A Project Report
On

IoT based HEALTH MONITORING SYSTEM

A Project Work Submitted in Partial Fulfillment of
the requirements for

DEGREE
In
COMPUTER SCIENCE AND ENGINEERING

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CERTIFICATE OF APPROVAL

This is to certify that the work embodied in this project entitled **IoT based HEALTH MONTIORING SYSTEM** submitted by Aayush Kapoor, Partheesh Ranjan Singh, Tejas Kumar NA to the Department of Computer Science and Engineering, have carried out under my direct supervisions and guidance.

The project work has been prepared as per the regulations of PES University and I strongly recommend that this project work be accepted in partial fulfillment of the requirement for Degree.

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Certificate by the Board of Examiners

This is to be certified that the project work entitled **IoT based HEALTH MONITORING SYSTEM** submitted by Aayush Kapoor, Partheesh Ranjan Singh, Tejas Kumar NA to the Department of Computer Science and Engineering of PES University has been examined and evaluated.

The project work has been prepared as per the regulations of Central Institute of Technology and qualifies to be accepted in partial fulfillment of the requirements for the Degree.

Project Co-ordinator
(Dr. Nagegowda KS)
Associate Professor,Dept. of CSE

Board of Examiners

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ACKNOWLEDGEMENT

We students of Degree 3rd year, Computer Science and Engineering, have successfully completed the project under the guidance of esteemed faculties of this very institute.
We would like to thank Dr. Nagegowda KS (Associate Professor, Dept., of CSE) for his valuable guidance and advice in completion of our project and providing us all possible assistance. He has been extremely motivating and helps us during the project work. We are also grateful to him for providing us necessary books and journals.

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ABSTRACT

Internet of Things (IoT) technology has brought revolution to each and every field of common man's life by making everything smart and intelligent. IoT refers to a network of things which make a self-configuring network. The development of Intelligent Smart Health monitoring IoT based devices is day by day turning the face of health monitoring by not only enhancing it but also making it cost-effective and initiating timely action. The aim / objective of this report is to propose IoT based Health Monitoring System assisting doctors and relatives of the user in getting Live Data (Pulse, temperature) for efficient health monitoring which will enable them to monitor their health and take decisions accurately. The IoT based Health Monitoring System being proposed via this report is integrated with Arduino Technology mixed with different Sensors and a Wifi module producing live data feed that can be obtained online from Blynk server.

1. CHAPTER I: INTRODUCTION

1.1 OVERVIEW

The objectives of this report is to proposed IoT based Smart Farming System which will enable farmers to have live data of soil moisture environment temperature at very low cost so that live monitoring can be done.

The structure of the report is as follows: chapter I will cover over of overview of IoT Technology and agriculture-concepts and definition, IOT enabling technologies, IOT application in agriculture, benefits of IOT in agriculture and IOT and agriculture current scenario and future forecasts. Chapter II will cover definition of IOT based smart farming system , the components and modules used in it and working principal of it. Chapter III will cover algorithm and flowchart of the overall process carried out in the system and its final graphical output .chapter IV consist of conclusion, future scope and references.

1.2 IOT TECHNOLOGY AND HEALTH MONITORING

1.2.1 IOT: CONCEPT AND DEFINITION

Internet of things IOT consists of two words Internet and Things .The term things in IOT refers to various IOT devices having unique identities and have capabilities to perform remote sensing , actuating and live monitoring of certain sort of data.IOT devices are also enable to have live exchange of data with other connected devices and application either directly or indirectly , or collected data from other devices and process the data and send the data to various servers. The other term internet is define as Global communication Network connecting Trillions of computers across the planets enabling sharing of information .Thus the IOT can be define as :"A dynamic Global Network Infrastructure with self -configuring capabilities based on standard and inter operable communication to protocol where physical and virtual things have identities, physical attributes ,and virtual personalities and use intelligent interfaces and are seamlessly integrated into the information network ,often communicate data associated with user and their environment." An ideal IoT device consists of various interfaces for making connectivity to other devices which can either be wired or wireless.

Any IoT based device consists of following components:

- I/O interface for Sensors.
- Interface for connecting to Internet.
- Interface for Memory and Storage.
- Interface for Audio/Video.

IoT devices can be of various forms like wearable sensors, smart watches, IoT smart home monitoring, IoT intelligent transport systems, IoT smart health devices etc.

1.2.2 IOT ENABLING TECHNOLOGIES

Internet of Things has a strong backbone of various enabling technologies- Wireless Sensor Networks, Cloud Computing, Big Data, Embedded Systems, Security Protocols and Architectures, Protocols enabling communication, web services, Internet and Search Engines. Wireless Sensor Network (WSN): It consists of various sensors/nodes which are integrated together to monitor various sorts of data.

Cloud Computing: Cloud Computing also known as on-demand computing is a type of Internet based computing which provides shared processing resources and data to computers and other devices on demand. It can be in various forms like IaaS, PaaS, SaaS, DaaS etc.

Big Data Analytics: Big data analytics is the process of examining large data sets containing various forms of data types—i.e. Big Data – to uncover hidden patterns, unknown correlations, market trends, customer preferences and other useful business information.

Communication Protocols: They form the backbone of IoT systems to enable connectivity and coupling to applications and these protocols facilitate exchange of data over the network as these protocols enable data exchange formats, data encoding and addressing.

Embedded Systems: It is a sort of computer system which consists of both hardware and software to perform specific tasks. It includes microprocessor/microcontroller, RAM/ROM, networking components, I/O units and storage devices.

1.2.3 IOT APPLICATIONS IN HEALTH MONITORING

According to a report by Aruba Networks, a Hewlett Packard Enterprises subsidiary, the healthcare industry is the third most advanced in IoT implementation.

QardioCore, an ECG monitor designed to provide continuous medical grade data.	Users can wear this device within their normal lifestyle: at work, the gym, or out and about. The data is said to help patients to better monitor health conditions such as high blood pressure and cholesterol. It also sends information into health centers that monitor conditions such as diabetes, heart troubles and weight gain, without the need for physical visits.
AwarePoint	This system places IoT sensors designed to track every nuance of the caretaking and caregiving process. This provides location tracking on patients and medical equipment in what they call “location-as-a-service.” The system is designed to improve staff and patient

	satisfaction, streamline asset management and patient flow.
smart thermometer produced by Kinsa	This has three key purposes: to detect patient illness, provide analysis for better care, and to map human illness through the collection of data. Smart Ear and Sesame Street versions can already be found in many homes across the U.S.
Medication Dispensing Service, by Philips	These are focused on patients who may find it difficult to manage medication independently. An MDS dispenser pre-fill with the required dosage for a specific day and provides notifications to patients when it is time to take or refill medicines. If a dosage is missed, the information can be tracked and fed back to the patient's doctor.

1. 2. 4. BENEFITS OF IOT IN HEALTH MONITORING

The benefits of IOT in this sector have brought a lot of revolutionary changes. Some of them are:

1. **Brings Continuous Health Monitoring**- These days, fitness bands, heart rate monitoring cuffs, blood pressure measuring bands, glucometer, and more advanced smart healthcare devices provide patients with real-time personalized health status. They remind the patient to keep a check on their regular calorie consumption, improve exercise routine, identifies changing blood pressure trend, and more. For elderly patients, it gets crucial to track their health conditions on a daily basis, and smart healthcare devices make their lifestyle easier by letting them know about any possible danger beforehand! It alerts the patient as well as to the patient's family members in order to warn them about the unexpected fluctuations in the patient's health conditions.

2. Makes Hospitals Smarter- Be it the wheelchairs, oxygen pumps, nebulizers, defibrillators, or some other monitoring equipment; they are tracked down on a regular note to be aware of their real-time locations. The IOT sensors associated with these help the hospital authorities to track their real-time location in just a few minutes. Medical staffs are required to be present at different locations, and their deployment could also be traced easily.

Hospitals are vulnerable, and the spread of infections is a huge concern. With IoT enabled hygiene monitoring devices, smart hygiene monitoring has become a thing of the past. IoT adoption ensures better patient protection, hospital asset management (pharmacy inventory control) and environmental monitoring, humidity, and temperature control for the healthcare industry.

3. Helps You Keep a Track on Your Patients- These days, physicians or personal nurses can keep track of their patient's health through wearables and some other home monitoring

equipment. This equipment is embedded with IoT sensors that support the physicians to track the patient's medical diagnostic status effectively. Planning the patient's treatment schedule, staying alert about those patients who require immediate medical treatment could all be done in effortless ways. A hospital holds several patients having the requirement of different medical assistance.

2. CHAPTER II: OVERVIEW OF THE PROJECT

2.1 DEFINITION IOT BASED HEALTH MONITORING SYSTEM

IoT based HEALTH MONITORING is regarded as IoT gadget focusing on Live Monitoring of health data in terms of Pulse (Beats per minute) and Body Temperature (in Celsius and Fahrenheit)with the sensors integrated with it. The system provides the concept of "Plug & Sense" in which health professionals and relatives of the user getting Live Data feeds on various devices like Smart Phones, Tablets etc. and the data generated via sensors can be easily shared and viewed by anyone anywhere remotely via Cloud Computing technology integration

2.2 COMPONENTS AND MODULES

In this section, various components and Modules being used for **IoT based HEALTH MONITORING SYSTEM** development is discussed:

2.2.1 ARDUINO UNO

The Arduino Uno is a microcontroller board based on theATmega328 (datasheet).It has 14 digital input/output pins(of which 6 can be used as PWM outputs),6 analog inputs, a 16 MHz crystal oscillator, a USB connection ,a power jack, an ICSP header , and a reset button.

Figure 2.1 ARDUINO UNO

2.2.2 *WIFI MODULE- Lolin NodeMCU V3*

The NodeMCU runs on the ESP8266 Wi-Fi SoC, and hardware which based on the ESP-12 module. The Lolin NodeMCU V3 board ads USB/UART converter chip as well as decoupled LDO power supply. The Lolin NodeMCU board uses the CH340G USB/UART converter chip. Integrates GPIO, PWM, IIC, 1-Wire and ADC

all in one board,10 GPIO, every GPIO can be PWM, I2C, 1-wire,4M Flash Memory, Built-in WiFi Antenna

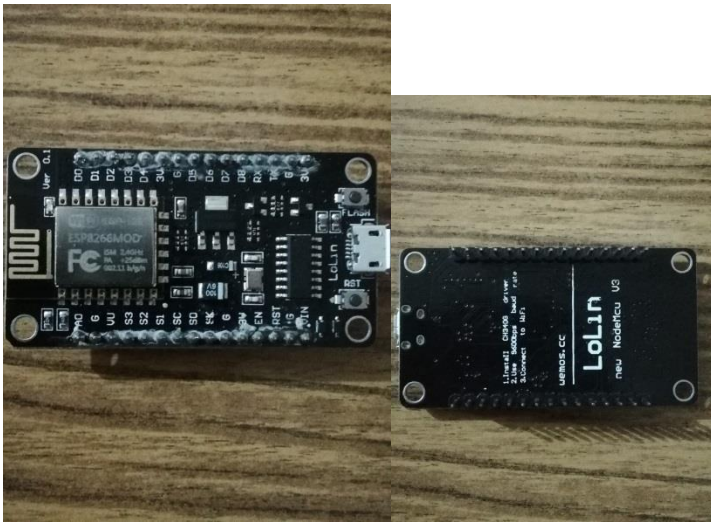


Figure 2.2NODEMCU Module

2.2.3. SENSORS

2.2.3.1. TEMPERATURE SENSOR-LM35

An analog temperature sensor used to calculate body temperature. Technical Specifications: Minimum and Maximum Input Voltage is 35V and -2V respectively. Typically 5V, Can measure temperature ranging from -55°C to 150°C, Output voltage is directly proportional (Linear) to temperature (i.e.) there will be a rise of 10mV (0.01V) for every 1°C rise in temperature, ±0.5°C Accuracy, Drain current is less than 60uA, Low cost temperature sensor, Small and hence suitable for remote applications.


FIGURE 2.3 LM-35 TEMPERATURE SENSOR

2.2.3.2 PULSE SENSOR

Biometric Pulse Rate used for detecting heartbeat. It is a Plug and Play type sensor. Technical Specification: Operating Voltage: +5V or +3.3V, Current Consumption: 4mA, Diameter: 0.625”, Thickness: 0.125” Thick

FIGURE 2.4 PULSE SENSOR

2.2.3.3 KY-013 ANALOG TEMPERATURE SENSOR

This sensor is used to detect the temperature using an analog pin on the Arduino. The sensor uses the concept of calculating its unknown resistance and then converting that value to temperature with the help of Steinhart–Hart equation to derive precise temperature of the thermistor.

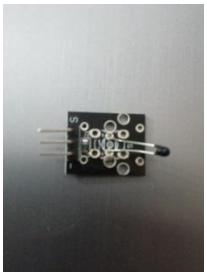
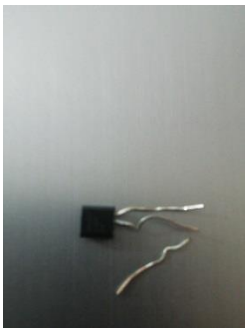


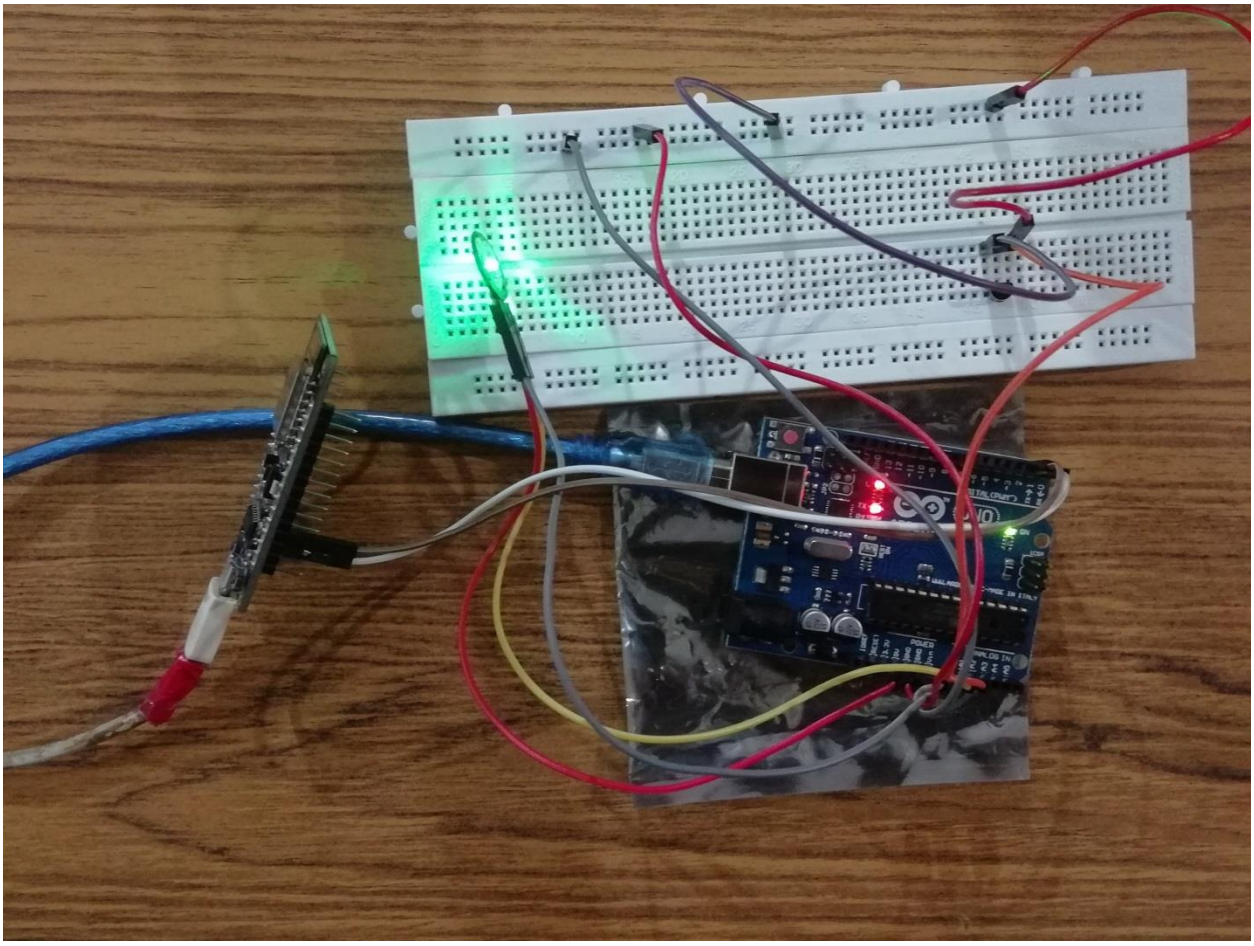
FIGURE 2.4 KY-013 TEMPERATURE SENSOR

NOTE: Our LM-35 sensor broke during the shooting of the video and we replaced it with the KY-013 and so the new circuit diagram is displayed and described.



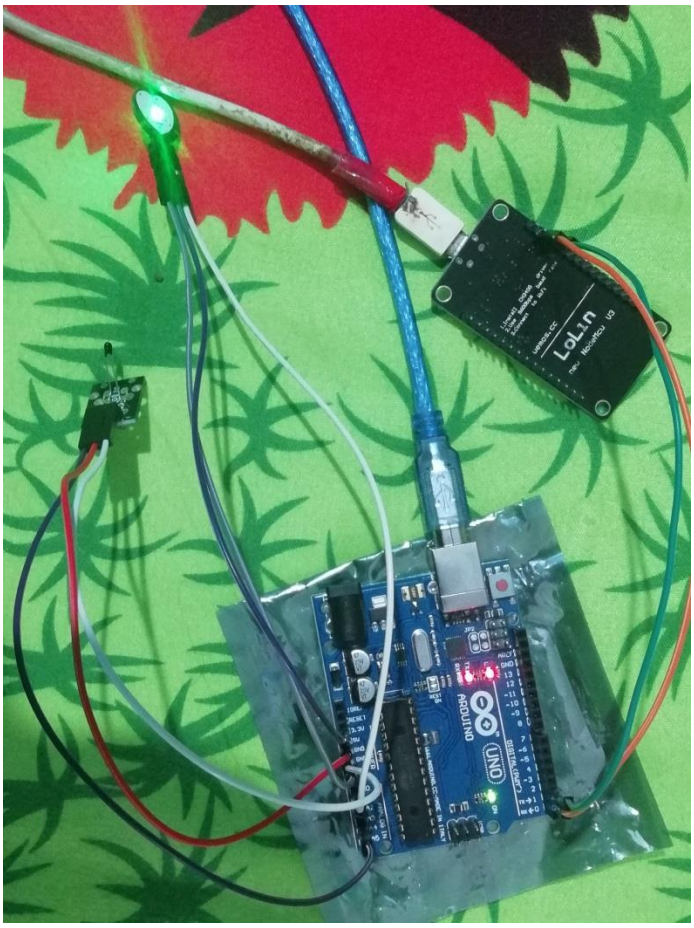
2.3 CIRCUIT DESCRIPTION & WORKING PRINCIPAL

(THIS IS THE OLD CIRCUIT)



The above circuit is designed for the IOT based health monitoring system. This circuit has an Arduino programmed to get the feed from the sensors. We can see a green light which is of the pulse sensor and on the breadboard we have attached the LM-35 temperature sensor. The NodeMCU board and the Arduino are powered by connecting the USB to the laptop. The values which are sent to the NodeMCU by the Arduino are sent to the cloud server (Blynk server) and the values are then received on the Blynk app.

(THE NEW CIRCUIT USE IN THE PROJECT VIDEO)



The above circuit is designed for the IOT based health monitoring system. This circuit has an Arduino programmed to get the feed from the sensors. We can see a green light which is of the pulse sensor and we have attached a KY-013 Temperature sensor to sense the body temperature. The NodeMCU board and the Arduino are powered by connecting the USB to the laptop. The values which are sent to the NodeMCU by the Arduino are sent to the cloud server (Blynk server) and the values are then received on the Blynk app.

3. CHAPTER-III : ALGORITHMS & FLOWCHART & OUTPUT GRAPHS

3.1 ALGORITHM

THE ALGORITHM OF OVERALL PROCESS:-

STEP 1: START THE PROCESS
STEP 2: CONNECTED TO WIFI
STEP 3: READ TEMERATURE AND PULSE (BPM) VALUES
STEP 4: GET TEMPERATURE AND PULSE (BPM) VALUES FROM ANALOG PINS
STEP 5: SEND DATA TO BLYNK CLOUD SERVER
STEP 6: RECEIVE THE DATA ON BLYNK APP
STEP 7: REPEAT STEP 4, 5 & 6 UNTIL THE PROCESS END
STEP 8: END

3.2 FLOWCHART

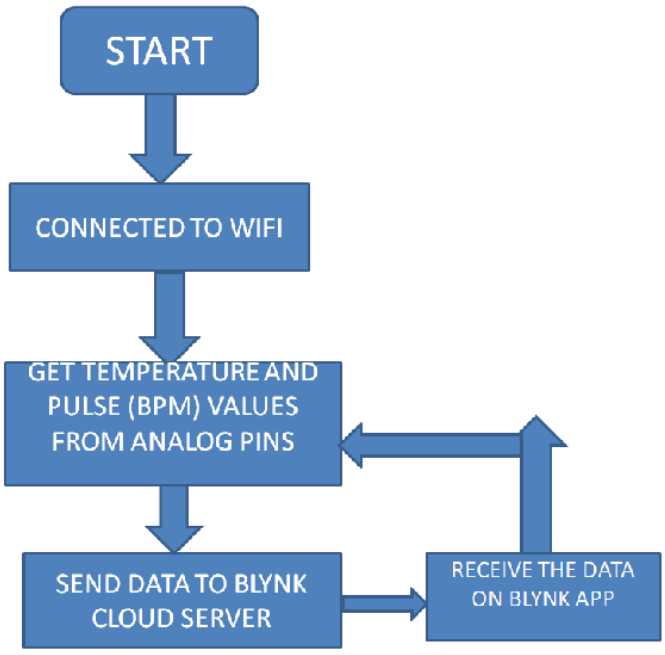


FIGURE 3.1 FLOWCHART OF OVERALL PROCESS

3.3 OUTPUT SCREENSHOTS

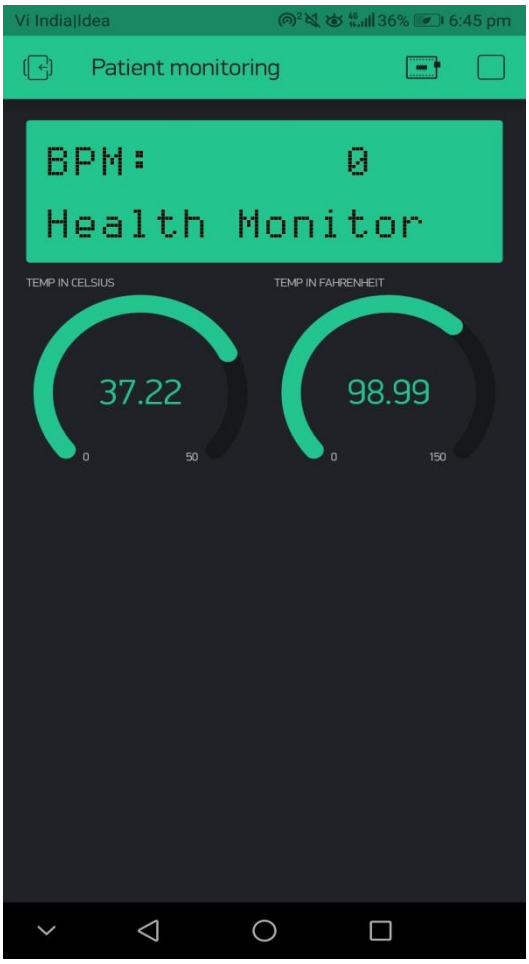


FIGURE 3.1 VALUES OF TEMPERATURE

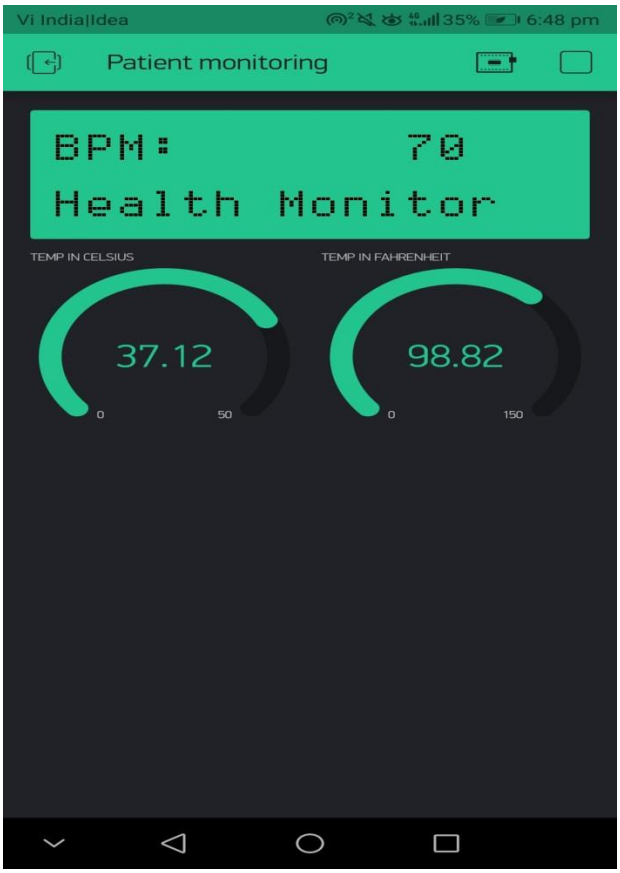


FIGURE 3.2 VALUES OF BPM AND TEMPERAUTURE

4. CHAPTER-IV: CONCLUSION & FUTURE SCOPE

4.1 CONCLUSION

IoT based HEALTH MONITORING SYSTEM for monitoring of health parameters like Pulse in beats per minute and body temperature has been proposed using Arduino and Cloud computing. The system has high accuracy and efficiency to fetch the values from the sensors.

The IoT based system will help the health professionals and relatives of the user to monitor the health of the user from the elder generation all the time with accuracy and efficiency.

4.2 FUTURE SCOPE

Future work would be focused more on increasing sensors on this system to fetch more data especially with regard to ECG and by also integrating big data analytics to enhance this Healthcare IoT Technology to full-fledged Healthcare Precision ready product to predict and detect heart diseases.

REFERENCE & SOURCES

1. https://www.researchgate.org
2. https://youtube.com
3. https://www.blynk.cc
4. https://www.ieeeexplore.org