A PROJECT REPORT

ON

PATIENT HEALTH MONITORING SYSTEM

Submitted by

VIDHI PITRODA (150410107084)

In partial fulfilment

Of

BACHELOR OF ENGINEERING

in

COMPUTER ENGINEERING

SARDAR VALLABHBHAI PATEL INSTITUTE OF TECHNOLOGY,

VASAD

Gujarat Technological University, Ahmedabad

SARDAR VALLABHBHAI PATEL INSTITUTE OF TECHNOLOGY, VASAD

COMPUTER ENGINEEERING DEPARTMENT

CERTIFICATE

Date: 13-04-2019

This is to certify that the project entitled "PATIENT HEALTH MONITORING SYSTEM" has been carried out by VIDHI PITRODA (150410107084), under my guidance in partial fulfillment of the project in Bachelor Of Engineering in Computer Engineering 8th semester of Gujarat Technological University, during the academic year 2018-2019.

Internal Guide	Head of Department
Mr. Vishal M. Shah	Dr. Neha Soni
Assistant Professor	CE Department
S.V.I.T Vasad	S.V.I.T Vasad

GUJARAT TECHNOLOGICAL UNIVERSITY

CERTIFICATE FOR COMPLETION OF ALL ACTIVITIES AT ONLINE PROJECT PORTAL

B.E. SEMESTER VIII, ACADEMIC YEAR 2018-2019

Date of certificate generation : 24 April 2019 (09:44:01)

This is to certify that, ***Pitroda Vidhi Rajesh*** (Enrolment Number - 150410107084) working on project entitled with ***Patient Health Monitoring System*** from ***Computer Engineering*** department of ***SARDAR VALLABHBHAI PATEL INSTITUTE OF TECHNOLOGY, VASAD*** had submitted following details at online project portal.

Periodic Progress Reports (PPR)	**Completed**
Business Model Canvas (Image)	**Completed**
Business Model Canvas (Report)	**Completed**
Patent Drafting Exercise (PDE)	**Completed**
Final Plagiarism Report	**Completed**
Final Project Report	**Completed**

Name of Student : Pitroda Vidhi Rajesh

Name of Guide : M r . S H A H V I S H A L MUKESHBHAI

Signature of Student : _____

*Signature of Guide : _____

Disclaimer :
This is a computer generated copy and does not indicate that your data has been evaluated. This is the receipt that GTU has received a copy of the data that you have uploaded and submitted as your project work.

*Guide has to sign the certificate, Only if all above activities has been Completed.

ACKNOWLEDGEMENT

I take this opportunity to express our profound sense of gratitude and respect to all those who helped us throughout the duration of this project.

Firstly, I am extremely grateful to Sardar Vallabhbhai Patel Institute of Technology, VASAD for providing me the excellent working environment to undergo my project.

I devote my success in this effort to my project guide **Mr. Vishal M. Shah** for giving me the opportunity to undertake the project and providing crucial feedbacks that influenced me and provide opportunity to undertake the project work in the esteemed concern.

I am also deeply thankful to **Dr. Neha R. Soni , Head of Department of SVIT** whose useful suggestions, gentle attitude and right directions helped me a lot to learn in this project and also for her constant encouragement and support throughout the project.

Also I am very thankful to all the faculty members of computer department for their kind help and great response towards the problem related to our project report.

My special thanks to **GUJARAT TECHNOLOGICAL UNIVERSITY** whose continuous encouragement, suggestions and constructiveness have been invaluable assets throughout my report analysis.

ABSTRACT

In IOT based monitoring project designed for keep on time track on the health status of the patient and updating to doctor at remote location anytime. With this effective device, health status of a critically ill patient can be constantly monitored. It can be used to keep track of health of aged people who frequently have heart or blood pressure issues. The IoT project developed here is built on Arduino UNO. It is interfaced with ESP8266 Wi-Fi modem to connect with an internet router and access the cloud server. The Arduino is interfaced with LM-35 temperature sensor to sense the body temperature and a pulse sensor to read pulse rate

It continuously monitors the pulse rate and body temperature and updates them to an IoT platform. If any abnormalities are detected then system immediately sends notification to doctor. The IoT platform used in this project is ThingSpeak. Thingspeak has capabilities for Visualizing the collected data in the form of charts, Ability to create apps for collaborating with web services or social network and other APIs.

The data from ThingSpeak to android application will send by HTTP request and HTTP response protocol. A threshold value is being set for pulse rate and body temperature. In android application there will be separate login credentials for patient and doctor. When the doctor will login, list of patients will be displayed along with two tags Patient Details and Health Status. In health status data from the Thingspeak will be fetched, doctor can check the medicine that the patient is consuming and can update is depending upon the health status. The patient can check the health status and medicine list and can also update details accordingly. Such a system consist of physiological data that stores, process and communicate through a local manner such as smart phones by using the system the health care professionals can monitor and advice their patient all the time.

INDEX

Chapter-1

Introduction

1. Introduction

The healthcare sector in the world is facing a number of challenges like increasing population, aging infrastructure, immense masses of rural population with limited access to high-quality medical care and a disproportionate number of medical staff when compared to the huge population. It is the need of the day to design new techniques to improve the healthcare systems in the world. Implementation of the health care system is an ongoing process which includes several stages. One of the ongoing processes includes smart health care system which is achieved by the internet to facilitate the common man with limited investment.

Modernized healthcare system or smart healthcare system has been implemented to solve these problems. Disease diagnosis, prevention, and patient monitoring are easy by using the smart healthcare system. This project includes several phases which if implemented in write way can solve the heath care problems. Internet of Things platform offers a promising technology to achieve the healthcare services, and can further improve the medical service systems This project includes several phases which if implemented in write way can solve the heath care problems

The techniques described enable a medical professional to monitor a person's health in their normal course of life, such as prior to each meal, during exercising, while at the office, and so forth. These techniques also enable monitoring that is tailored by a medical professional to that particular person to better understand a suspected problem or a known condition. By so doing, the medical professional is enabled to monitor a person over various times and situations, which adds detail and robustness to the data collected. The techniques permit alert notification and recommendation, thereby enabling the health professional to gain the desired information quickly and easily without requiring the patient or the health professional to wait for an in-person visit.

2. Existing System

Health assessments are usually performed at a hospital or medical practitioner's office.. Currently, our vital statistics like heart rate, temperature, blood pressure are taken onto various machines. The nurses would convert these signals into comprehensible format and the doctors would study them. Later these were monitored daily or at regular intervals and doctors would review them and give there diagnosis. This has been a traditional process, but being always on the move and working a hectic schedule does not give everyone a lot of options as far as taking appointments with doctors is concerned. Health monitoring at a hospital or office, however, cannot monitor a person during their normal course of life. This can be a serious limitation because a snapshot captured at a hospital or office may not accurately reflect the person's health. This can be due to the testing being of a short duration, infrequent, or due to the testing being in an artificial environment

3. Need for the new System

Health is one of the global challenges of humanity. Healthy individual leads the life happily and securely. The modernized healthcare system is a prerequisite to keeping individuals healthy. The current healthcare system facing many problems.

- The healthcare professionals and staff must be on a site of the patient all the time.
- The patient remains admitted in a hospital, wired to bedside biomedical instruments, for a period of time.
- People have busy schedule and they hardly get time to wait for a long appointment hours and then get to meet doctor for their regular visit.
- Physician and nurse shortages.

- Protecting the devices that Protect Public Health
- Lack of electronic health records interoperability
- Health monitoring at a hospital or office, however, cannot monitor a person during their normal course of life.. This can be due to the testing being of a short duration, infrequent, or due to the testing being in an artificial environment.

4. Objective of the New System

The main objective of this system is to keep on time track on the health status of the patient and updating to doctor at remote location anytime. With this effective device, health status of a critically ill patient can be constantly monitored. It can be used to keep track of health of aged people who frequently have heart or blood pressure issues. patient monitoring is easy by using the smart healthcare system. This project includes several phases which if implemented in write way can solve the heath care problems. Internet of Things platform offers a promising technology to achieve the healthcare services, and can further improve the medical service systems This project includes several phases which if implemented in write way can solve the heath care problems it can also be used to identify health problems. The patterns of heart rate, pulse, body temperature and blood pressure can be monitored and diagnosed for anomalies. The information can be sent to the doctor and patient, both can check data via android application along with that android application offers various functionalities to keep track on health status. This system will be very useful to senior citizens and disabled people who live independently.

1.5 Advantages and Limitations of the Proposed System

IoT has numerous applications in the medical industry as well, appearing everywhere from patient devices all the way up to supply chain management for equipment and pharmaceuticals. IoT has the potential to change the medical industry from the ground up, though time has not yet determined if that change is going to be a positive or negative one.

Advantages:

- Higher patient engagement.

The IoT makes it easier for patients to play an active role in their healthcare journey. Not only are the devices evolving to better meet the needs of remote monitoring (smaller form factors, lighter weight, etc.), but the way patients access data is changing as well. Patients can now use apps and software to access their own health data and see their progress and the impact of the healthcare program on their well-being.

- Better patient outcomes.

  With the IoT, caregivers have access to real-time patient information that enables them to make informed decisions and therefore deliver better outcomes. When a healthcare provider can make diagnosis based on evidence — in real time — everyone wins. The bonus: Patients that can be monitored remotely can avoid doctors' visits, hospital stays and re-admissions.

- A decrease in errors.

  When data is collected and transmitted automatically via automated workflows, error rates drop compared with manual collection and reporting.

- An enhanced patient experience.

  Healthcare is all about the patient, so the needs of the patient should always come first. The IoT helps improve that experience by providing timely intervention and diagnosis, improved accuracy, proactive treatments, and better treatment outcomes.

- Automation and Control

Due to physical objects getting connected and controlled digitally and centrally with wireless infrastructure, there is a large amount of automation and control in the workings.

Without human intervention, the machines are able to communicate with each other leading to faster and timely output.

- Time

The amount of time saved because of IoT could be quite large. And in today's modern life, we all could use more time. Patient will no longer have to wait for long time for appointment.

- Money

The biggest advantage of IoT is saving money. IoT fundamentally proves to be very helpful to people in their daily routines by making the appliances communicate to each other in an effective manner thereby saving and conserving energy and cost. Allowing the data to be communicated and shared between devices and then translating it into our required way, it makes our systems efficient.

- Automation of daily tasks leads to better monitoring of devices

The IoT allows you to automate and control the tasks that are done on a daily basis, avoiding human intervention. Machine-to-machine communication helps to maintain transparency in the processes. It also leads to uniformity in the tasks. It can also maintain the quality of service. We can also take necessary action in case of emergencies.

- Efficient and Saves Time

The machine-to-machine interaction provides better efficiency, hence; accurate results can be obtained fast. This results in saving valuable time. Instead of repeating the same tasks every day, it enables people to do other creative jobs.

Limitations:

- Compatibility

As devices from different manufacturers will be interconnected, the issue of compatibility in tagging and monitoring crops up. Although this disadvantage may drop off if all the manufacturers agree to a common standard, even after that, technical issues will persist.Compatibility issues may result in people buying appliances from a certain manufacturer, leading to its monopoly in the market.

- Complexity

The IoT is a diverse and complex network. Any failure or bugs in the software or hardware will have serious consequences. Even power failure can cause a lot of inconvenience.

- Lesser Employment of Menial Staff

The workers and helpers may end up losing their jobs in the effect of automation of daily activities. This can lead to unemployment issues in the society. This is a problem with the advent of any technology and can be overcome with education. With daily activities getting automated, naturally, there will be fewer requirements of human resources, primarily, workers and less educated staff. This may create Unemployment issue in the society.

- Technology Takes Control of Life

Our lives will be increasingly controlled by technology, and will be dependent on it. The younger generation is already addicted to technology for every little thing. We have to decide how much of our daily lives are we willing to mechanize and be controlled by technology.

- Privacy/Security:

With all of this IoT data being transmitted, the risk of losing privacy increases.

Chapter-2

Requirement Gathering and Analysis

2.1 Functional Requirement

A functional requirement document defines the functionality of a system or one of its subsystems. It also depends upon the type of software, expected users and the type of system where the software is used.

Medical Electronics is also going to advance with the application of Internet of Things. Internet of Things is the fastest growing technology. IoT is about to find application everywhere and in everything. In this project, a simple patient health monitoring device is developed as an IoT application. This IoT device could read pulse rate and measure surrounding temperature. It continuously monitors the pulse rate and surrounding temperature and updates them to an IoT platform. The IoT platform used in this project is ThingSpeak

.

- To begin with the main hardware component is Arduino to which sensors are attached they will take generate digital data from temperature and pulse sensor from person's body.
- WiFi Module Esp8266 is attached to direct data to Thingspeak. It is an IOT interface which collect and manages sensors data

Furthermore data is then received to Android application. This application contains several features.

- The application will have separate login credentials for doctor and patients.
- Application will have high level of error correction and input validation
- Unique patient ID must be generated for each patient
- Previous history of patient can be viewed
- Patient can retrieve, update personal information
- Application must operate 24 hours a day without any interruption
- Application must contain full and complete record for each patient

2.2 Non Functional Requirement

Non-functional requirements describe how the system works, while functional requirements describe what the system should do. In systems engineering and requirements engineering, a non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. Non-functional requirements are often called "quality attributes" of a system. The non functional requirements for the system are as follows:

- Authorized access to user is provided as a patient, doctor or System Administrator
- More than three attempts at login and failure will produce a red flag to system administrator.
- Input errors will be returned in red with appropriate message box.

- The software interface must follow design conventions which allow for familiar location of drop down menus, help etc.
- User satisfaction is ensured by providing quick computing, and importing and exporting data.
- User is allowed to change the password and notified when he attempts to change his password.
- The application should require minimal maintenance.
- The application should be easy to use/user friendly.
- The application response should be quick.

2.3 Hardware Requirement

- Arduino Uno
- LM-35 Temperature Sensor
- Pulse sensor
- Jumping wires
- BreadBoard
- Resistors
- Esp8266-01 Wifi-Module

2.4 Software Requirement

- Arduino IDE

- Android Studio
- Thingspeak

2.5 Technical Feasibility Study

The proposed system consists of three phases:

- Data acquisition phase for monitoring and transferring the patient data.
- Data transfer for transmitting the signals between the sensors and Thingspeak
- Data access for accessing and monitoring the patient data.

The healthcare domain presents opportunities for a significant number of applications of wireless sensor technology.

Functions of a smart system include sensing, actuation and controlling. In the healthcare sector, smart systems technology leads to Disease diagnosis, prevention, and patient monitoring is easy. It provides quality of service and reduces the cost of the public healthcare system. The system uses biosensors like Temperature, blood pressure, pulse sensor. Whenever the patient comes to the hospital premises, sensors sense the physiological signals and these signals are converted to electrical signals.Then analog electrical signal is converted to digital signal (digital data) which is stored in Thingspeak. The doctor receives data in android phone and checks whether it is normal or not and then sends prescription to patient.

2.6 Economic Feasibility Study:

For any system if the expected benefits equal or exceed the expected costs, the system can be judged to be economically feasible. In economic feasibility, cost benefit analysis is done in which expected costs and benefits are evaluated. This study evaluates the money aspects of the project by performing arts a price profit analysis and addressing each tangible (real) or intangible advantages of the system. Economic or money practicability considers the estimated price of hardware. The proposed system is economical as the total cost of hardware is 1200 INR

2.7 Timeline Chart

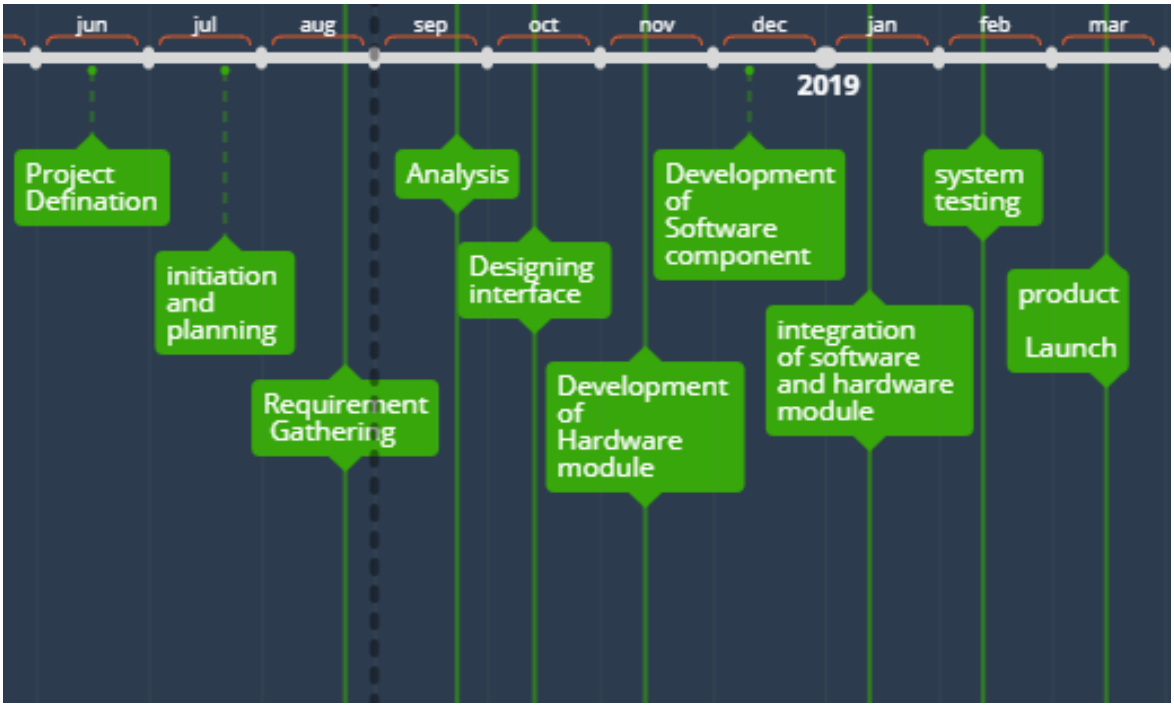


Fig 2.7 Timeline Chart

Chapter-3

System Design

3.1 Block Diagram

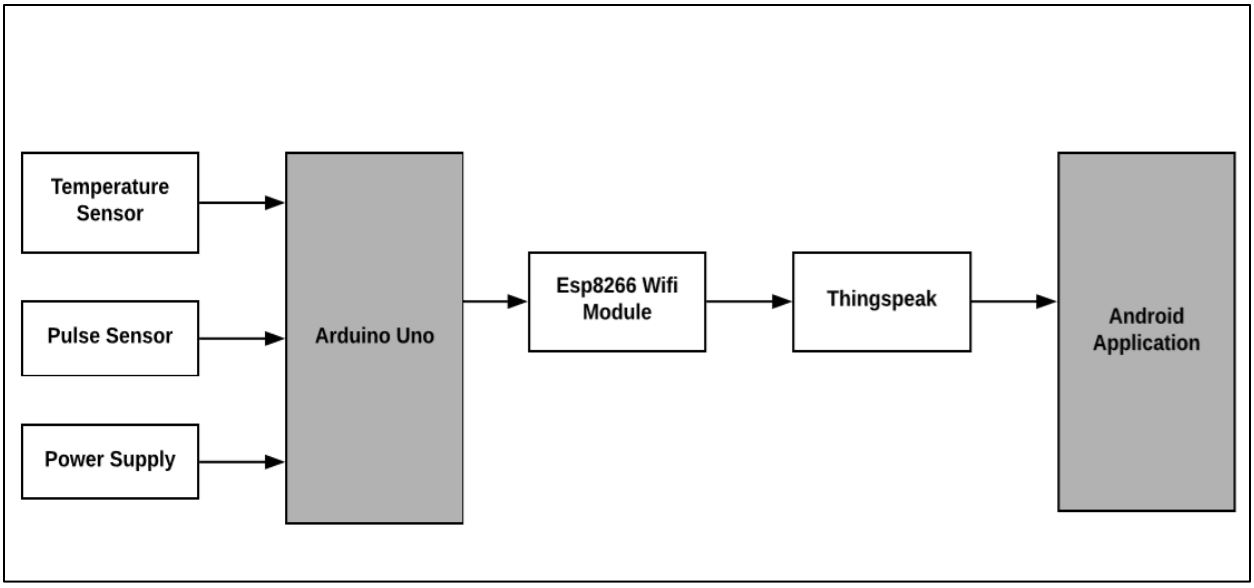


Fig 3.1 Block Diagram

This block diagram explains that when power will be supplied to Arduino Uno, it will receive data from pulse sensor and temperature sensor in Analog form. Then after this data will be converted into digital form and then it will be transmitted to Thingspeak server through Esp8266 wifi module. Data will be analysed on Thingspeak and then those data will be transferred to Android application via protocols.

3.2 Circuit Diagram

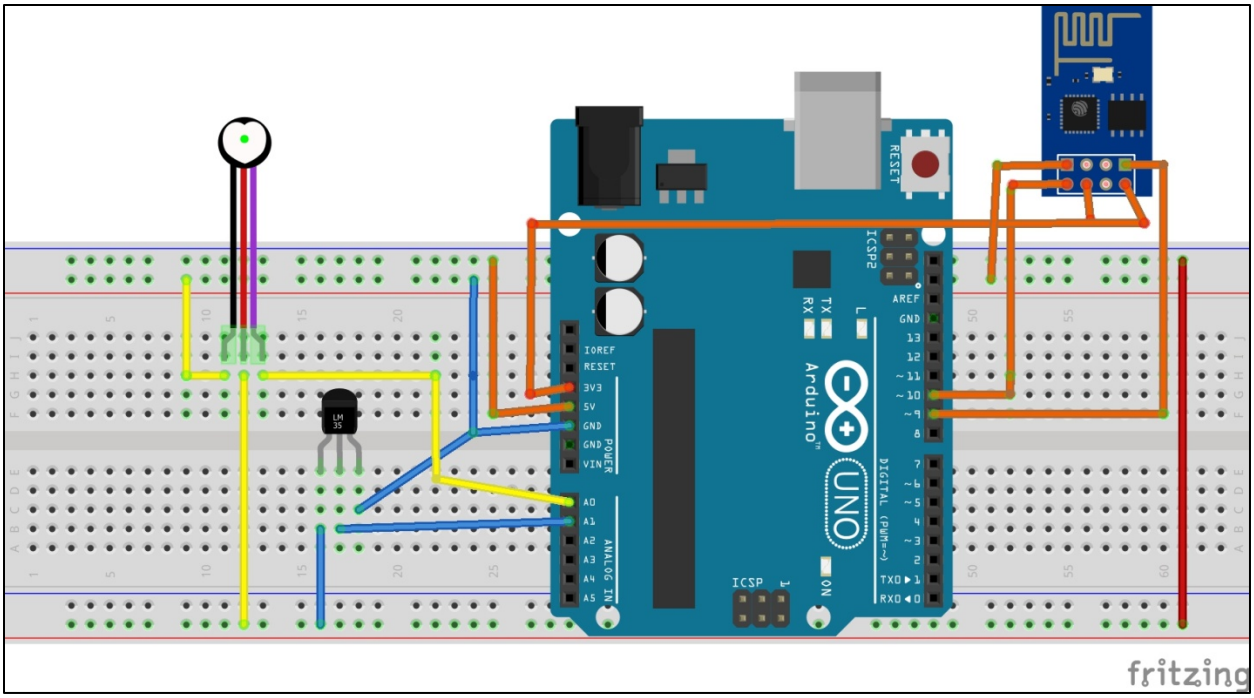


Fig 3.2 Circuit Diagram

Below are the connections:

- Signal pin of pulse sensor -> A0 of arduino
- Vcc pin of pulse sensor -> 5V of arduino
- GND pin of pulse sensor -> GND of arduino
- Vout of LM35 -> A1 of Arduino
- Tx of ESP8266 -> pin 10 of arduino
- Rx of ESP8266 -> pin 11 of arduino
- CH_PD and Vcc of ESP8266 -> 3.3 V of arduino
- GND of ESP8266 -> GND of arduino

3.3 Use Case

Use Case Diagram for Doctor represents how doctor will interact with the system

Fig 4.3.1 Use case of Doctor

Use case diagram for patient represents how patients will interact with the system

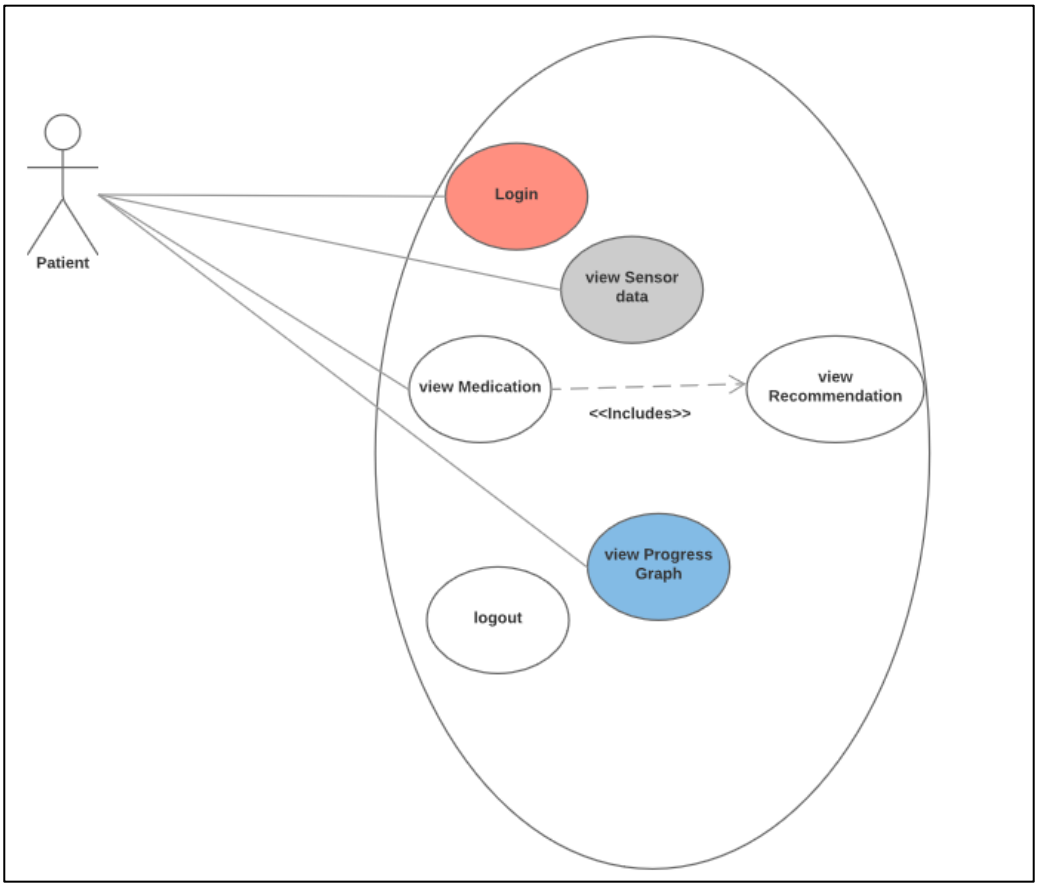


Fig 4.3.2 Use case of patient

3.4 Activity Diagram

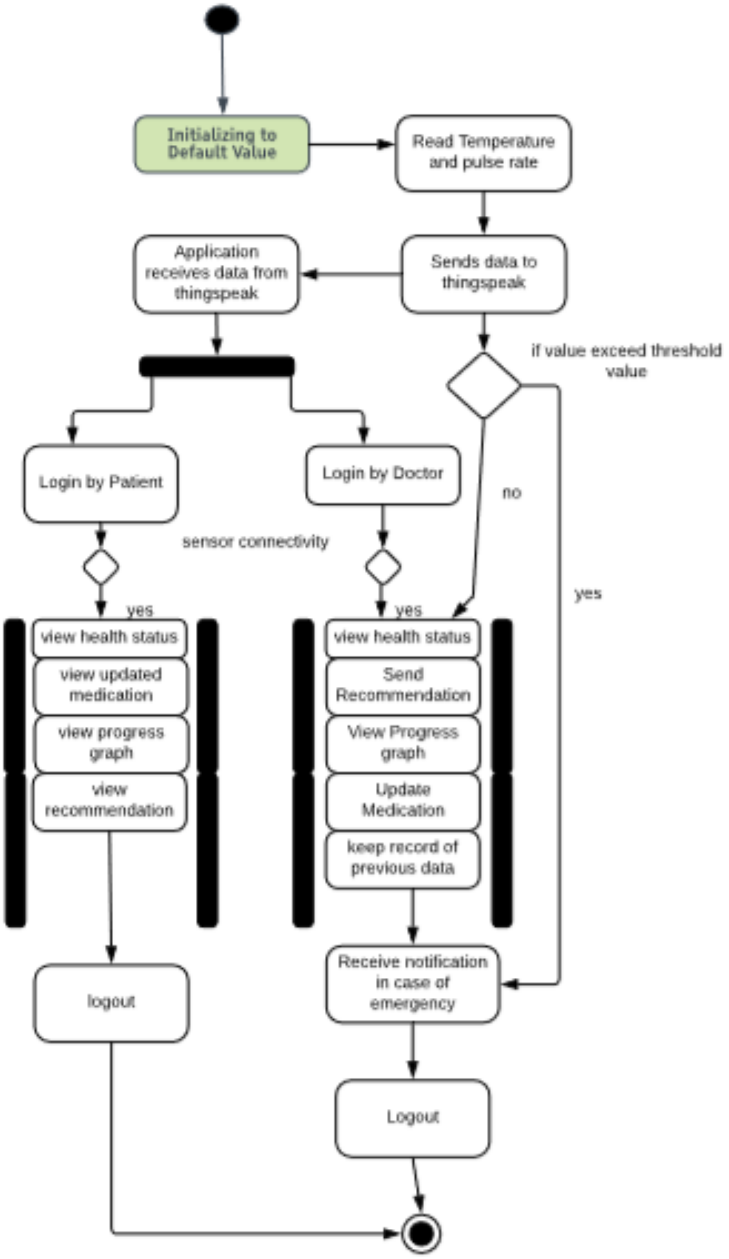


Fig 4.4 Activity Diagram

Chapter - 4

System Description

4.1 Software Description

4.1.1 ThingSpeak

ThingSpeak has APIs for collecting data produced by sensors and APIs for reading that data from applications. Think of an IoT project as two parts. One part of the project is where you need to program a thing to send data. The ThingSpeak API allows to build "Internet of Things" applications. Use the API to create cloud applications that interact with sensors and controls from anything that supports the HTTP protocol. The ThingSpeak API is able to interface with devices from Arduino and ioBridge, iPhone and Android mobile devices, home automation systems, robots, thermostats, industrial controls, etc. ThingSpeak also supports integration with external web services such as Twitter, Prowl, Twilio, and WeatherBug, and Foursquare, by using the ThingHTTP app. In addition to the free hosted API, the ThingSpeak API is open source and available on GitHub for download on private servers.

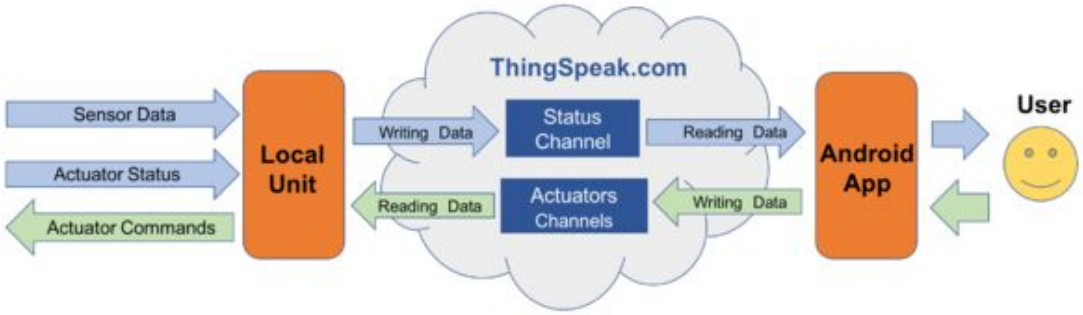


Fig 4.1.1.1

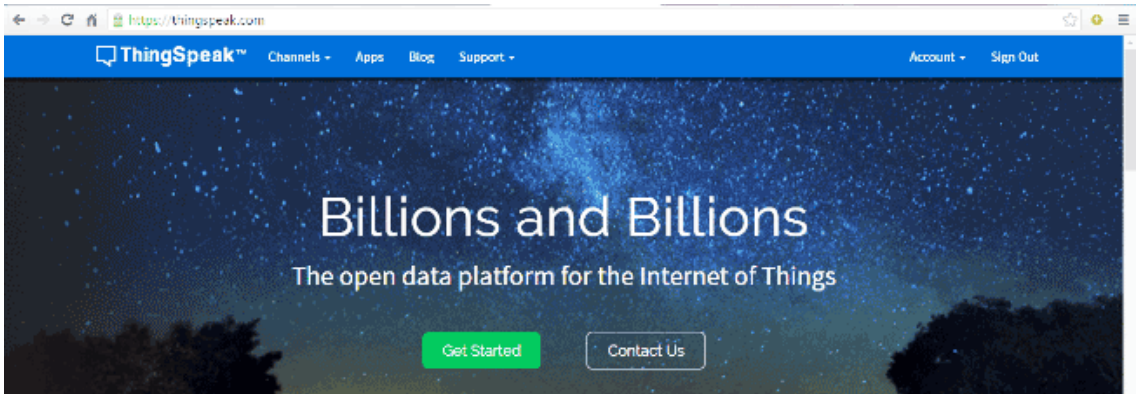


Fig 4.1.1.2 ThingSpeak

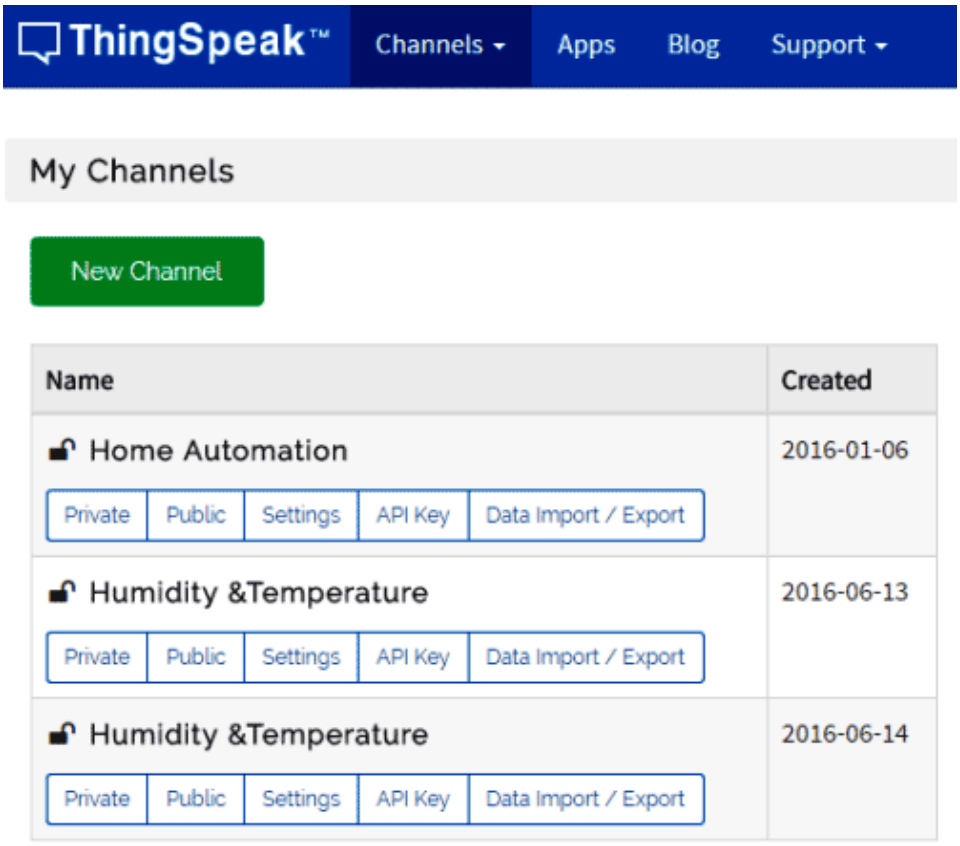


Fig 4.1.1.3 ThingSpeak

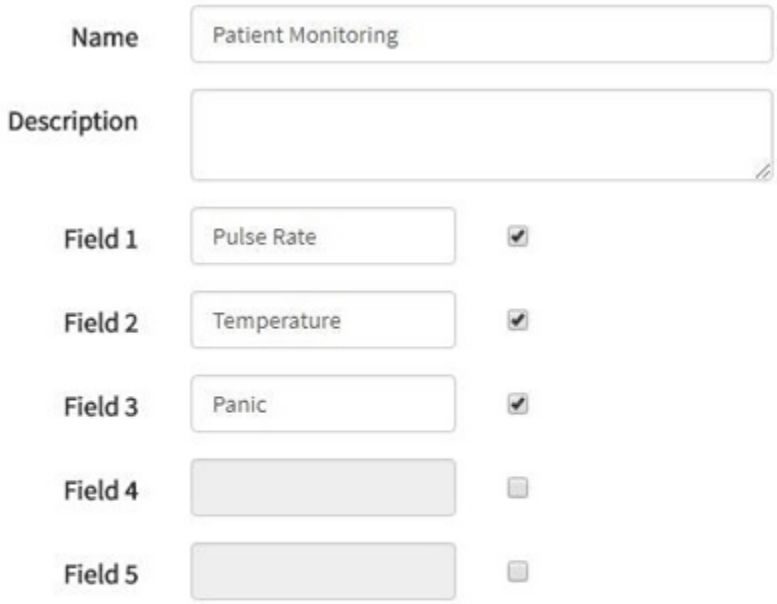


Fig 4.1.1.4 ThingSpeak

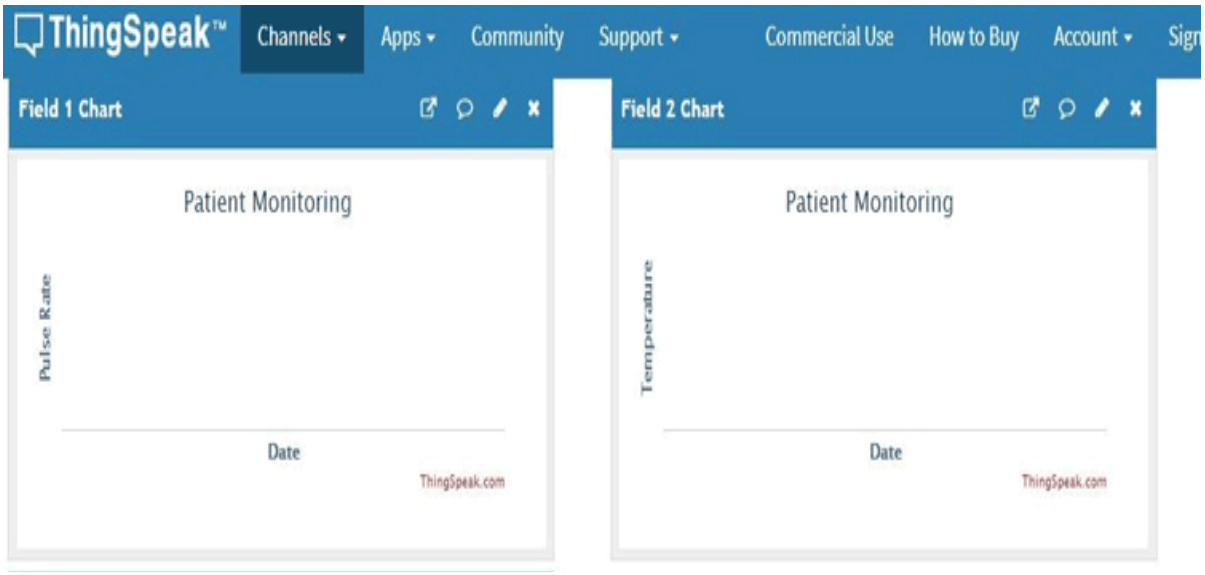


Fig 4.1.1.5 ThingSpeak

4.1.2 Android Studio

Android is a mobile operating system developed by Google, based on a modified version of the Linux kernel and other open source software and designed primarily for touchscreen mobile devices such as smartphones and tablets.

The following features are provided in the current stable version

- Gradle-based build support
- Android-specific refactoring and quick fixes
- Lint tools to catch performance, usability, version compatibility and other problems
- ProGuard integration and app-signing capabilities
- Template-based wizards to create common Android designs and components
- A rich layout editor that allows users to drag-and-drop UI components, option to preview layouts on multiple screen configurations
- Support for building Android Wear apps
- Built-in support for Google Cloud Platform, enabling integration with Firebase Cloud Messaging (Earlier 'Google Cloud Messaging') and Google App Engine
- Android Virtual Device (Emulator) to run and debug apps in the Android studio.

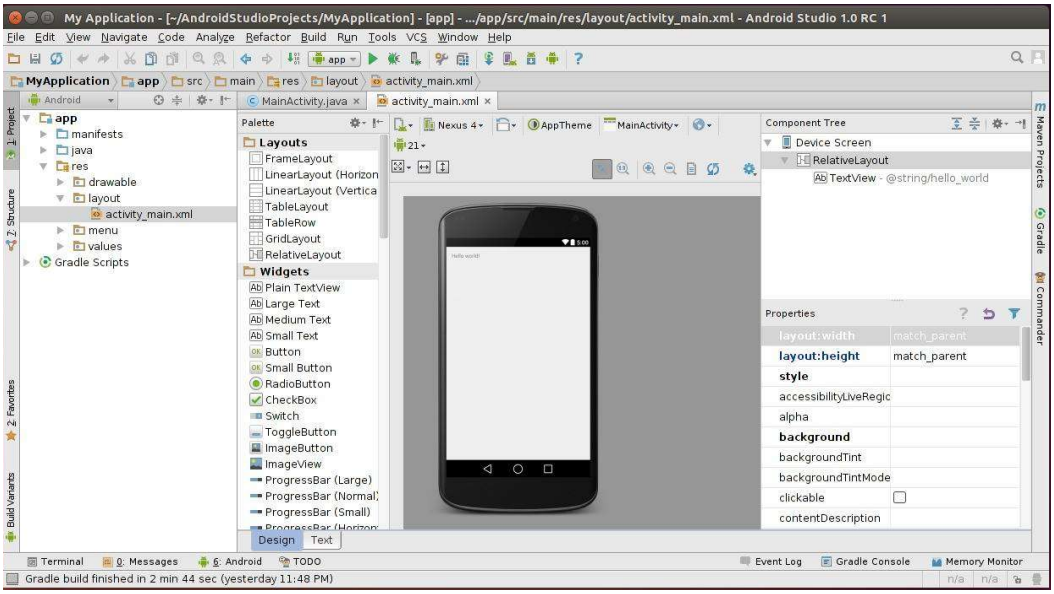


Fig 4.1.2 Android Studio

4.1.3 Arduino IDE

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The top menu bar has the standard options, including “File” (new, load save, etc.), “Edit” (font, copy, paste, etc.), “Sketch” (for compiling and programming), “Tools” (useful options for testing projects), and “Help”. The middle section of the IDE is a simple text editor that where you can enter the program code. The bottom section of the IDE is dedicated to an output window that is used to see the status of the compilation, how much memory has been used, any errors that were found in the program, and various other useful messages.

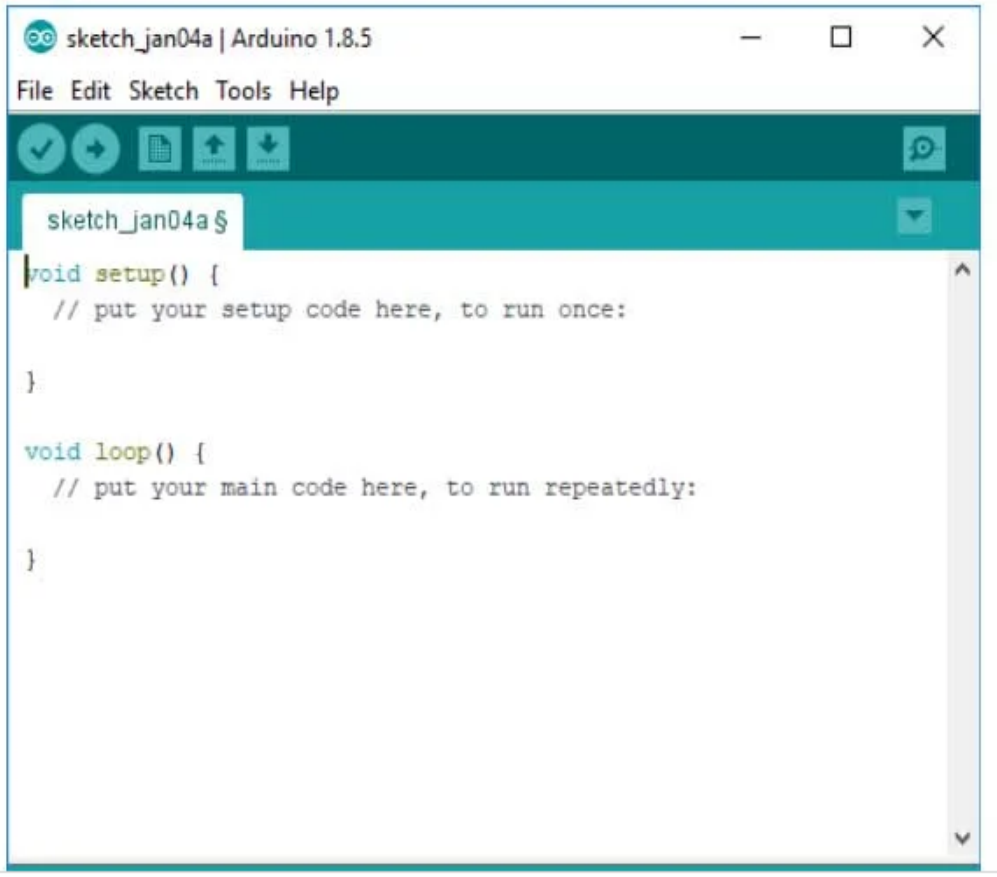


Fig 4.1.3 Arduino IDE

4.2 Hardware Description

4.2.1 Arduino Uno

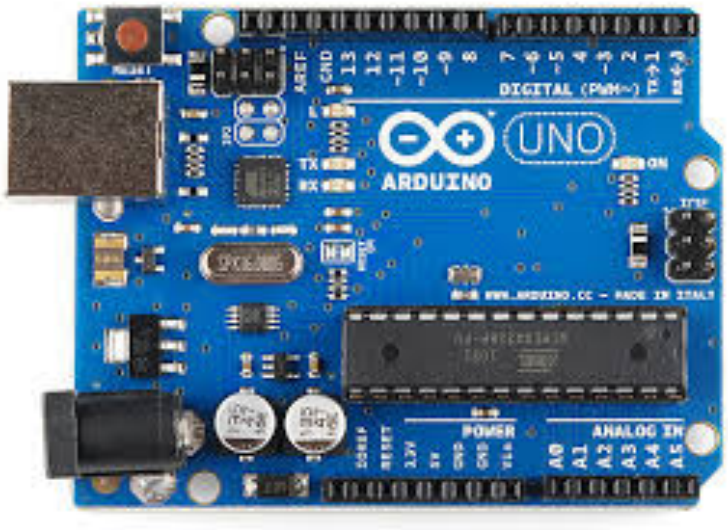


Fig. 4.2.1 Arduino Uno

The Arduino UNO is ATmega328 based microcontroller board. It is one of the most popular prototyping boards. The board comes with built-in arduino boot loader. It has 14 GPIO pins, 6 PWM pins, 6 Analog inputs and on board UART, SPI and TWI interfaces, an on-board resonator, a reset button, and holes for mounting pin headers. While programming the board, it can be connected to the PC using USB port and the board can runs on USB power. The Arduino UNO has 32 Kb Flash memory, 1 Kb EEPROM and 2 Kb SRAM. The board can be connected to different Arduino Shields for connectivity with Ethernet, Bluetooth, Wi-Fi, Zigbee or Cellular network and it can be connected to most of the IoT platforms**.**

Pin Description

Pin Category	Pin Name	Details

Power	Vin, 3.3V, 5V, GND	Vin: Input voltage to Arduino when using an external power source. 5V: Regulated power supply used to power microcontroller and other components on the board. 3.3V: 3.3V supply generated by on-board voltage regulator. Maximum current draw is 50mA. GND: ground pins.
Reset	Reset	Resets the microcontroller.
Analog Pins	A0 – A5	Used to provide analog input in the range of 0-5V
Input/Output Pins	Digital Pins 0 – 13	Can be used as input or output pins.
Serial	0(Rx), 1(Tx)	Used to receive and transmit TTL serial data.
External Interrupts	2, 3	To trigger an interrupt.
PWM	3, 5, 6, 9, 11	Provides 8-bit PWM output.
SPI	10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK)	Used for SPI communication.
Inbuilt LED	13	To turn on the inbuilt LED.
TWI	A4 (SDA), A5 (SCA)	Used for TWI communication.
AREF	AREF	To provide reference voltage for input voltage.

Arduino Uno Technical Specifications

Microcontroller	ATmega328P – 8 bit AVR family microcontroller
Operating Voltage	5V
Recommended Input Voltage	7-12V
Input Voltage Limits	6-20V
Analog Input Pins	6 (A0 – A5)
Digital I/O Pins	14 (Out of which 6 provide PWM output)
DC Current on I/O Pins	40 mA
DC Current on 3.3V Pin	50 mA
Flash Memory	32 KB (0.5 KB is used for Bootloader)
SRAM	2 KB
EEPROM	1 KB
Frequency (Clock Speed)	16 MHz

4.2.2 Temperature Sensor

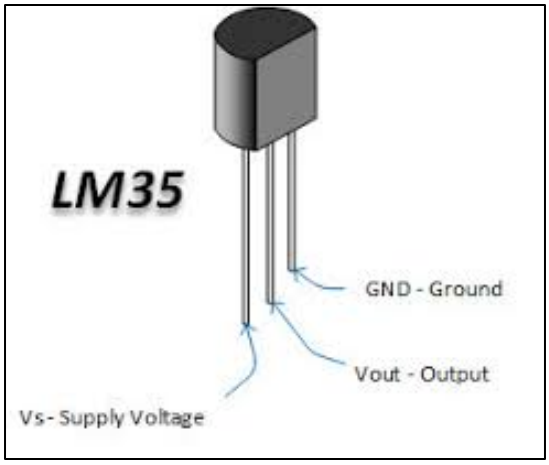


Fig 4.2.2 LM-35

LM-35 is a precision IC temperature sensor with its output proportional to the temperature (in oF). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM-35, temperature can be measured more. LM35 is an analog temperature sensor. This means the output of LM35 is an analog signal. Microcontrollers dont accept analog signals as their input directly. We need to convert this analog output signal to digital before we can feed it to a microcontroller's input. For this purpose, we can use an ADC(Analog to Digital Converter). But modern day boards like Arduino and most modern day micro controllers come with inbuilt ADC. Arduino uno has an in built 10 bit ADC (6 channel). We can make use of this in built ADC of arduino to convert the analog output of LM35 to digital output. Since Arduino uno has a 6 channel inbuilt ADC, there are 6 analog input pins numbered from A0 to A5. Connect analog out of LM35 to any of these analog input pins of arduino.

4.2.3 Pulse Sensor

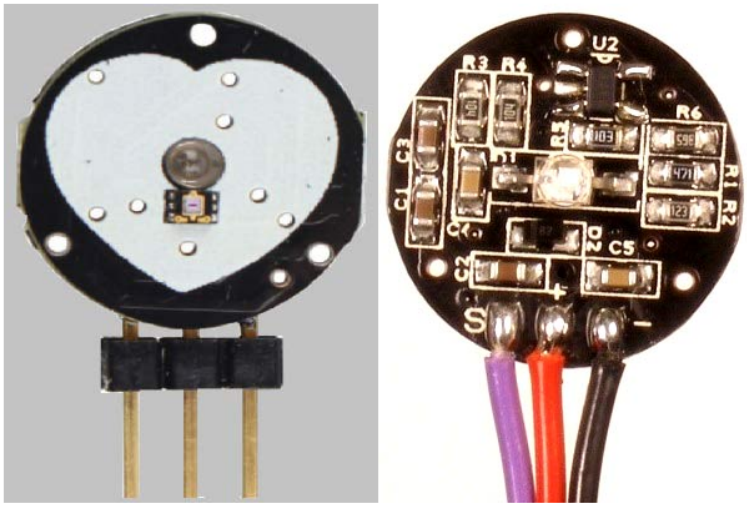


Fig 4.2.3 pulse sensor

The Pulse Sensor Amped is a plug-and-play heart-rate sensor for microcontrollers like PIC, AVR, Arduino etc. It can be used to easily incorporate live heart-rate data into a project. It essentially combines a simple optical heart rate sensor with amplification and noise cancellation circuitry making it fast and easy to get reliable pulse readings. It simply needs to be clipped to earlobe or finger tip and plug into 3.3 V or 5 V supply from Arduino or battery. The pulse sensor module has three terminals - VCC, Ground and Out. The output pin of the pulse sensor module is connected to analog pin A0 of the Arduino. The VCC is connected to 5V DC output of Arduino and Ground is connected to the common ground. The front of the sensor is the covered with the Heart shape logo. This is the side that makes contact with the skin. On the front you see a small round hole, which is where the LED shines through from the back, and there is also a little square just under the LED. The square is an ambient light sensor, exactly like the one used in cellphones, tablets, and laptops, to adjust the screen brightness in different light conditions. The LED shines light into the fingertip or earlobe, or other capillary tissue, and sensor reads the amount of light that bounces back. That's how it calculates the heart rate. The other side of the sensor is where the rest of the parts are mounted.

4.2.4 ESP8266-01 Wi-Fi Module

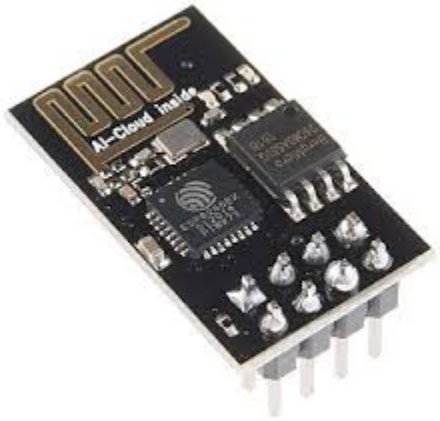


Fig 4.2.4 ESP8266-01

The ESP8266 Wi-Fi Module is used to connect the Arduino board with a Wi-Fi router, so that it can access the cloud. It is a self contained SOC with integrated TCP/IP protocol stack that can access to a Wi-Fi network. The ESP8266 is capable of either hosting an application or off loading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware. The module comes available in two models - ESP-01 and ESP-12. ESP-12 has 16 pins available for interfacing while ESP-01 has only 8 pins available for use.

The ESP-01 model is used in the project. The ESP-01 model has the following pin configuration

Pin Number	Pin Name	Pin Function
1	Ground	Ground
2	GPIO1	General purpose IO, Serial Tx1
3	GPIO2	General purpose IO
4	CH_PD	Active High Chip Enable
5	GPIO0	General purpose IO, Launch Serial Programming Mode if Low while Reset or Power ON
6	RESET	Active Low External Reset Signal
7	GPIO3	General purpose IO, Serial Rx
8	VCC	Power Supply

4.2.5 Breadboard

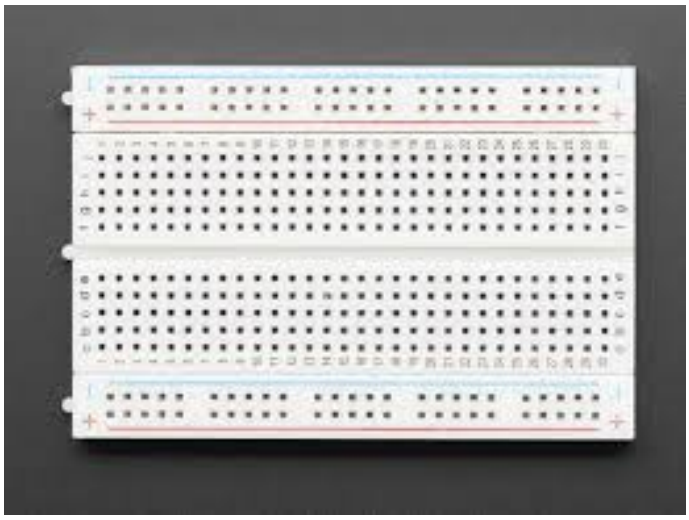


Fig 4.2.5 Breadboard

A breadboard is a solderless device for temporary prototype with electronics and test circuit designs. Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate.

4.2.6 Resistors

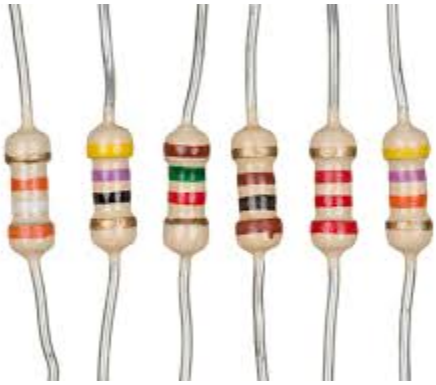


Fig 4.2.6 Resistors

A resistor is an electrical component that limits or regulates the flow of electrical current in an electronic circuit. Resistors can also be used to provide a specific voltage for an active device such as a transistor. A resistor is a passive two-terminal electrical component that implements

electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines

4.2.7 Jumper Wires

Fig 4.2.7 Jumper wires

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.

Chapter-5

Canvas

5.1 AEIOU CANVAS

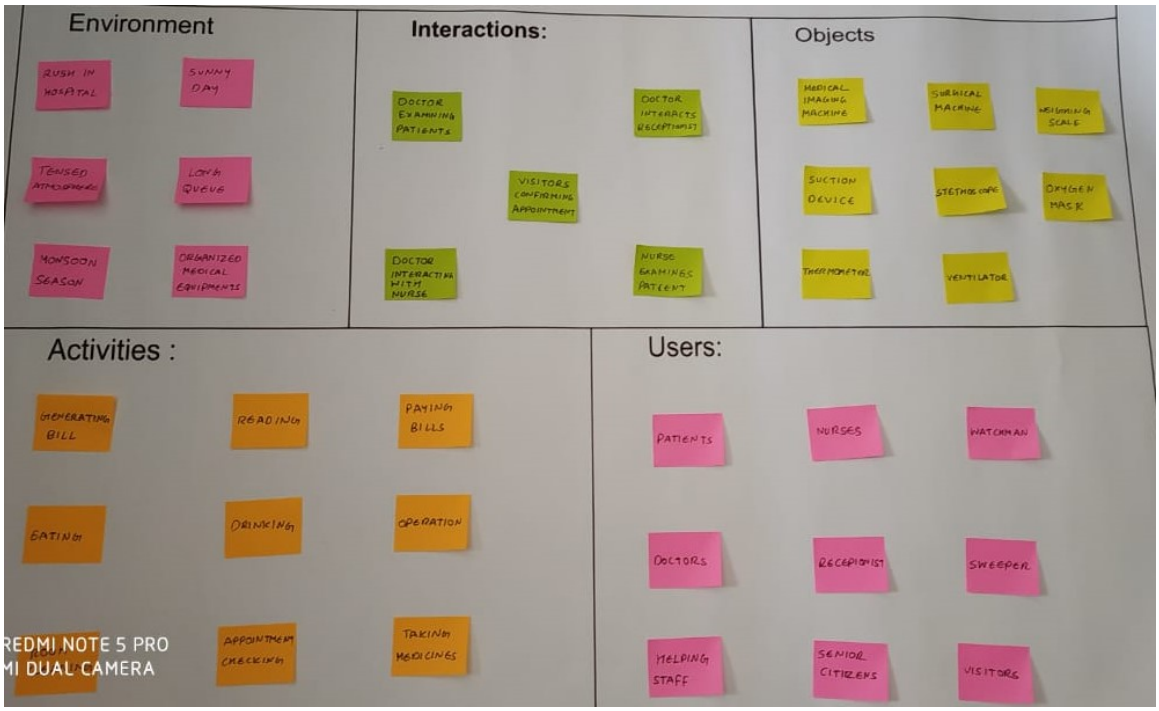


Fig 5.1 AEIOU Canvas

Environment: Rush in hospital, long queue, tensed atmosphere, sunny day,

organized equipments, monsoon season

Interaction: Doctor Examining patients, Doctor interacting with nurse,

visitors confirming appointments, nurse examines patients.

Objects: Thermometer, ventilator, Suction device,

surgerical equipments, sthethescope

Activities: Generating bills, eating, reading, drinking, operation, appointment checking

Users: patients , nurse, watchman, helping staff, senior citizens,civilians

5.2 Empathy Canvas

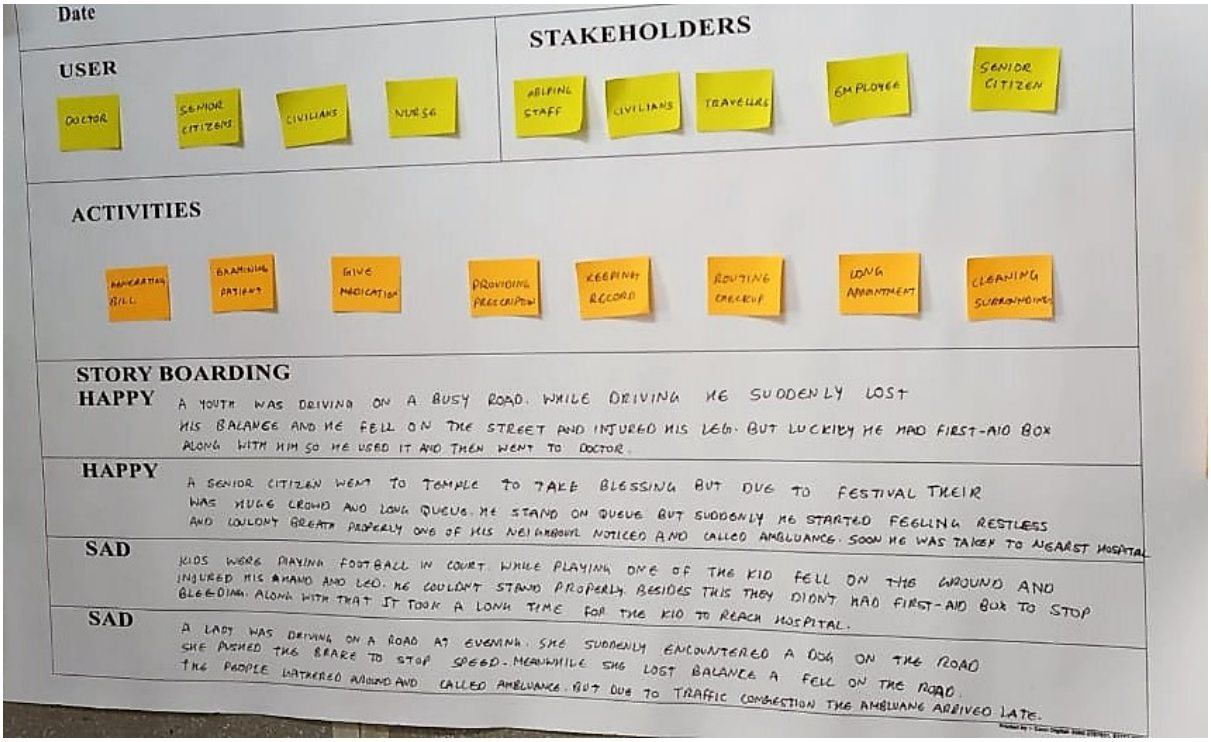


Fig 5.2 Empathy Canvas

Users: Doctors, civilians, travelers, senior citizens

Stakeholders: employee, senior citizen, helping staff, civilians

Activities: Regular checkup, long appointments, cleaning surrounding

Examining patients, generating bills, keeping record

5.3 Ideation Canvas

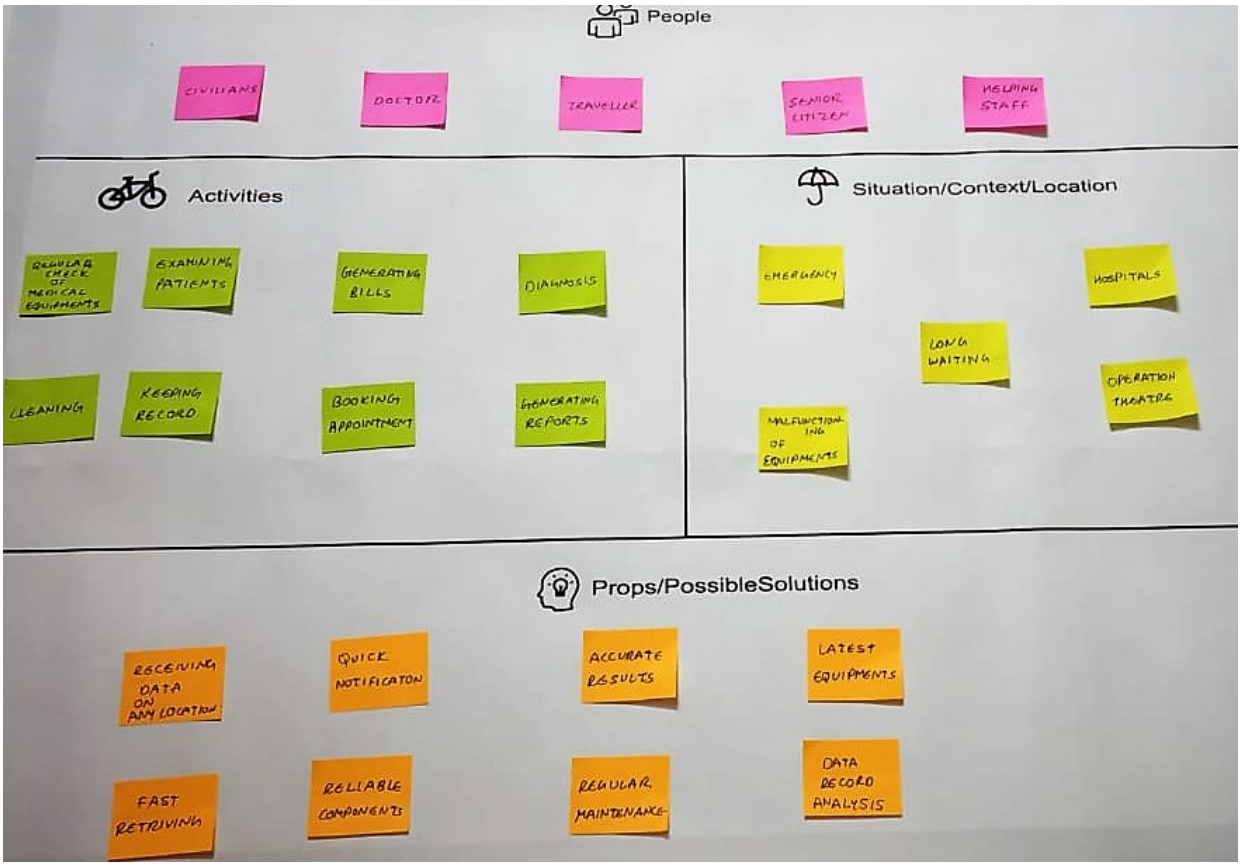


Fig -5.3 Ideation Canvas

Situation/Context/ Location: Malfunctioning in equipments, emergency, operation Theatre, hospitals, long waits.

Possible solutions: Accurate results, latest equipments, fast retrieving, reliable Components, data records, regular maintenance

People: civilians, senior citizens, nurse, doctors, traveler

Activities: booking appointment, generating reports, diagnosis, cleaning, keep on time Track on patients

5.4 Product Development Canvas

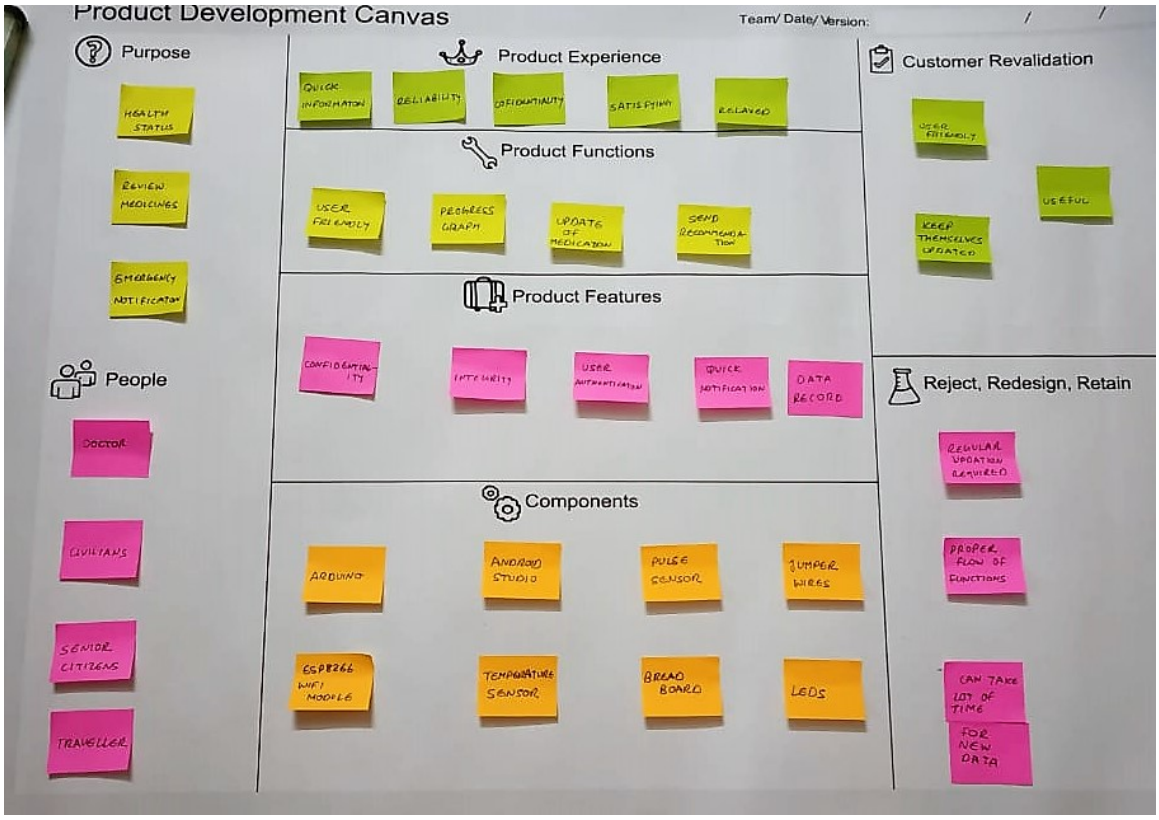


Fig 5.4 Product Development Canvas

Product Experience: happy, satisfied, user friendly, quick information

Product Function: quick notification, easy access, progress graph, recommendations

Product Features: data record, integrity , confidentiality, quick access

Components: Arduino, temperature sensor, pulse sensor, jumper wires,

Breadboard, android, Esp8266, registers

Customer Revalidation: user friendly, informative, keep themselves updated

Reject Redesign Retain: Regular update, Proper flow of functions,

Strong network connection

Chapter-6

System Implementation

As per the circuit diagram connection was made

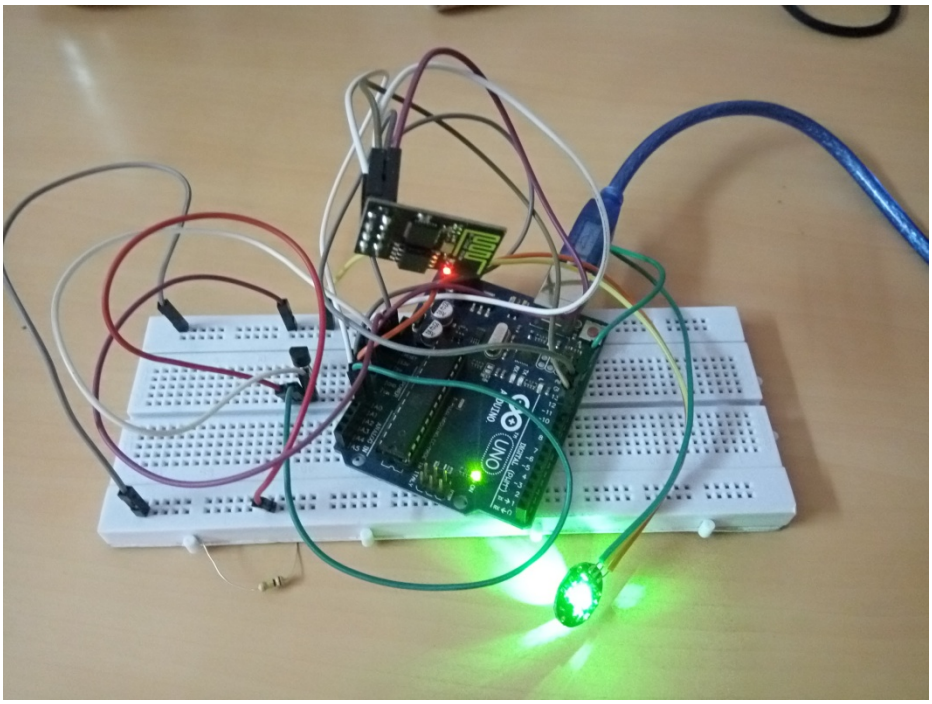


Fig 6.1: Circuit

The circuit is connected to laptop via usb cable and 5 voltage is applied to Arduino. The pulse sensor and ESP8266 module gets power supply of 3.3 volt while the temperature sensor gets power supply of 5 volt. After uploading the code the serial monitor output can be observed.

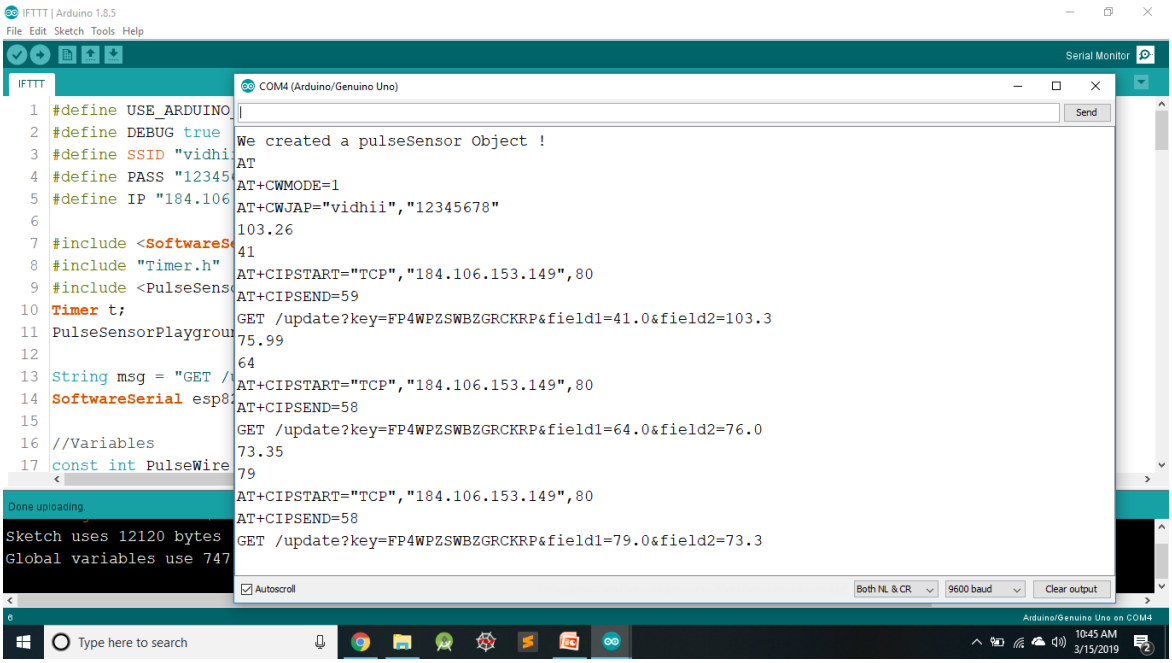


Fig 6.2: Serial Monitor

The sensor data observed on Thingspeak server can be can be observed.

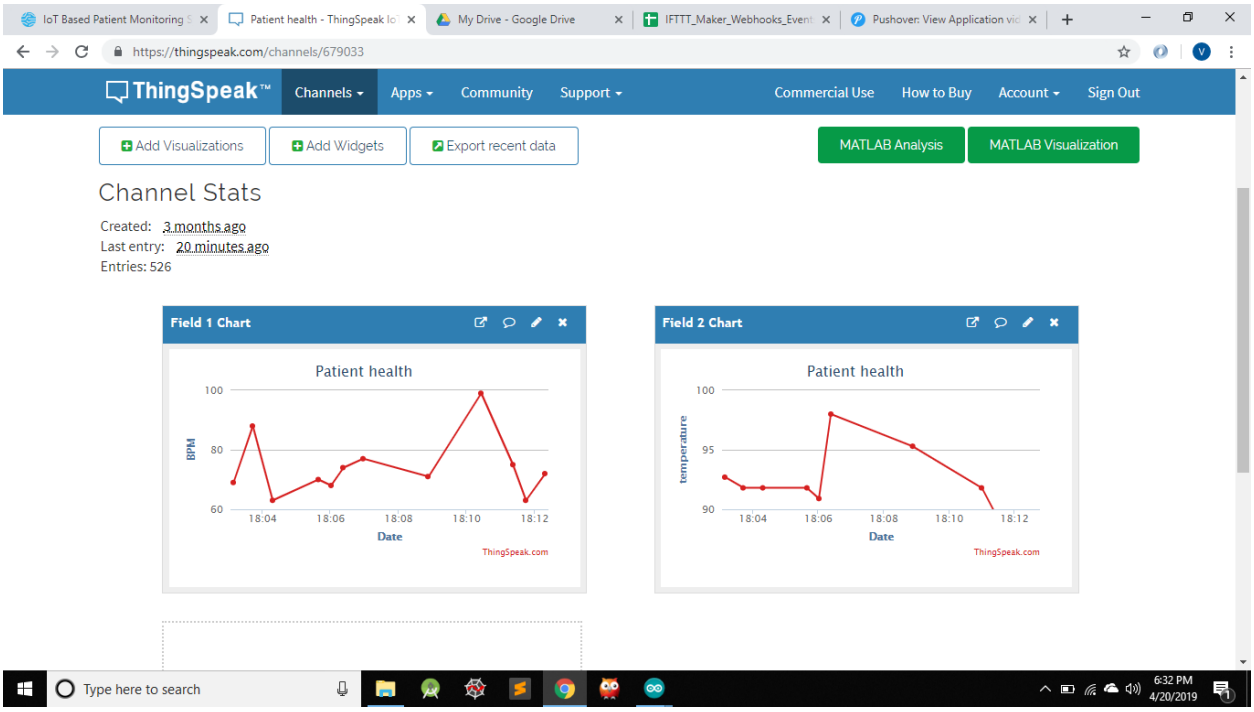
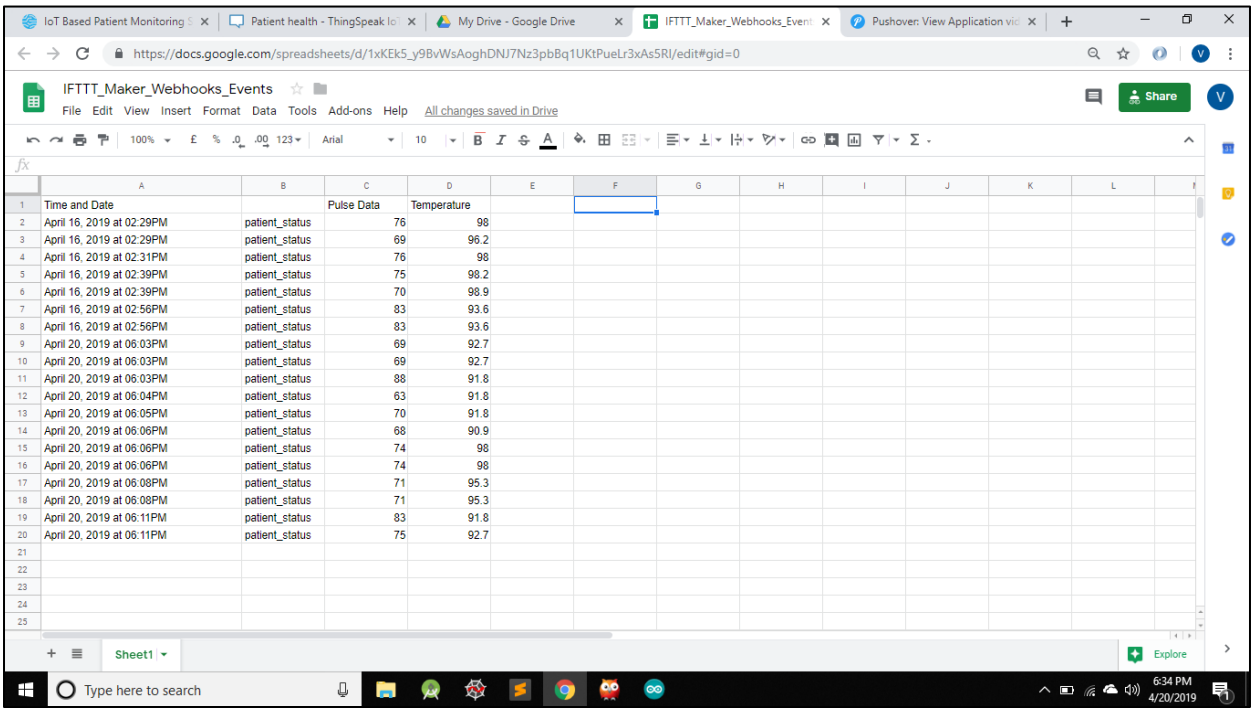


Fig 6.3: ThingSpeak

These data are fetched on GoogleSheet to remove redundancy using IFTTT applet.



IFTTT_Maker_Webhooks_Events

	A	B	C	D
1	Time and Date		Pulse Data	Temperature
2	April 16, 2019 at 02:29PM	patient_status	76	98
3	April 16, 2019 at 02:29PM	patient_status	69	96.2
4	April 16, 2019 at 02:31PM	patient_status	76	98
5	April 16, 2019 at 02:39PM	patient_status	75	98.2
6	April 16, 2019 at 02:39PM	patient_status	70	98.9
7	April 16, 2019 at 02:56PM	patient_status	83	93.6
8	April 16, 2019 at 02:56PM	patient_status	83	93.6
9	April 20, 2019 at 06:03PM	patient_status	69	92.7
10	April 20, 2019 at 06:03PM	patient_status	69	92.7
11	April 20, 2019 at 06:03PM	patient_status	88	91.8
12	April 20, 2019 at 06:04PM	patient_status	63	91.8
13	April 20, 2019 at 06:05PM	patient_status	70	91.8
14	April 20, 2019 at 06:06PM	patient_status	68	90.9
15	April 20, 2019 at 06:06PM	patient_status	74	98
16	April 20, 2019 at 06:06PM	patient_status	74	98
17	April 20, 2019 at 06:08PM	patient_status	71	95.3
18	April 20, 2019 at 06:08PM	patient_status	71	95.3
19	April 20, 2019 at 06:11PM	patient_status	83	91.8
20	April 20, 2019 at 06:11PM	patient_status	75	92.7

Fig 6.4: GoogleSheet

Android Application:

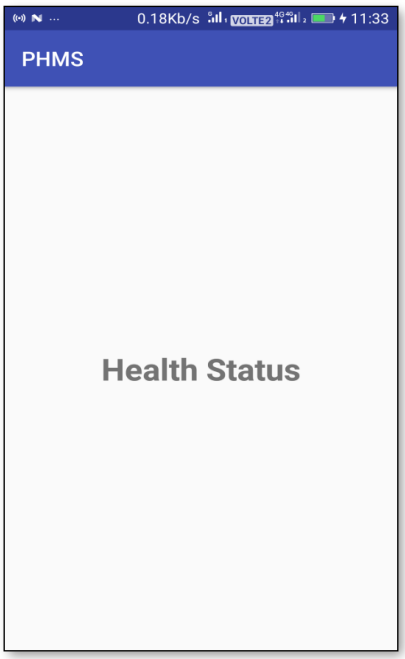


Fig 6.5: Home Activity

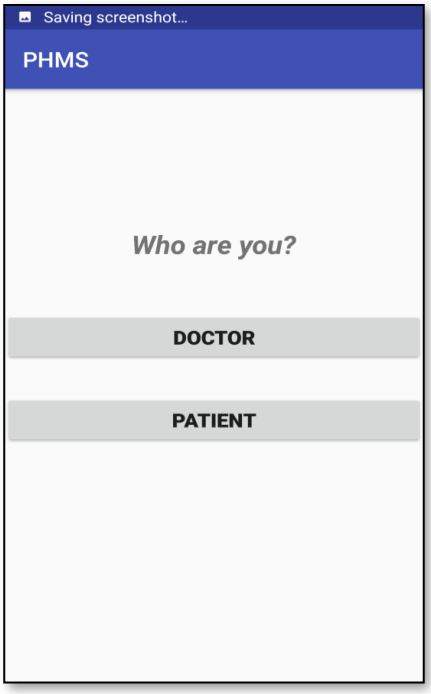


Fig 6.6: First Activity

If Doctor is selected:

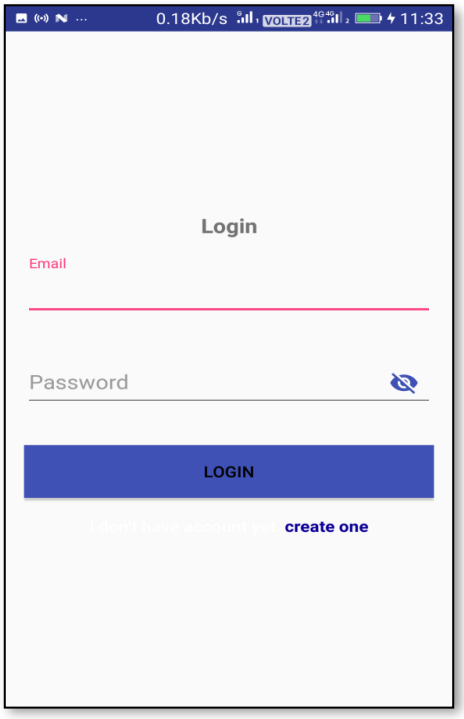


Fig 6.7: Doctor Login

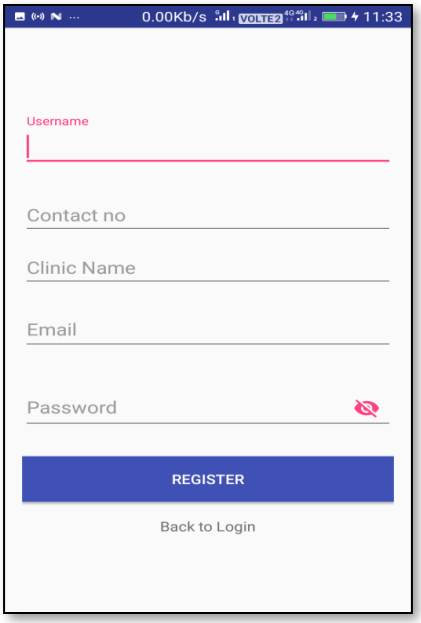


Fig 6.8: Doctor Register

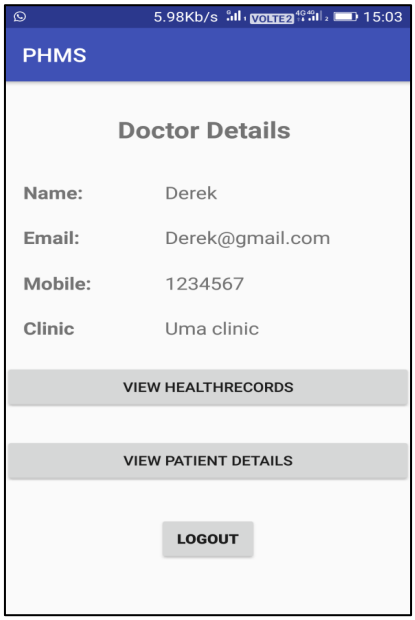


Fig 6.9: Doctor Logged in Successfully

Fig 6.9: when doctor selects patient details

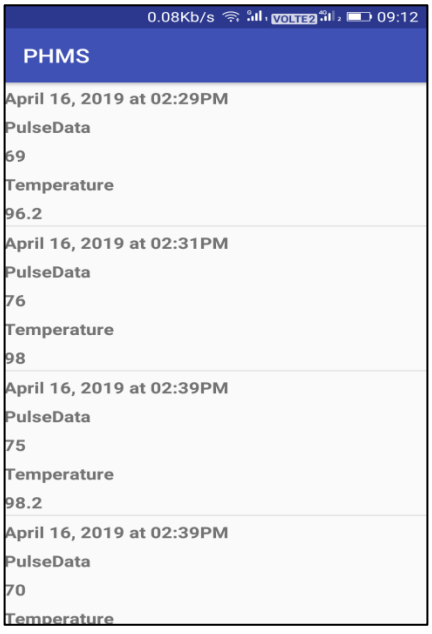


Fig 6.10: Health Records

From the first activity if user selects patient

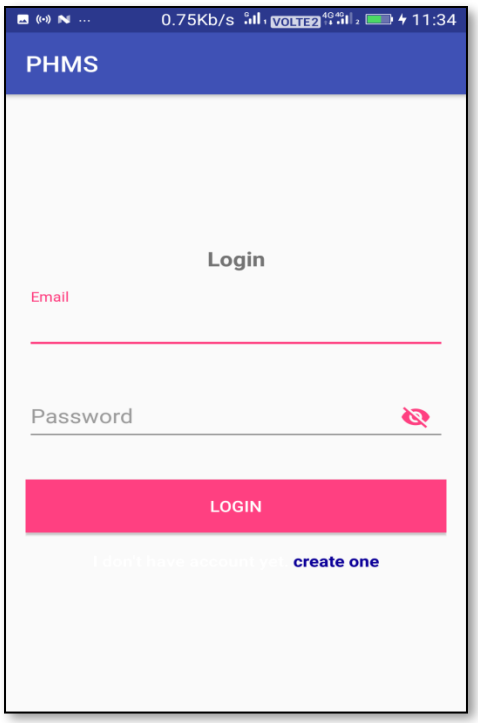


Fig 6.12: Patient Login

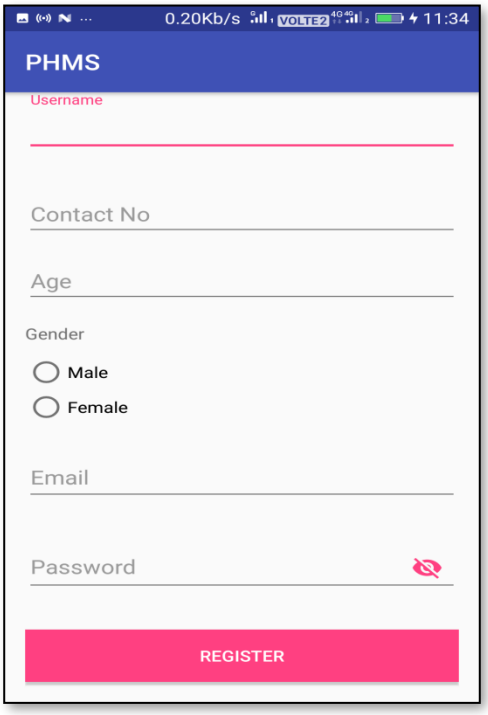


Fig 6.13: Patient Registration

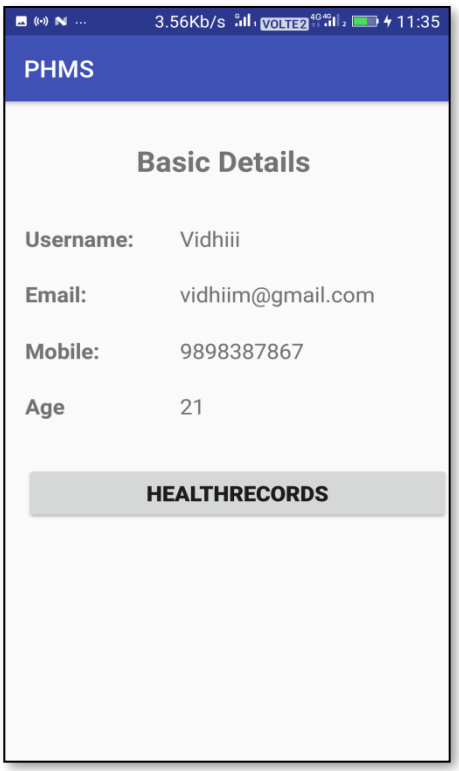


Fig 6.14 When Patient logged in successfully

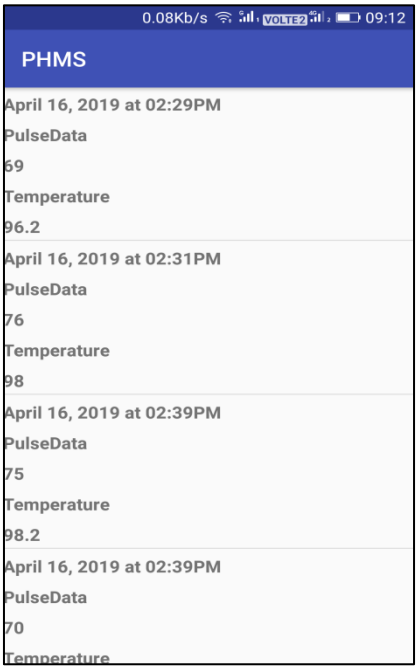


Fig 6.15 Health Records

In case of abnormalities notification will be appeared on doctor's android phone.

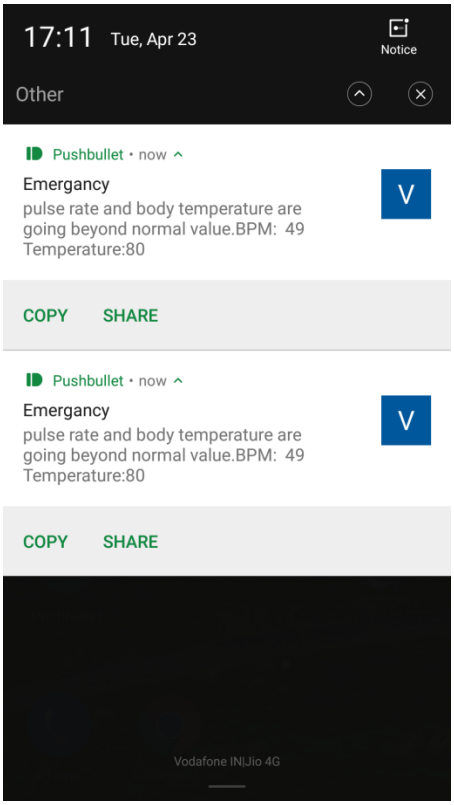


Fig 6.16 Emergency notification

Chapter-7

Conclusion and Future Scope

Conclusion:

Over all, it can be concluded that, currently health monitoring is the major problem in today's world. Due to lack of proper health monitoring, patient suffer from serious health issues. There are lots of IoT devices now days to monitor the health of patient over internet. Health experts are also taking advantage of these smart devices to keep an eye on their patients. With tons of new healthcare technology start-ups, IoT is rapidly revolutionizing the healthcare industry. Here in this, an IoT based Health Monitoring System which records the patient heart beat rate and body temperature sends data to android application and also keeps record. In case of emergency when the sensor values crosses the threshold value which is set in thingspeak then at that time alarm notification will be send to doctor so that quick action can be taken. Along with that android application also provides various functionalities such as sends prescription, view progress graph, update and view medicines and see previous records. It can be said that this system will be more effective and also accurate.

Future Scope:

- To make this system more effective another feature can be added that is; when the sensor data crosses the threshold value and voice notification will appear on doctor's android phone so that doctor can take immediate action.
- More parameters (like blood pressure) can be added to the device.

Chapter- 8

References

- Learning Internet of Things - written by Peter Waler
- https://ieeexplore.ieee.org/document/7443888
- https://en.wikipedia.org/wiki/Android_Studio
- https://www.arduino.cc/
- https://thingspeak.com/
- http://www.circuitstoday.com/lm35-and-arduino-interfacing
- https://www.javatpoint.com/android-tutorial
- Heartbeat and Temperature Monitoring System for Remote Patients using Arduino IJAERS research paper
- Smart Health Care Monitoring using Internet of Things and Android IJARECE research paper
- Real Time Patient Monitoring System based on Internet of Things, 4th International Conference on Advances in Electrical Engineering (ICAEE)
- Arduino UNO and GSM Based Wireless Health Monitoring System for Patients, International Conference on Intelligent Computing and Control Systems