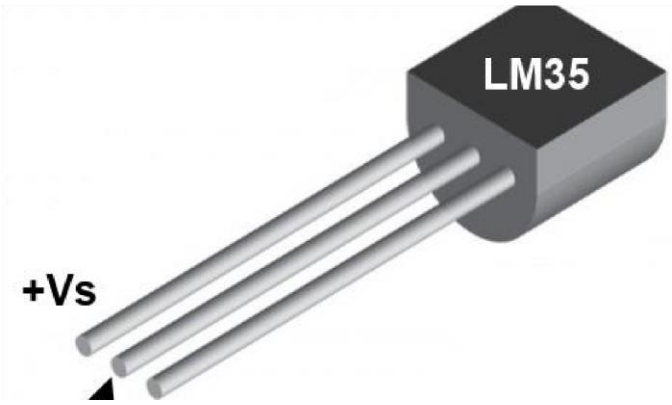

Fig 4.5 LM35 Temperature sensor

Fig 4.5 LM35 Temperature sensor that outputs an analog signal which is proportional to the instantaneous temperature. The output voltage can easily be interpreted to obtain a temperature reading in Celsius. The advantage of lm35 over thermistor is it does not require any external calibration. The coating also protects it from self-heating.

LM35 can measure from -55 degrees centigrade to 150-degree centigrade. The accuracy level is very high if operated at optimal temperature and humidity levels. The conversion of the output voltage to centigrade is also easy and straight forward.

4.1.4 LCD 16 X 2

An electronic device that is used to display data and the message is known as LCD 16×2. In LCD 16×2, the term LCD stands for Liquid Crystal Display that uses a plane panel display technology, used in screens of computer monitors & TVs, smartphones, tablets, mobile devices, etc. As the name suggests, it includes 16 Columns & 2 Rows so it can display 32 characters (16×2=32) in total & every character will be made with 5×8 (40) Pixel Dots. So, the total pixels within this LCD can be calculated as 32 x 40 otherwise 1280 pixels.

Fig 4.6 LCD display

Fig 4.6 LCD display and its basic Working principle is passing the light from layer-to-layer modules. This modules will vibrate and line up their position on 90 degrees that permits the polarised sheet to allow the light to pass through it.

4.1.5 POWER SUPPLY

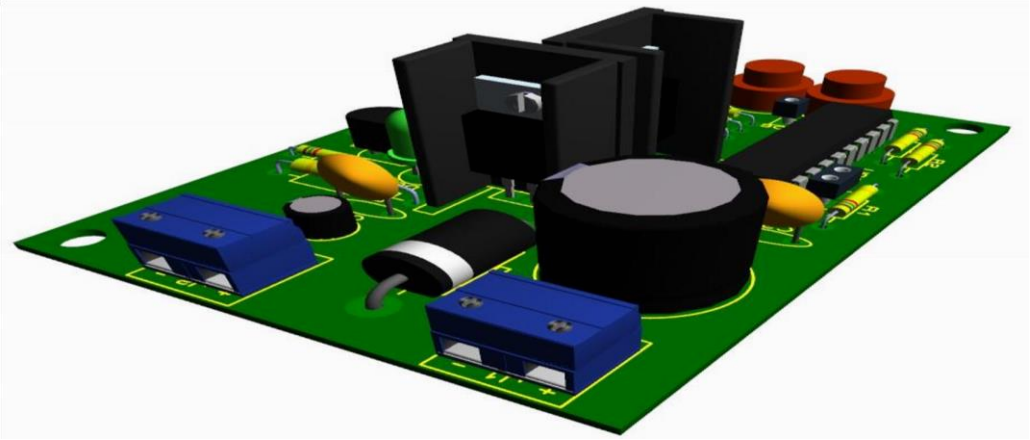

Fig 4.7 Power supply

Fig 4.7 Power supply is a component that supplies power to at least one electric load. Typically, it converts one type of electrical power to another, but it may also convert a different form of energy – such as solar, mechanical, or chemical - into electrical energy.

A power supply provides components with electric power. The term usually pertains to devices integrated within the component being powered. For example, computer power supplies convert AC current to DC current. A power supply is also known as a power supply unit, power brick or power adapter.

4.2 SOFTWARE COMPONENTS

- Arduino
- Ubiodts

4.2.1 Arduino IDE:

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++. Here, IDE stands for Integrated Development Environment.

The program or code written in the Arduino IDE is often called as sketching. We need to connect the Genuino and Arduino board with the IDE to upload the sketch written in the Arduino IDE software. The sketch is saved with the extension '.ino.'

The Upload button compiles and runs our code written on the screen. It further uploads the code to the connected board. Before uploading the sketch, we need to make sure that the correct board and ports are selected.

We also need a USB connection to connect the board and the computer. Once all the above measures are done, click on the Upload button present on the toolbar.

The latest Arduino boards can be reset automatically before beginning with Upload. In the older boards, we need to press the Reset button present on it. As soon as the uploading is done successfully, we can notice the blink of the Tx and Rx LED.

If the uploading is failed, it will display the message in the error window.

We do not require any additional hardware to upload our sketch using the Arduino Bootloader. A **Bootloader** is defined as a small program, which is loaded in the microcontroller present on the board. The LED will blink on PIN 13.

Serial Monitor : The serial monitor button is present on the right corner of the toolbar. It opens the serial monitor.

When we connect the serial monitor, the board will reset on the operating system Windows, Linux, and Mac OS X. If we want to process the control characters in our sketch, we need to use

an external terminal program. The terminal program should be connected to the COM port, which will be assigned when we connect the board to the computer.

4.1.2 Ubidots

Ubidots is an IoT Platform empowering innovators and industries to prototype and scale IoT projects to production. Use the Ubidots platform to send data to the cloud from any Internet-enabled device. You can then configure actions and alerts based on your real-time data and unlock the value of your data through visual tools. Ubidots offers a REST API that allows you to read and write data to the resources available: data sources, variables, values, events and insights. The API supports both HTTP and HTTPS and an API Key is required.

Your data will be protected with two more replication, encrypted storage and optional TLS/SSL data support. You can also customize permission groups to each module of the platform, making sure the right information is shown to the right user.

4.3 DESIGN USING UML DIAGRAMS

4.3.1 Class Diagram

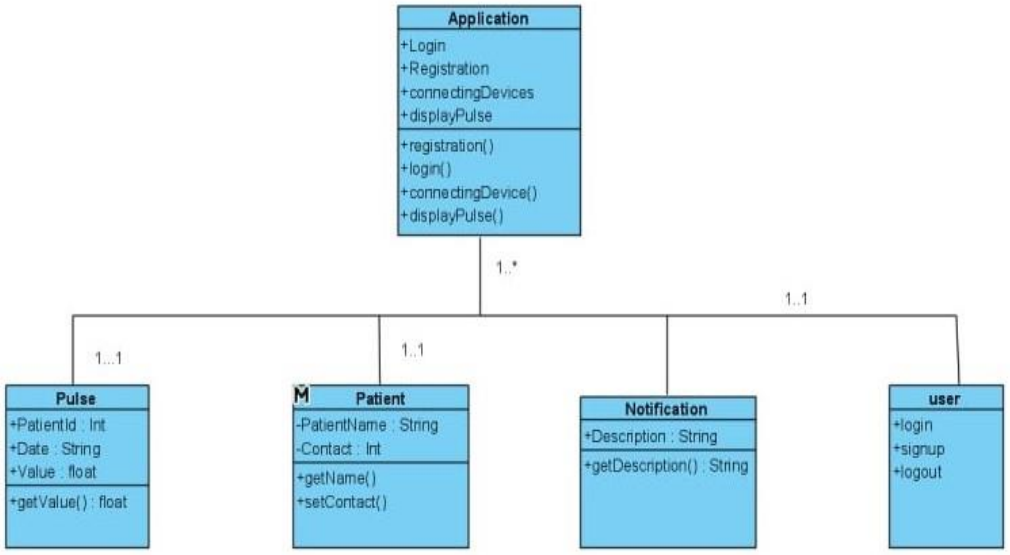

Fig 4.8 Class Diagram

Fig 4.8 Class Diagram Showing that user can login in the Application, and device transmit .Patient readings to the Application and it sends Notifications to Respective users. The class diagram consists of Patient, Notification, user and Pulse.

4.3.2 SEQUENCE DIAGRAM:

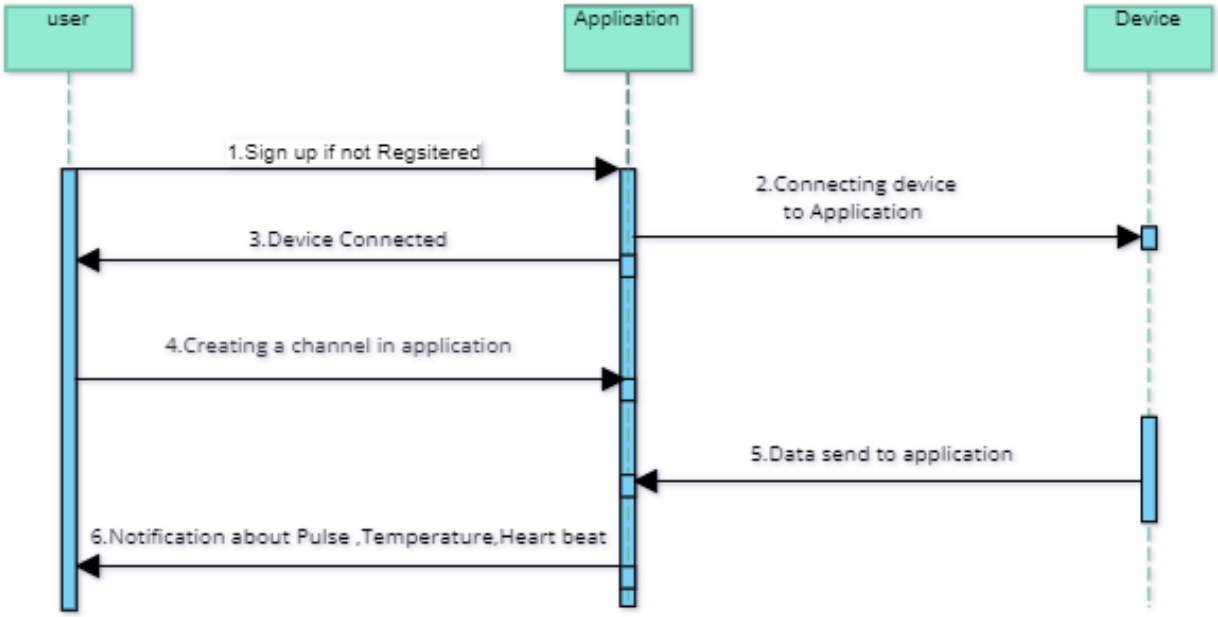

Fig 4.9 Sequence Diagram

Fig 4.8 Sequence Diagram showing that user can Log in to Application and connect the device to Application. Then create a channel in Application. The Device send data to the Application and It can send Notifications to respective users.

4.3.3 ACTIVITY DIAGRAM:

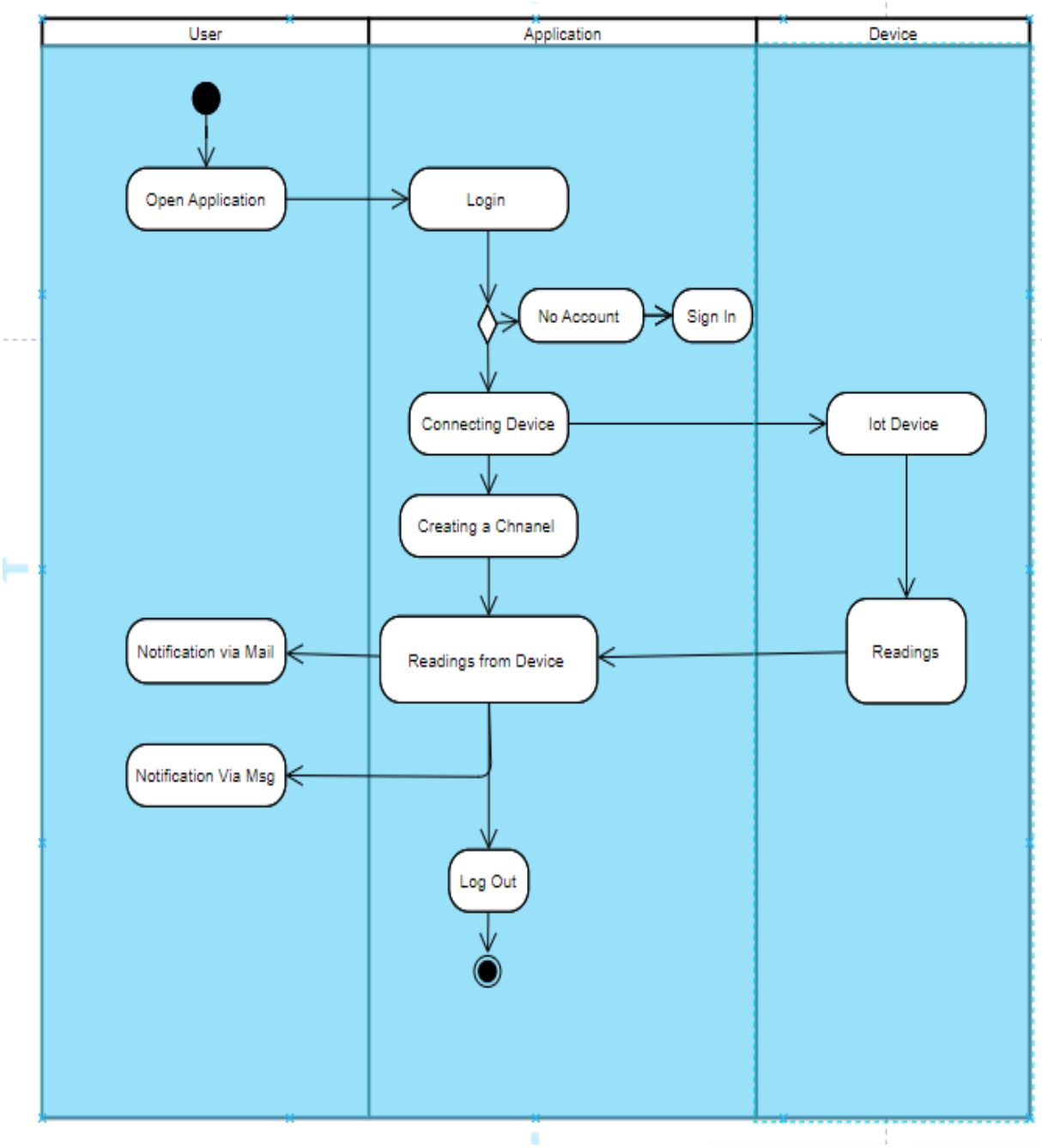

Fig 4.10. Activity Diagram

Fig 4.10. Activity Diagram Showing That user can Log in to Application and connect the device to Application. Then create a channel in Application. The Device send data to the Application and It can send Notifications like Mail and Normal Message to User

4.4 WORKING PRINCIPLE

- The proposed system consists of the pulse rate and SpO2 sensors and the body temperature sensor connected to a Node MCU.
- The Arduino is connected to the prototype with the help of a USB, which will help power up the system.
- When user upload data to the Node MCU, the system starts working, and the measured data will be shown in the serial monitor of the Arduino Integrated Development Environment (IDE) and the Liquid Crystal Display (LCD).
- The LCD displays the values of heart rate, temperature and oxygen saturation level and based on the below tables we can determine the health condition of our body.

Table 1: Body Temperature

Body temperature	State
36.0 – 37.5 degree Celsius	Normal
>37.5 degree Celsius	High
<36.0 degree Celsius	Low

Table 2: Pulse Rate

Pulse Rate	State
60 BPM – 100 BPM	Normal
>100 BPM	High
<60 BPM	Low

Table 3: Spo2

Spo2	State
95% - 100%	Normal
<67%	Low

Chapter-5

5.SOFTWARE IMPLEMENTATION

5.1 PROGRAM CODE

```
#include <PubSubClient.h>
#include <ESP8266WiFi.h>
#include <ESP8266WiFiMulti.h>
#include <stdio.h>
#include <Wire.h>
#include <OneWire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 16, 2);
#include <DallasTemperature.h>
#include "MAX30100_PulseOximeter.h"
#define REPORTING_PERIOD_MS     1000
#define WIFISSID "RAM" // Put your WifiSSID here
#define PASSWORD "123456789" // Put your wifi password here
#define TOKEN "BBFF-zZsf7phLSQQRCQZQXIaPJJ3VOYmzNe" // Put your Ubidots' TOKEN
#define DEVICE_LABEL "health-monitoring" // Put the device label
#define VARIABLE_LABEL_1 "heartrate" // Put the variable label
#define VARIABLE_LABEL_2 "SPo2" // Put the variable label
#define VARIABLE_LABEL_3 "temperature" // Put the variable label
#define MQTT_CLIENT_NAME "EI_OXMO" // MQTT client Name, put a Random ASCII
#define Pin D3
PulseOximeter pox;
float temp;
OneWire ourWire(Pin);
DallasTemperature sensors(&ourWire);
uint32_t tsLastReport = 0;
char mqttBroker[] = "industrial.api.ubidots.com";
char payload[700];
char topic[150];
```

```
// Space to store values to send
char str_val_1[6];
char str_val_2[6];
char str_val_3[6];
int flag = 0;
int count = 0;
ESP8266WiFiMulti WiFiMulti;
WiFiClient ubidots;
PubSubClient client(ubidots);
void onBeatDetected()
{
  Serial.println("Beat!");
  count++;
  if (count > 3)
  {
    count = 0;
    pox.shutdown();
    if (flag == 0)
    {
      client.connect(MQTT_CLIENT_NAME, TOKEN, "");
      Serial.println("MQTT connected again");
      flag = 1;
    }
    if (!client.connected()) {
      Serial.print("Reconnecting ... ");
      reconnect();
    }
    sensors.requestTemperatures();       //Prepare the sensor for reading
    temp = sensors.getTempFByIndex(0);
    Serial.println(sensors.getTempFByIndex(0)); //Read and print the temperature
    lcd.setCursor(0, 1);
    lcd.print("Temperature:");
    lcd.print(sensors.getTempFByIndex(0));
```

```
    dtostrf(pox.getHeartRate(), 4, 2, str_val_1);
    dtostrf(pox.getSpO2(), 4, 2, str_val_2);
    dtostrf(sensors.getTempFByIndex(0), 4, 2, str_val_3);
    sprintf(topic, "%s", ""); // Cleans the topic content
    sprintf(topic, "%s%s", "/v1.6/devices/", DEVICE_LABEL);
    sprintf(payload, "%s", ""); // Cleans the payload content
    sprintf(payload, "{\"%s\":", VARIABLE_LABEL_1); // Adds the variable label
    sprintf(payload, "%s {\"value\": %s}", payload, str_val_1); // Adds the value
    sprintf(payload, "%s, \"%s\":", payload, VARIABLE_LABEL_2); // Adds the variable label
    sprintf(payload, "%s {\"value\": %s}", payload, str_val_2); // Adds the value
    sprintf(payload, "%s, \"%s\":", payload, VARIABLE_LABEL_3); // Adds the variable label
    sprintf(payload, "%s {\"value\": %s}", payload, str_val_3); // Adds the value
    sprintf(payload, "%s}", payload); // Closes the dictionary brackets
    Serial.println(payload);
    Serial.println(topic);
    client.publish(topic, payload);
    client.loop();
    pox.resume();
  }

}
void callback(char* topic, byte* payload, unsigned int length) {
  Serial.print("Message arrived [");
  Serial.print(topic);
  Serial.print("] ");
  for (int i = 0; i < length; i++) {
    Serial.print((char)payload[i]);
  }
  Serial.println();
}
void reconnect() {
  // Loop until we're reconnected
  while (!client.connected()) {
```

```
    Serial.println("Attempting MQTT connection...");
    // Attempt to connect
    if (client.connect(MQTT_CLIENT_NAME, TOKEN, "")) {
      Serial.println("connected");
    } else {
      Serial.print("failed, rc=");
      Serial.print(client.state());
      Serial.println(" try again in 2 seconds");
      // Wait 2 seconds before retrying
      delay(2000);
    }
  }
}
void setup()
{
  Serial.begin(115200);
  lcd.init();
  lcd.backlight();
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("HEALTH MONITORIN");
  lcd.setCursor(0, 1);
  lcd.print("G  USING IOT    ");
  WiFiMulti.addAP(WIFISSID, PASSWORD);
  Serial.println();
  Serial.println();
  Serial.print("Wait for WiFi... ");
  while (WiFiMulti.run() != WL_CONNECTED) {
    Serial.print(".");
    delay(500);
  }
  Serial.println("");
  Serial.println("WiFi connected");
```

```
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
  client.setServer(mqttBroker, 1883);
  client.setCallback(callback);
  sensors.begin();
  Serial.print("Initializing pulse oximeter..");
  // Initialize the PulseOximeter instance
  // Failures are generally due to an improper I2C wiring, missing power supply
  // or wrong target chip
  // pox.setIRLedCurrent(MAX30100_LED_CURR_24MA);
  if (!pox.begin()) {
    Serial.println("FAILED");
    for (;;);
  } else {
    Serial.println("SUCCESS");
    digitalWrite(D0, HIGH);
  }
  //pox.setIRLedCurrent(MAX30100_LED_CURR_24MA);
  pox.setIRLedCurrent(MAX30100_LED_CURR_7_6MA);
  // Register a callback for the beat detection
  pox.setOnBeatDetectedCallback(onBeatDetected);
}
void loop() {


  // Make sure to call update as fast as possible


  pox.update();
  if (millis() - tsLastReport > REPORTING_PERIOD_MS)
  {
    // to computer Serial Monitor
    Serial.print("BPM: ");
    Serial.print(pox.getHeartRate());
```

```
    //blue.println("\n");
    Serial.print("    SpO2: ");
    Serial.print(pox.getSpO2());
    Serial.print("%");
    Serial.println("\n");
    lcd.setCursor(0, 0);
    lcd.print("BPM:");
    lcd.print(pox.getHeartRate());
    lcd.setCursor(8, 0);
    lcd.print(";");
    lcd.print("SpO2:");
    lcd.print(pox.getSpO2());
    lcd.print(" ");

    //client.publish(topic, payload);
    //client.loop();
    tsLastReport = millis();
  }
}
```

Chapter-6

RESULTS

6.1 SETTING THE UBIDOTS

- Ubidots provides a very good tool for IoT based projects.
- By using the Ubidots site, we can monitor our data and control our system over the Internet, using the Ubidts token.
- So, first you need to sign up for the Ubidots for that vist **https://ubidots.com/** And create an account.

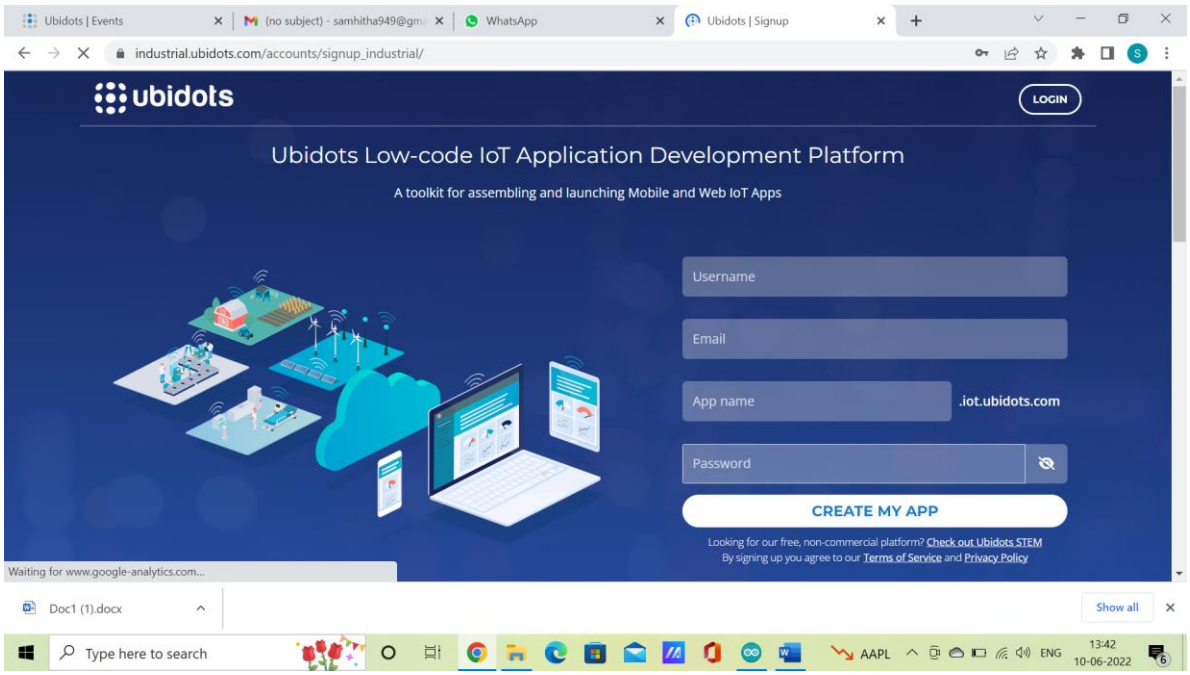

Fig 6.1 Setting Ubidots

Fig 6.1 shows the creating an account for Ubidots, and it ask all the details like username,Email, and App name means name given to iot device in Ubidots and Password.

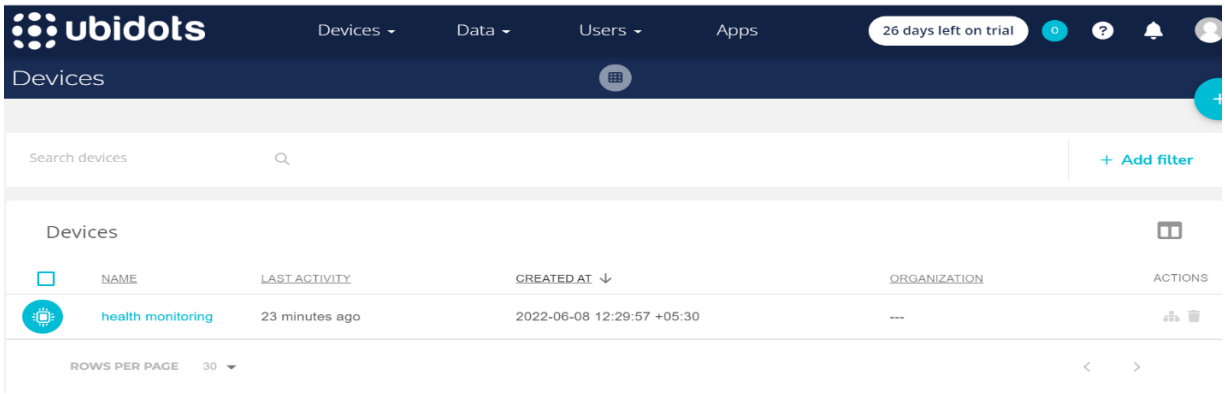

Fig 6.2 Creating device name called heath monitoring

Fig 6.2 shows the App name is health monitoring and it contain all the fields of Temperature, Spo2 and Heart beat for virtualization.

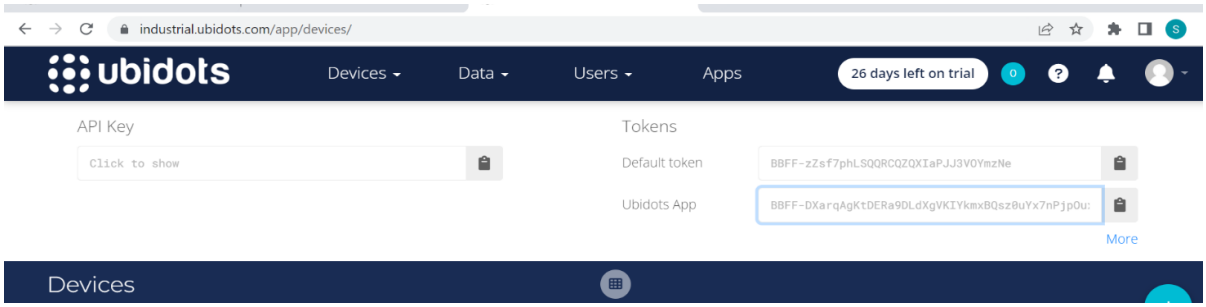

Fig 6.3 Copying Ubidots Token

Fig 6.3 shows the copying of API Key of Ubidots Token paste it in your Code . Then upload the code to the Node MCU. Open the serial Monitor it will automatically connect to WIFI and set up everything.

Now click on device so that you can see the online data streaming, i.e IoT Based Patient Health Monitoring System as shown below.

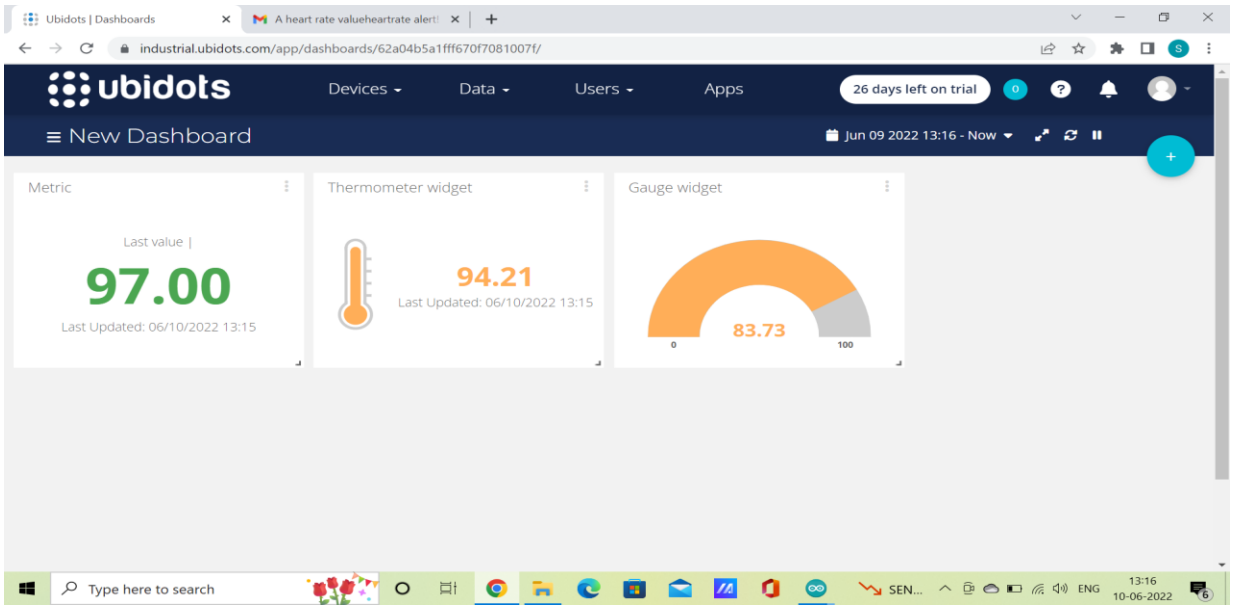

Fig 6.4 Live Data Streaming

Fig 6.4 showing the Live Data Streaming of SpO2,Temparature and Pulse readings in the Ubidots.

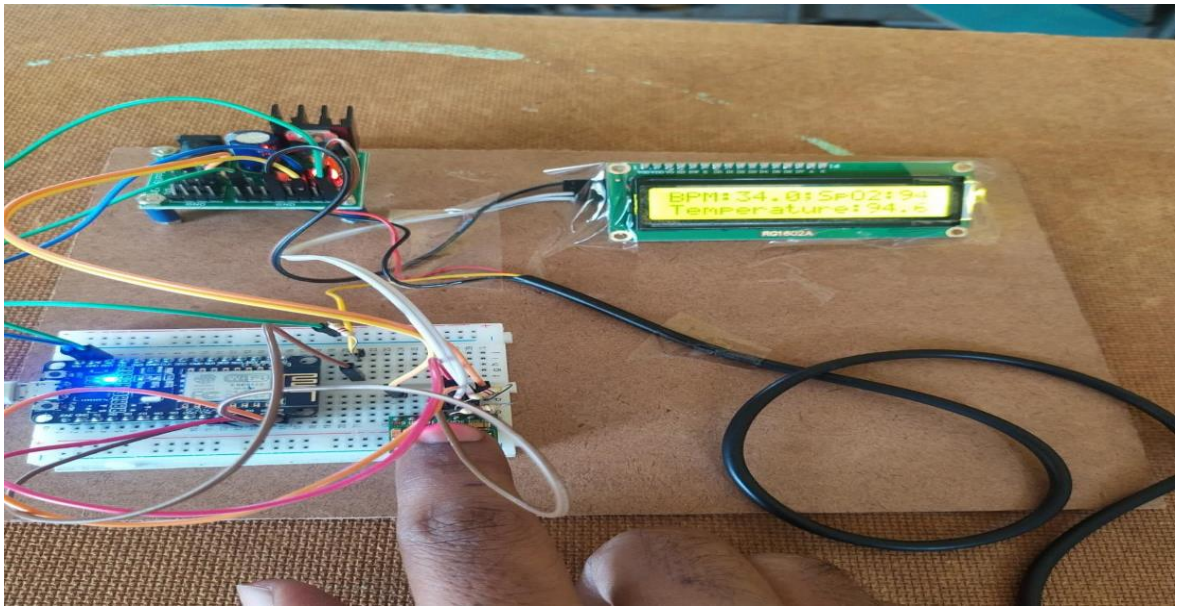

Fig 6.5 Connections from Node MCU to Max30010

Fig 6.5 Shows the Connections of LCD ,Max30100 and Node MCU and power supply.

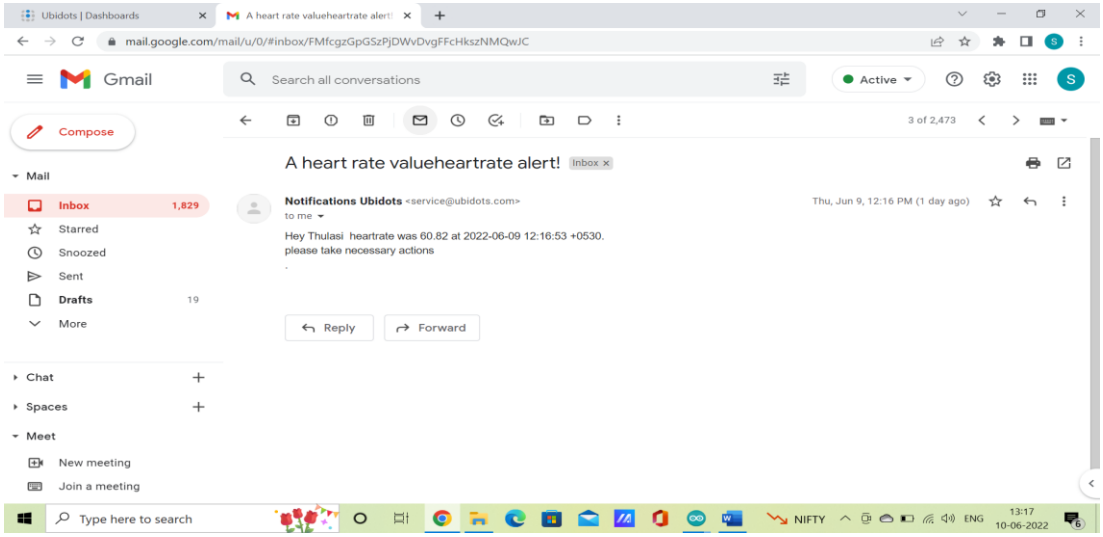

Fig 6.6 Displaying a Mail notification of Pulse Readings

Fig 6.6 shows the detailed Mail Notification of Pulse Readings of Patient to their Respective Doctor mail. And The Patient mail can get the same Notification.

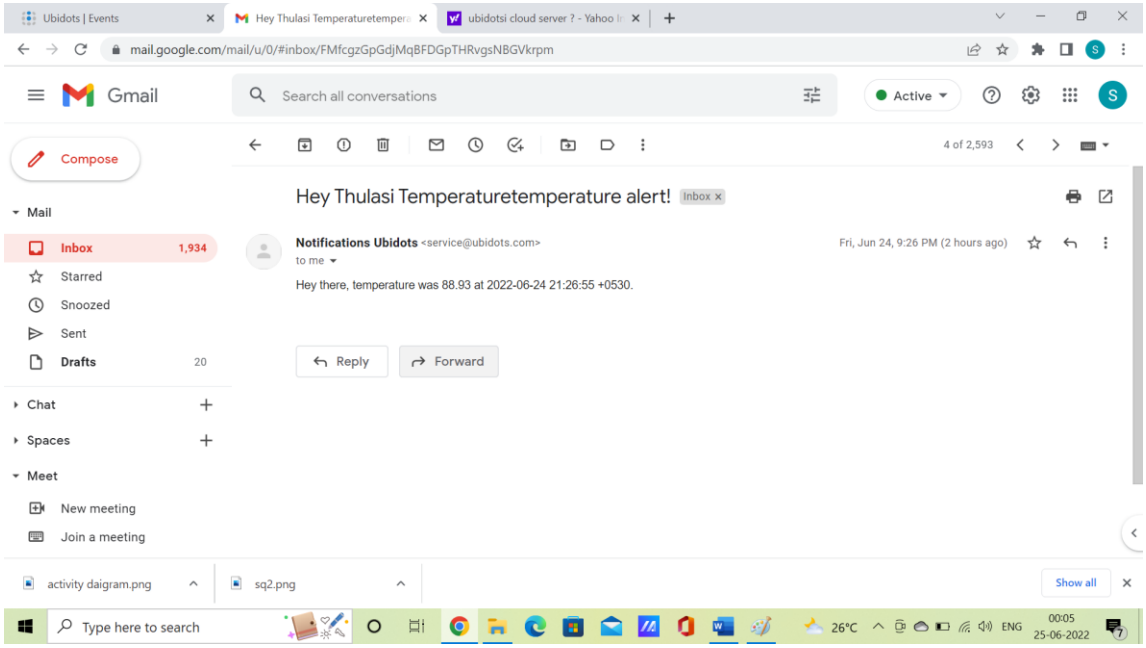

Fig 6.7 Displaying a Mail notification of Temperature readings

Fig 6.7 shows the detailed Mail Notification of Temperature readings of Patient to their Respective Doctor mail. And The Patient mail can get the same Notification.

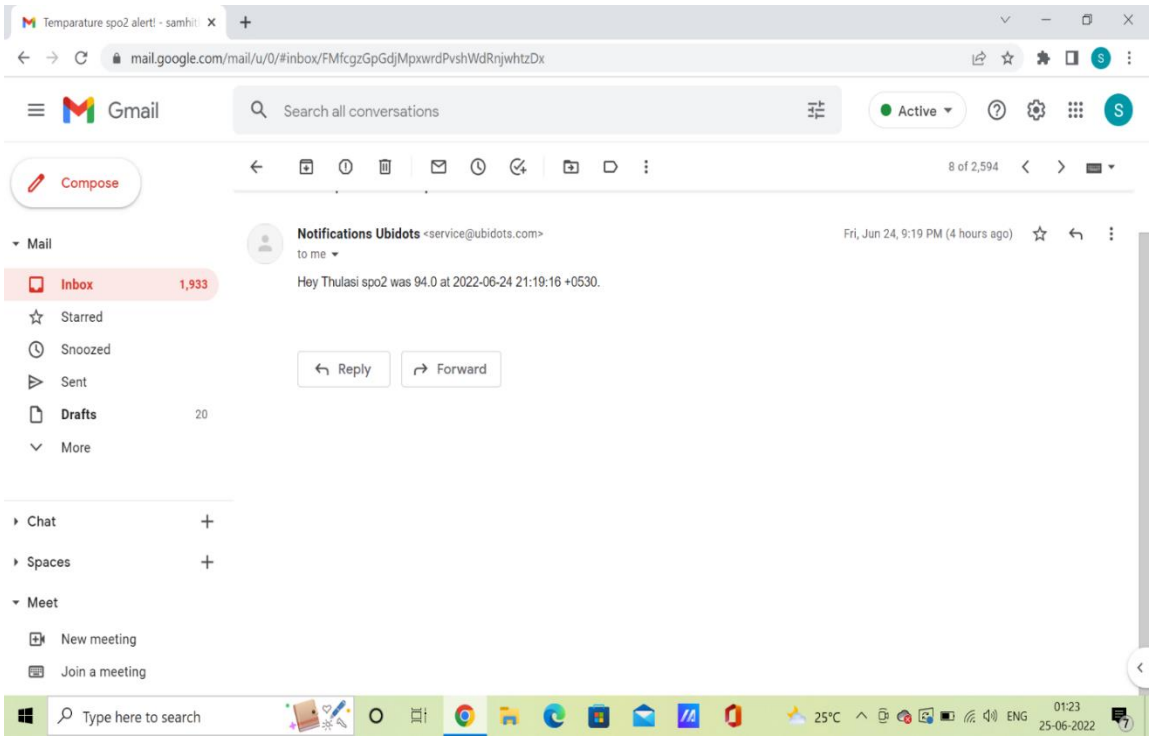

Fig 6.8 Displaying a Mail notification of SPO2 readings

Fig 6.8 shows the detailed Mail Notification of SPO2 readings of Patient to their Respective Doctor mail. And The Patient mail can get the same Notification.

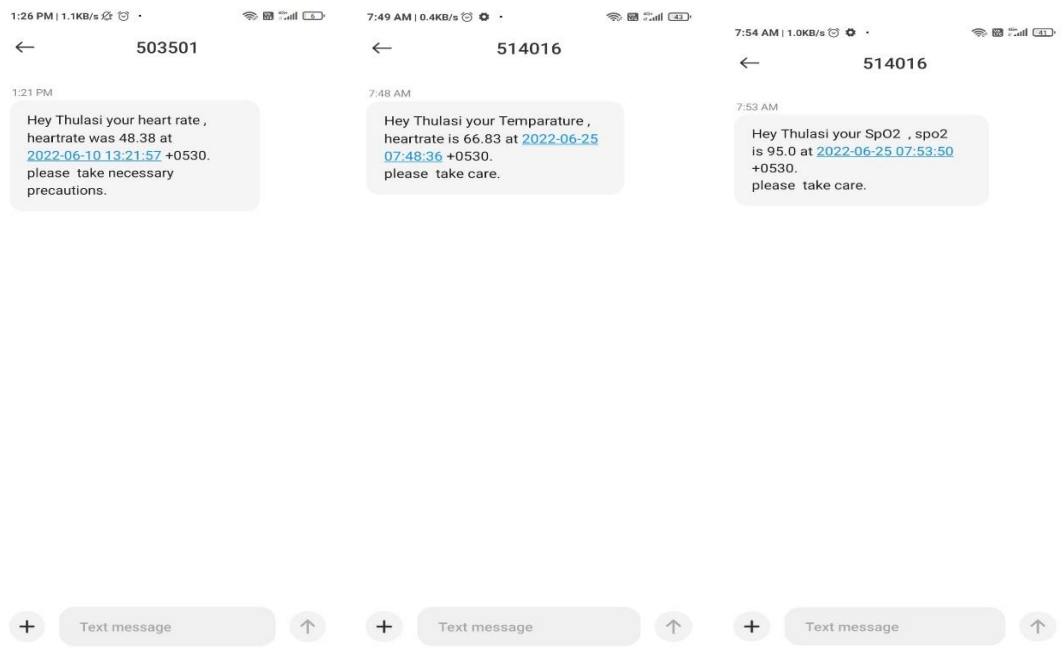

Fig 6.9. Displaying a Normal Msg Nofication of Temperature, SpO2, and Heart beat readings.

Fig 6.9 shows the detailed Normal Notification of SPO2,Temperature and Pulse rate readings of Patient to their Respective Doctor mail. And The Patient mail can get the same Notification.

Chapter-7

CONCLUSION

In this project, an IoT based health monitoring system was developed. The system monitors body temperature, pulse rate and Spo2 by using the sensors and also the values are displayed on a LCD. And further the values are updated on a platform called Ubidots which helps us to compare our health condition and send Notifications to respective users. Ubidots can send Email notifications and normal message notifications to respective user. With the help of this IoT device we can analyze the Patient's health Conditions regularly, if Patient condition is critical, that means the values are crossed the Limited value then the Ubidots platfrom send the notifications to respective user.

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