GUJARAT TECHNOLOGICAL UNIVERSITY

Chandkheda Ahmedabad
Affiliated

Sardar Vallabhbhai Patel Institute of Technology Vasad – 041

A Report on:

Internet of Things – Home Security

Under the course of

DESIGN ENGINEERING – 2B(2160001)

B.E. III, Semester – VI

(Information and Technology)

Submitted by:

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(Head of Department)

Academic Year

(2019-2020)

GUJARAT TECHNOLOGICAL UNIVERSITY

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CERTIFICATE

This is to certify that the students namely, **Kaustubh Wade(160410116050), Naisargi Kothari(160410116051), Parjita Munshi(160410116064)** of ***B.E. (Information Technology) Semester VI*** have successfully completed the course work and related tasks for the course of **Design Engineering 2B (2160001)** during the academic term ending in the month of April 2019.

Date: 13-04-2019

Place: SVIT, Vasad

Prof. Amit Kariyani	**Prof N. V. Shah**	
	(Head of Department)	
(Internal Faculty)	(Internal Examiner)	(External Examiner)

ACKNOWLEDGEMENT

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We would like to express our gratitude towards our member of IT Department for their kind co-operation and encouragement which help us in completion of this project.

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1. Introduction

Imagine a world in which every device in the home, workplace and car are connected. A world where the lights automatically turn on when the car approaches the driveway, the coffee starts brewing when the morning alarm goes off and the front door automatically unlocks when approached by a member of the household but stays locked when a stranger arrives on the front step. That is the type of world the Internet of Things can create.

2. Canvases

2.1. A.E.I.O.U. Canvas

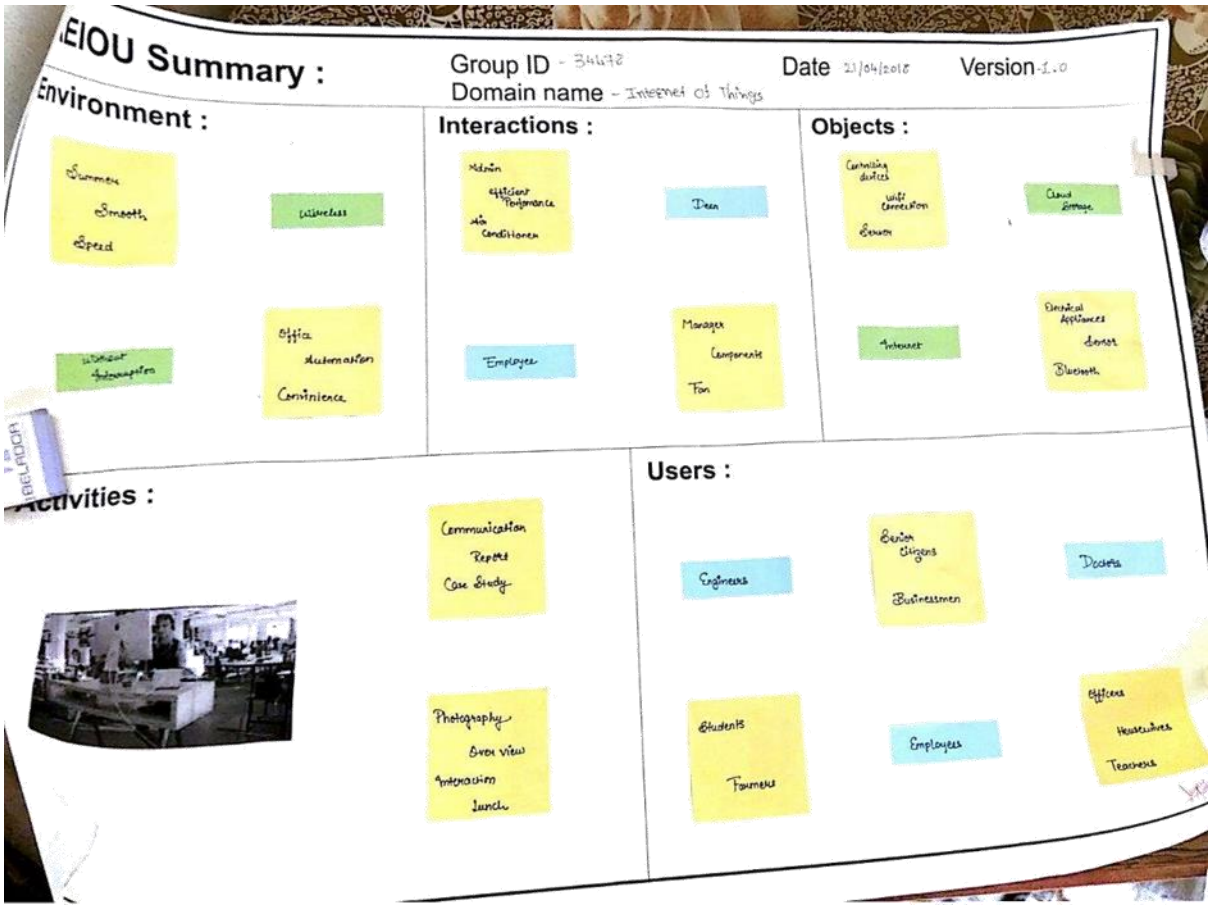


Figure 1 AEIOU Canvas

There are five topics that comes under AEIOU canvas.

2.1.1. A-Activity

- Communication
- Report
- Overview
- Enjoyment
- Case study
- Photography
- Lunch

2.1.2. E-Environment

- Smart Home
- Wearables
- Connected Cars
- Industries
- Smart City
- Agriculture
- Entertainment System

2.1.3. I-Interaction

- Admin
- Manager
- Employee
- Components
- Fan
- Air-conditioner

2.1.4. O-Objects

- Controlling Device
- Electrical Appliances
- Internet
- Wi-Fi Connection
- Sensors
- Cloud Storage
- Server
- Bluetooth

2.1.5. U-Users

- Engineers
- Senior Citizens
- Officers

- Doctors
- Businessmen
- Employers
- Students
- Teachers

2.2. Mind Mapping Canvas

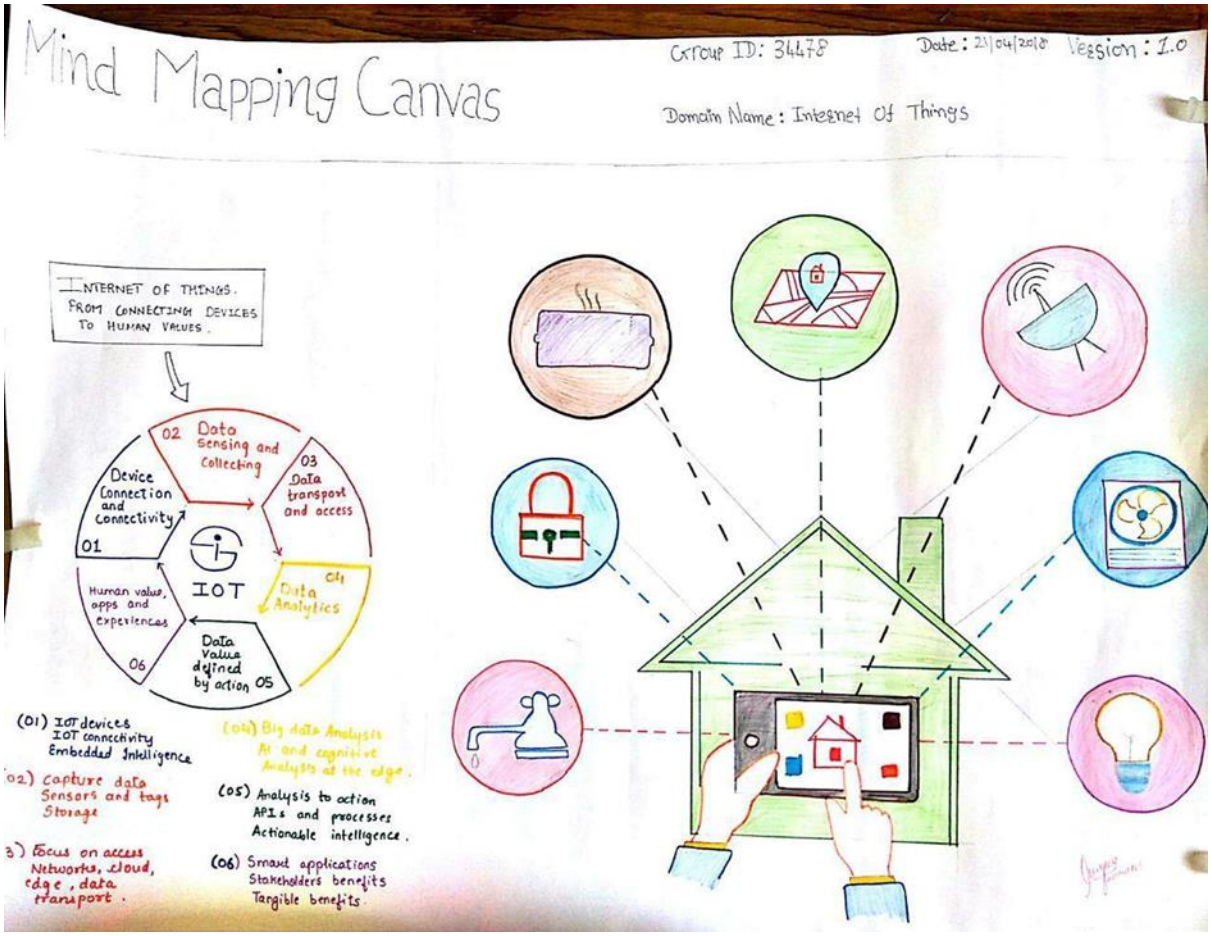


Figure 2 Mind Mapping Canvas

There are 5 features in the Mind Mapping Canvas.

- Users
- Activity
- Function
- Features
- Components

2.3. Empathy Mapping Canvas

Here we are going to explain Users, Stack Holders and Activity. And hear story boarding which have one happy story and one sad story.

2.3.1. Users

- Students
- House Wives
- Doctors
- Senior Citizens
- Teachers

2.3.2. Stakeholders

- Manufacturers
- Engineers
- Servants
- Businessmen
- Dealers

2.3.3. Activity

- Easy Availability for Applications
- Home Security
- Multi-Tasking
- Data Capture
- Automation
- Controlling Appliances
- Saving Electricity

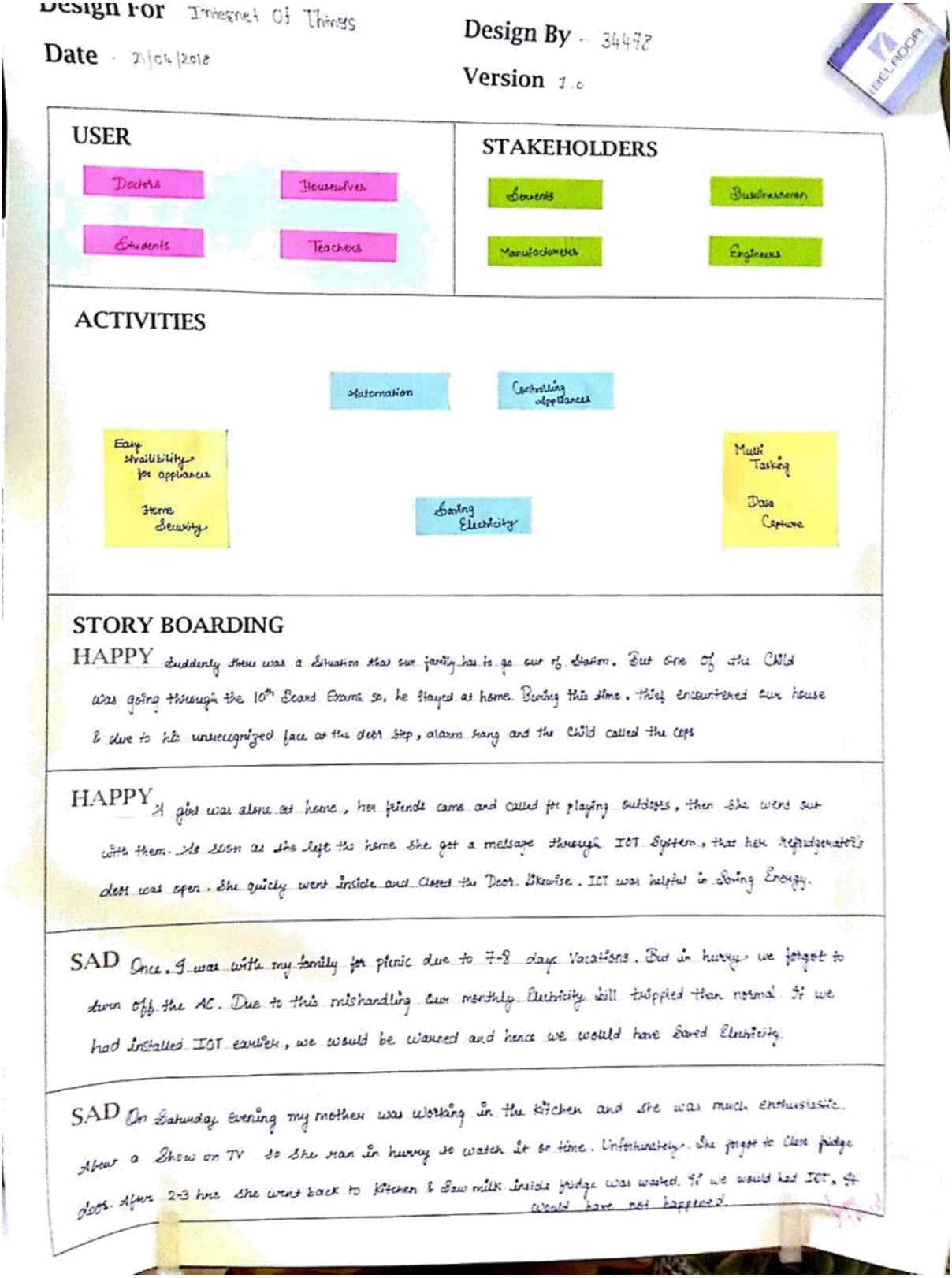


Figure 3 Empathy Mapping Canvas

2.4. Ideation Canvas

We have described activities of people, situation and location and the problems which they face. This canvas is very helpful to reach near goal as it helped us to know the areas on which we need to focus.

2.4.1. People

- Senior Citizens
- House Wives
- Businessmen
- Engineers
- Students
- Teachers
- Doctors

2.4.2. Activities

- Local Sensing
- Data Capture
- Home Security
- Automation
- Home Security
- Controlling Devices
- Saving Electricity
- Multi-Tasking

2.4.3. Situation/Context/Location

- Home Invasion
- Safety
- Car Parking
- Smart Metering
- Smart Farming
- Gardening

- Industry
- Living room
- College

2.4.4. Props/Possible Solution

- Controlling Devices
- Sensor
- Internet Connection
- Wi-Fi
- Electrical Appliances
- Cloud Storage
- Server
- Connectors
- Bluetooth

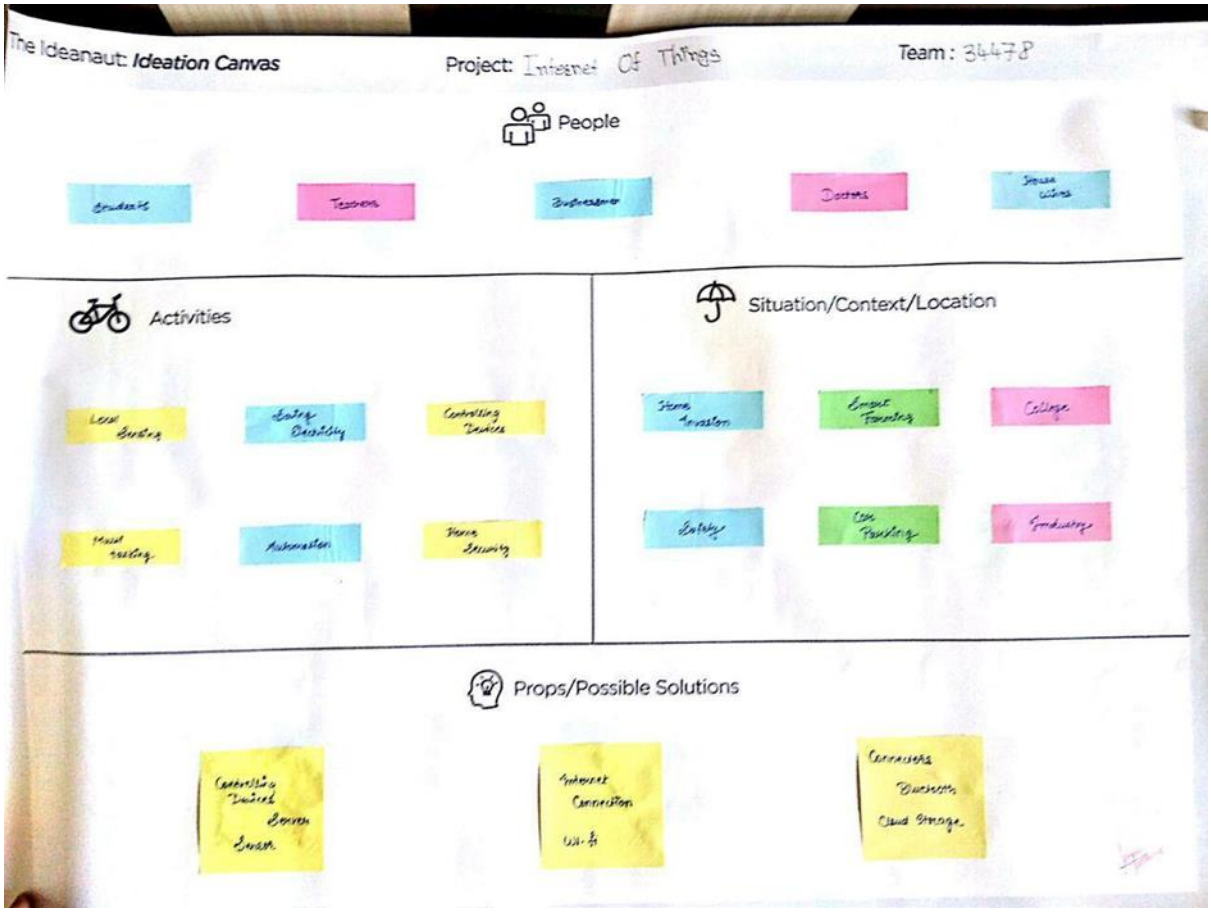


Figure 4 Ideation Canvas

2.5. Product Development Canvas

This Canvas is helpful to understand the purpose, product experience and function of our project.

2.5.1. Purpose

- Easy Handling
- Automation
- Smart Metering
- Energy Saving

2.5.2. People

- House Wives
- Senior Citizens
- Students
- Engineers
- Doctors

2.5.3. Product Function

- Manages range of devices
- Environmental monitoring
- Stores personal data
- Home automation

2.5.4. Product features

- Saves Resources
- Security
- Command & Control
- Increases Task Efficiency
- Drives down Costs

2.5.5. Components

- Controlling Devices
- Sensors
- Server
- Internet
- Wi-Fi Connection
- Connectors
- GPS, Bluetooth
- Cloud Storage
- Electrical Appliances

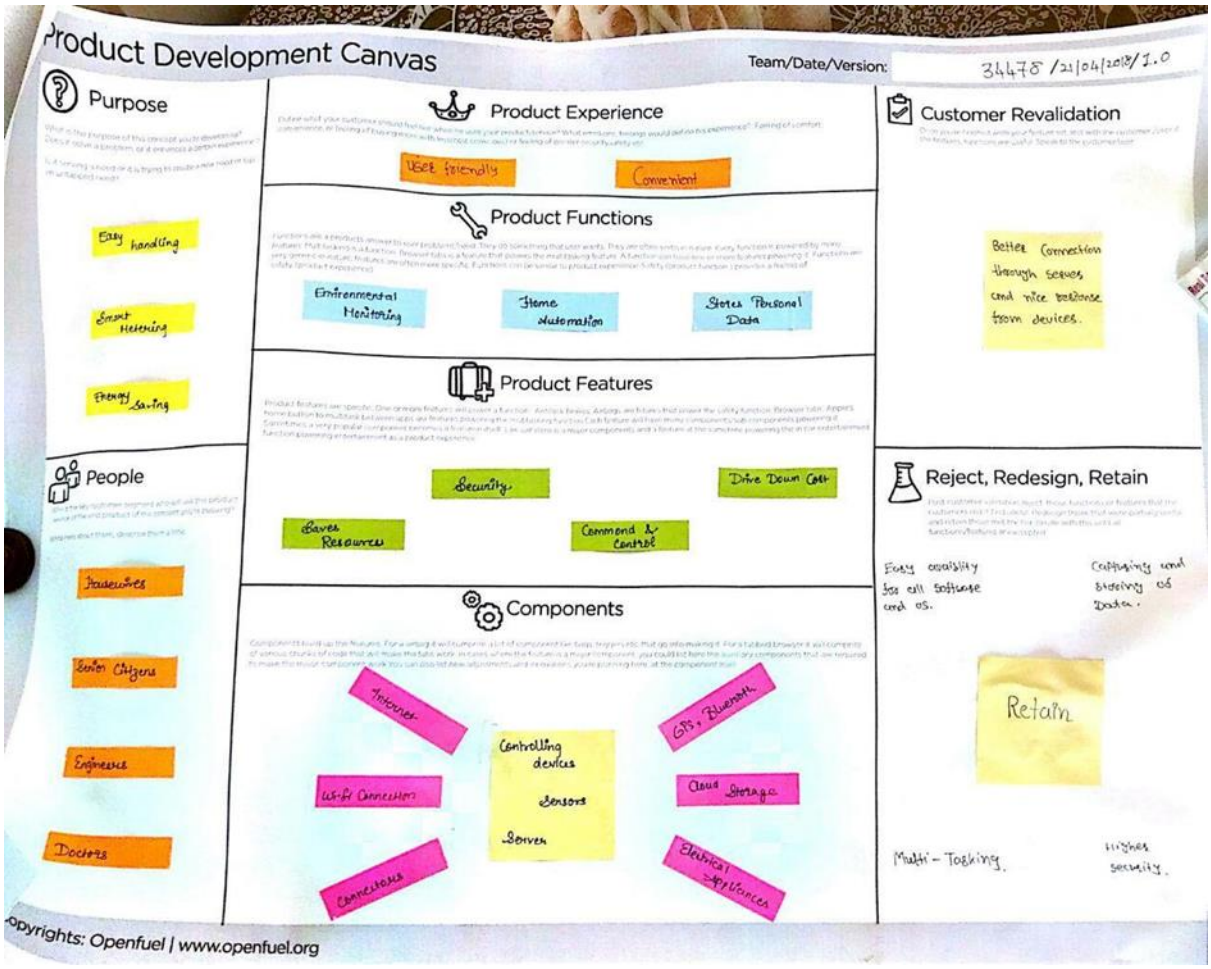


Figure 5 Product Development Canvas

3. Learnings Need Matrix

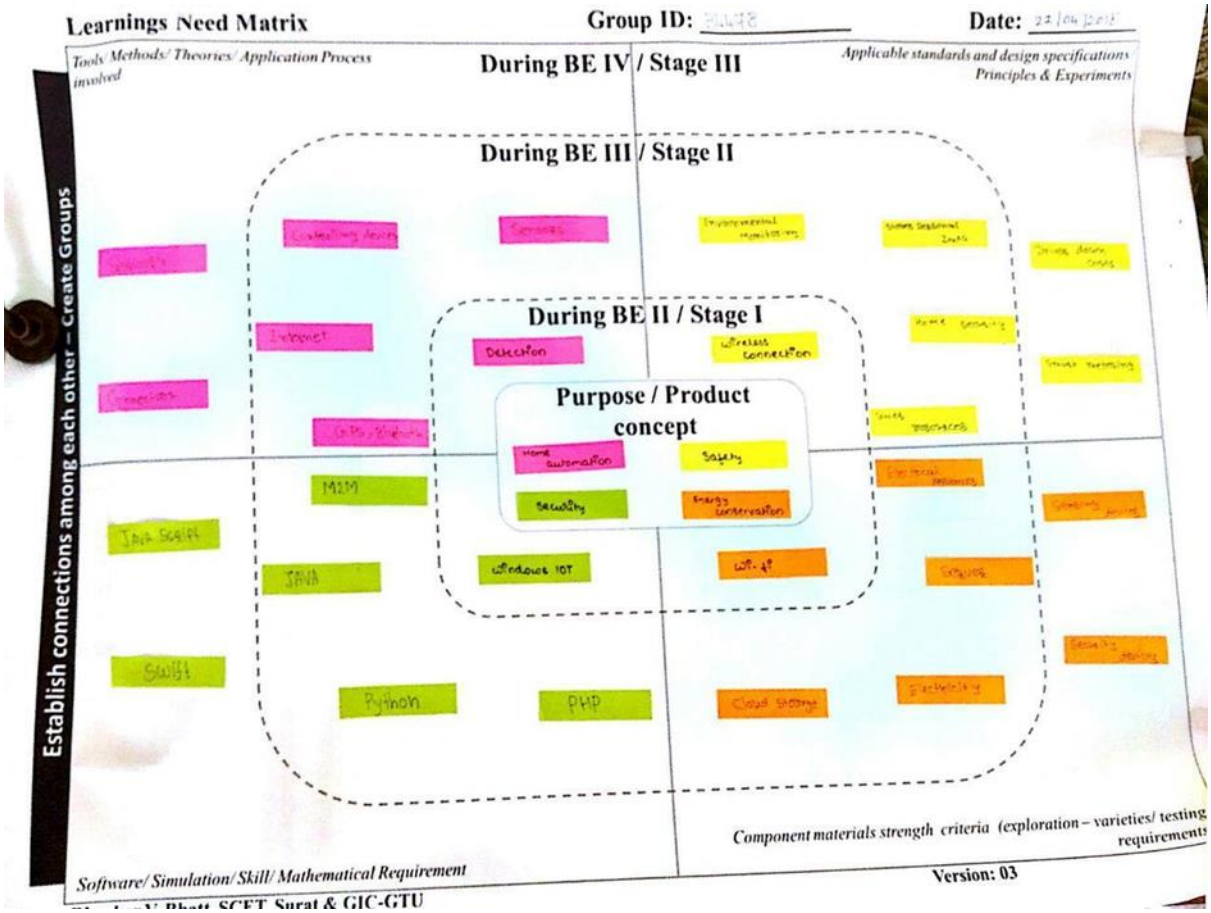


Figure 6 Learnings Need Matrix Canvas

We students, with the guidance of our Faculty Guide, need to identify at this stage, the needs for the generic learning, required while we develop their idea. The learning requirements will depend upon and may be specific for the concept/idea for our solution. This will help us to do the research in a timely manner so that we are able to obtain the specific learning/ understanding, we would require for designing the product. With understanding of the basic branch/ project related subjects, (after having discussions with and the guidance of our Faculty Guide) we will be able to identify tools/ use of software/ applicable standards/ material / design specifications/ theories/ principles/ methods/ experiments related needs to be acquired by us to complete our project successfully. After identifying the specific learning that will be required to develop our idea/product/concept further, we have to distribute learning requirements among the members of the group and each member has to learn minimum one component of LNM, in consultation with the Faculty Guide.

We need to make LNM and include it in our report. LNM would include four major aspects as below:

A) Theories/ Methods/ Application Process Involved/ Mathematical Requirement.

B) Applicable Standards and Design Specifications/ Principles & Experiments.

C) Software/ Tools/ Simulation Methods/ Skill.

D) Components Materials' & strengths criteria (Exploration- varieties/testing requirements).

4. Rough Prototype Model

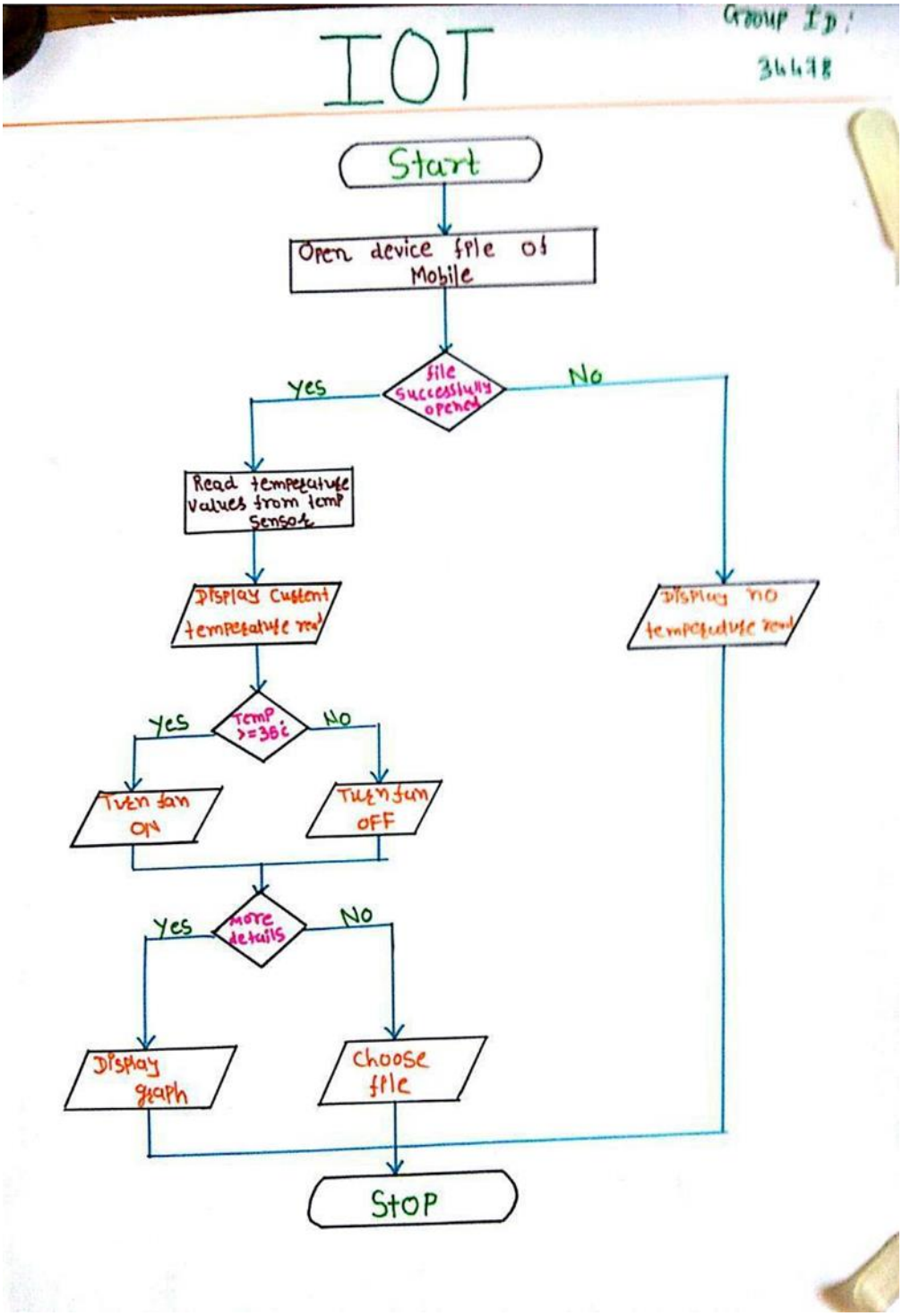


Figure 7 Prototype

5. Software Requirements Specification (SRS)

Functional Requirements

R1.1: Provide comprehensive application detail.

R1.1.1: The application displays detailed information of the security instructions.

Input: Select room details as per requirement and tariff.

Output: Description about the security services, alerts that the application provide as services, etc.

R1.1.2: The application provides room details which ensure the user to get constant information about the status of the room.

Input: Select the room that needs to be monitored.

Output: Description about the status of room and any activity (if any is going on).

R1.2: Maintain user profile.

R1.2.1: It allows the user to register.

Input: Sign up for if not registered for new user.

Output: Display form to fill up information.

Process: User fill up form and press Submit button.

R1.2.2: Application allows user to Login and update their profile if already signed up.

Input: Enter User-name and password.

Output: User gets Login, welcome message and profile will be displayed if the username and password are correct.

Process: Check user-name and password and authenticate the user.

R1.3: Provide user support.

R1.3.1: Provides different types of services.

Input: User selects service.

Output: Respective details of selected service and terms of service.

R1.3.2: Option available to write inquiry.

Input: Fill up inquiry form and submit it.

Output: Give one unique ID.

Process: Receive inquiries and solve problems of security related issues of the user.

R1.4: Online status availability.

R1.4.1: Display mode for status display for the user and alert settings that are set as per the requirement of the user.

Input: Select option to edit the settings as per the requirement.

Output: The user requested alert as per the settings set by the user.

Process: In case of any security related issues, the user will get the notification on her/his device through this security set up using the internet of things as per the settings requested by the user.

R1.5: Feedback and reviews.

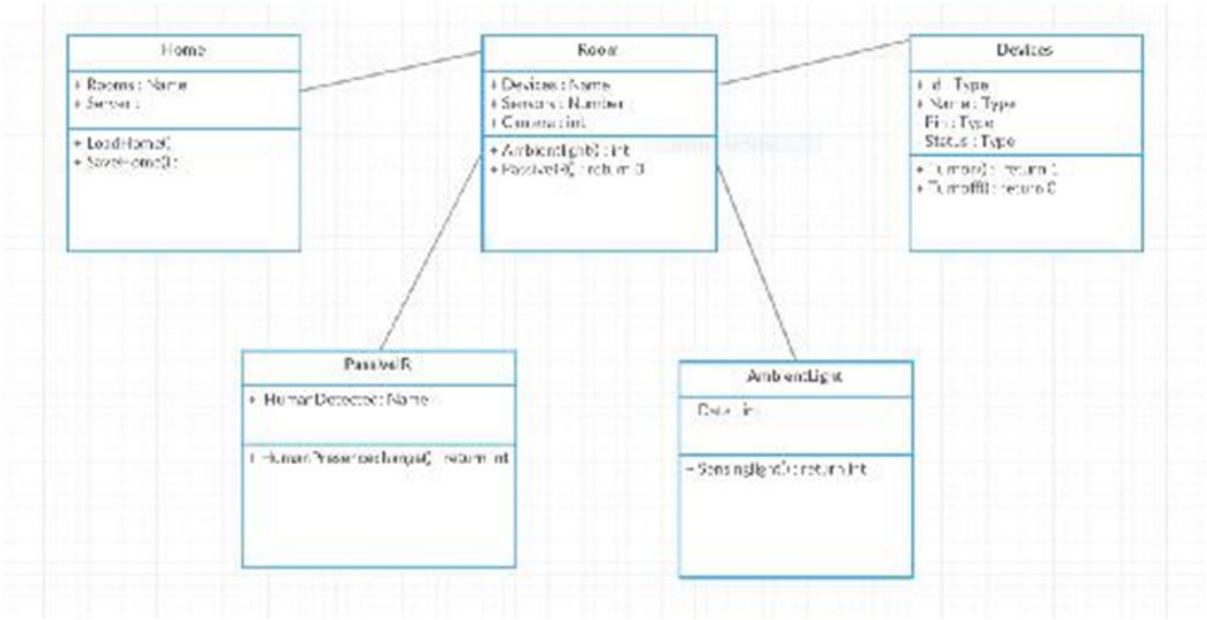
R1.5.1: Allow the user to enter online feedback and ratings and any suggestions for the improvement.

Input: Add feedback or ratings.

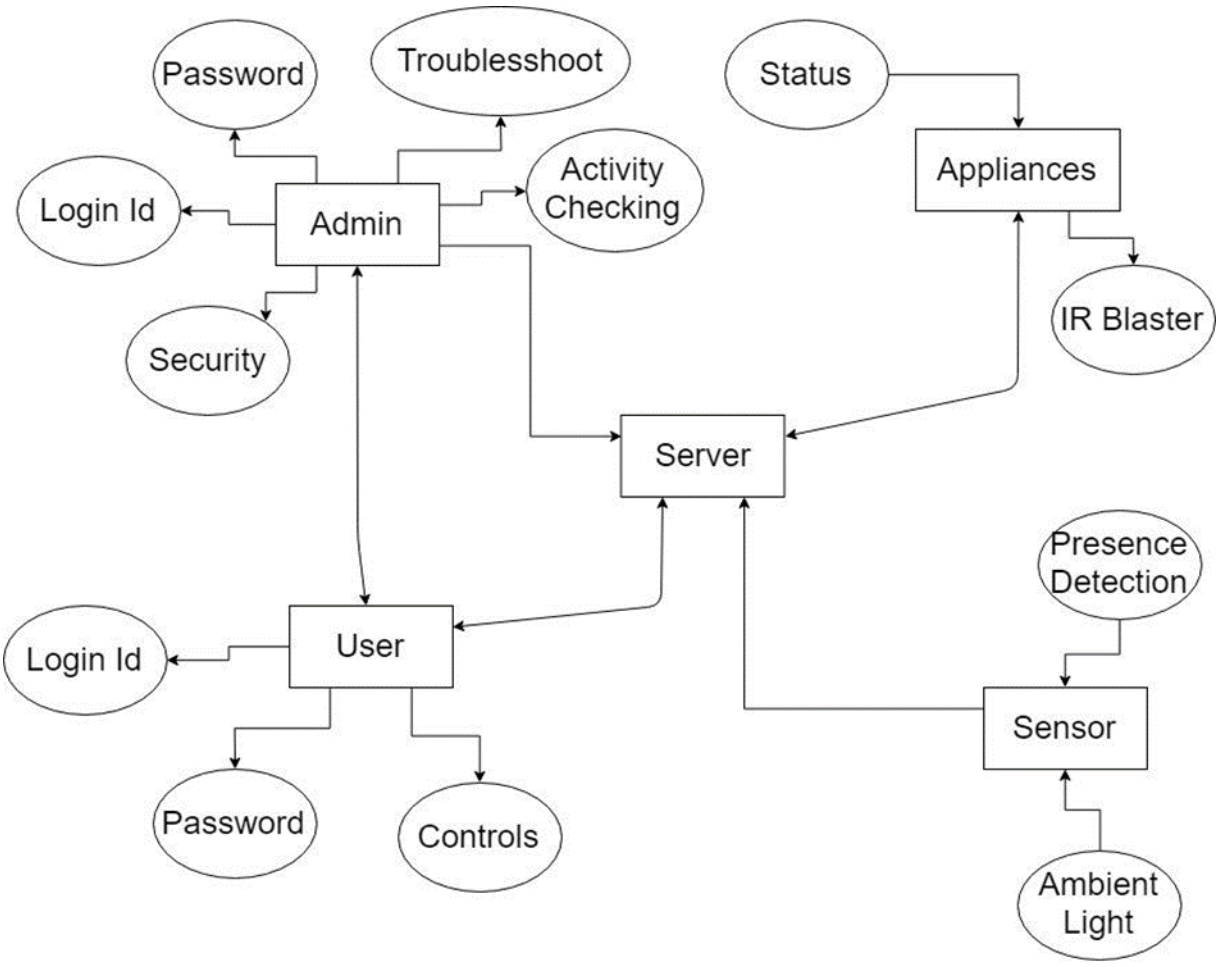
Output: User forum will be displayed, and you can also write your reviews or give ratings and any suggestions for improvements.

6. Design Diagrams

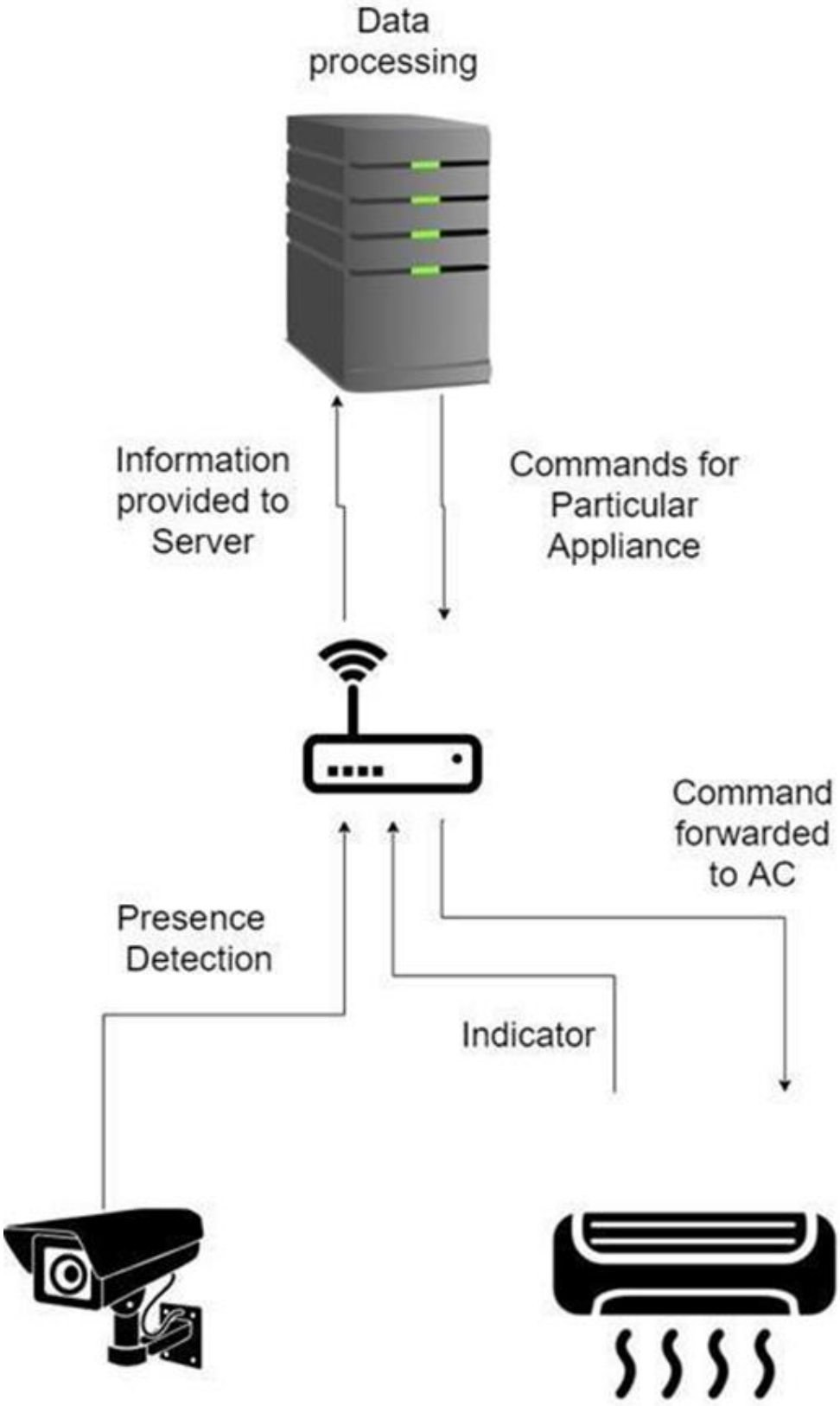
6.1. Class Diagram



6.2. ER – Diagram

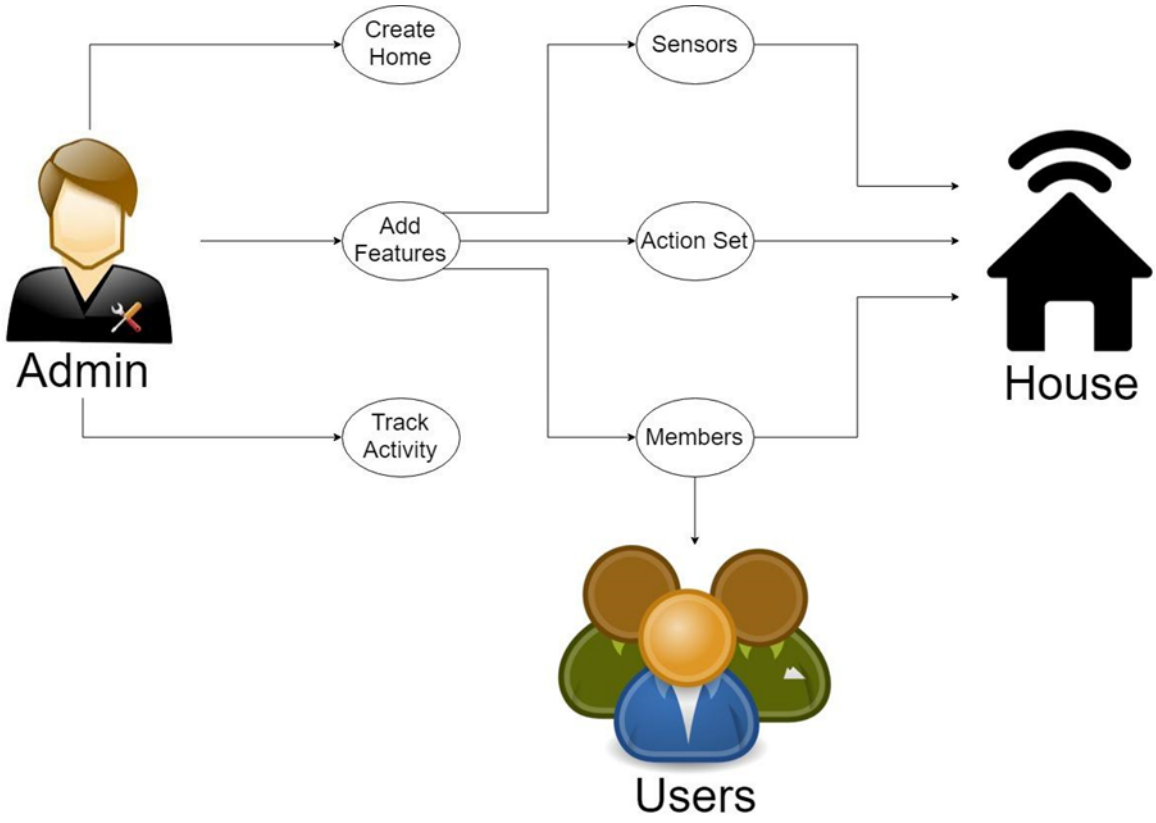


6.3. Data Flow Diagram

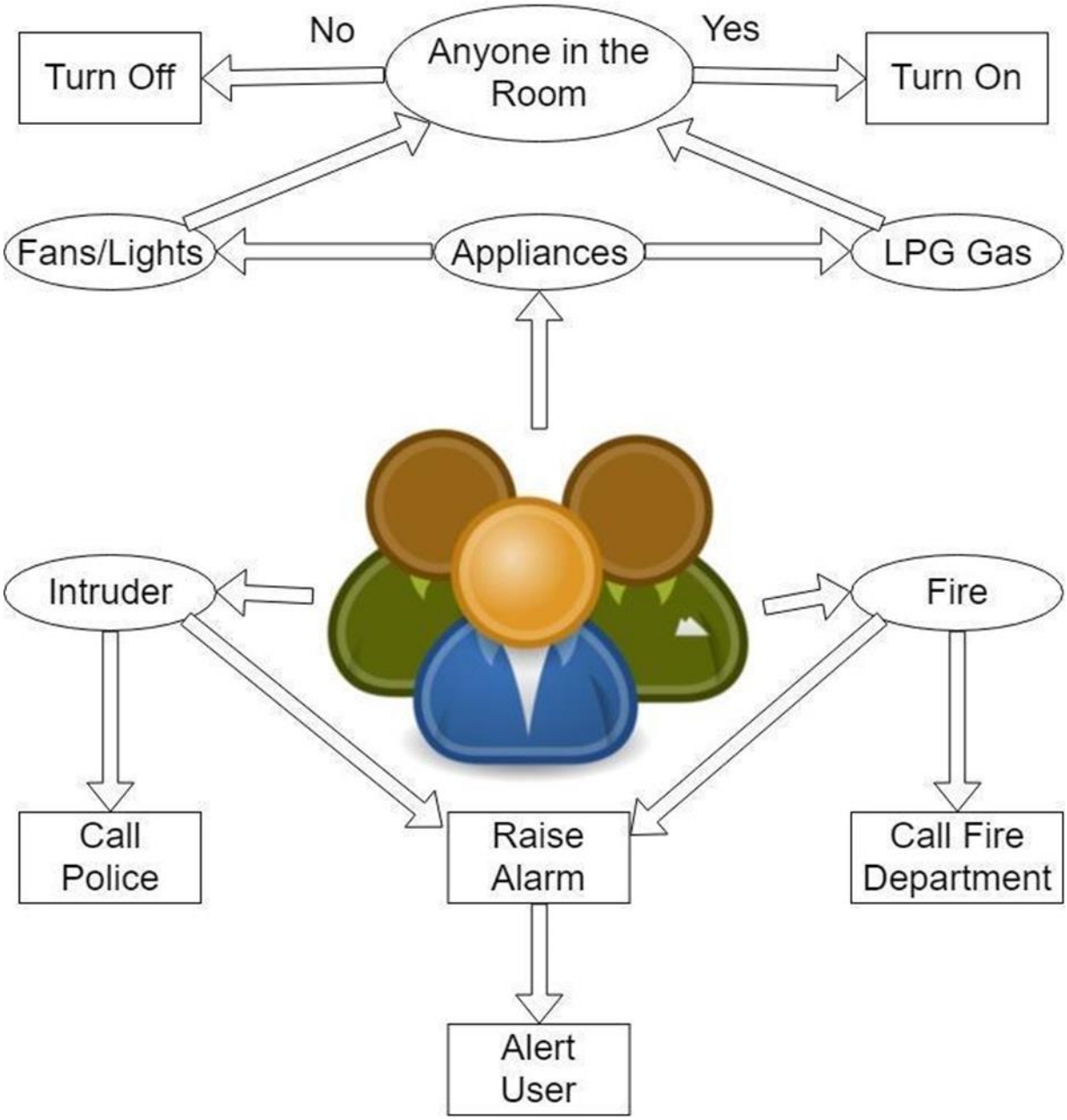


6.4. Use Case Diagram

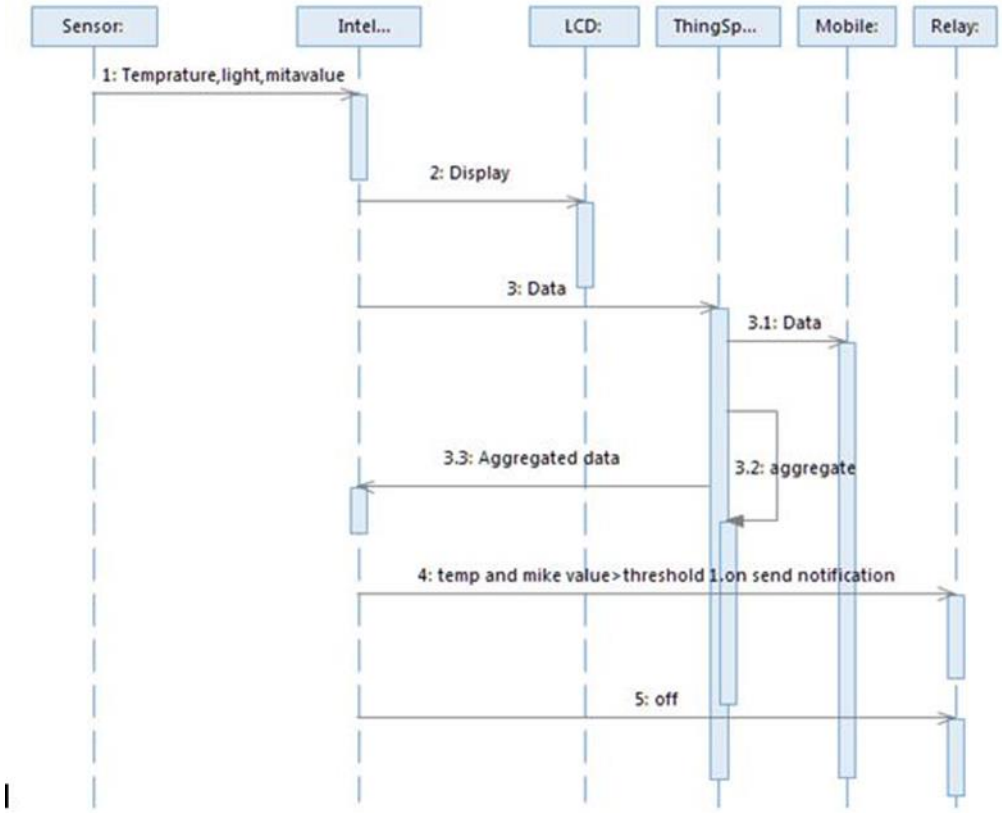
6.4.1. Use Case for Admin



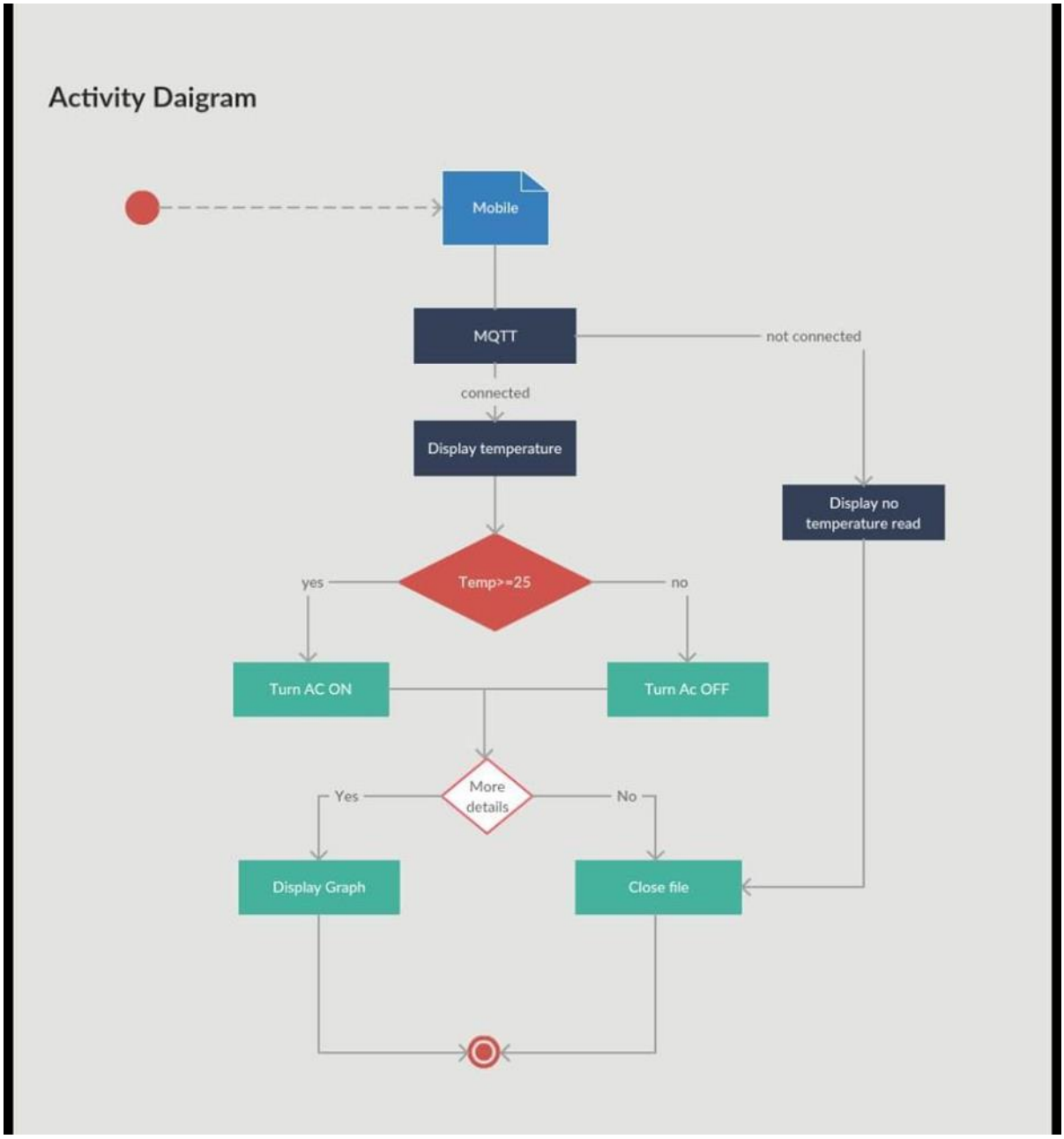
6.4.2. Use Case for User



6.5. Sequence Diagram



6.6. Activity Diagram



7. Prototype Working Model

Components Required

- Wi-Fi
- Arduino mega 2560 and genuino mega 2560
- NFC module
- Ultrasonic Sensor
- DHT22 Temperature Sensor
- Water Sensor
- DFROBOT Gas Sensor mq-5
- DFROBOT current Sensor
- Buzzer
- Positive acting presensitized PCB
- Relay
- Tactile push button
- 5mm LED white, green, red.

Wi-Fi Module

Wi-Fi (Wireless Fidelity) is a wireless networking technology used for exchanging the information between two or more devices without using cables or wires. There are various Wi-Fi technologies like Wi-Fi 802.11a, 802.11b, 802.11g and 802.11n. Here, in this project Wi-Fi module is used to receive commands from the internet and activate loads through TRIAC & Optocoupler by executing a program written within the Wi-Fi module. Hence, no microcontroller is used in this project to drive loads.

Arduino mega 2560 and genuino mega 2560

The Arduino MEGA 2560 and genuine mega 2560 is designed for projects that require more I/O lines, more sketch memory and more RAM. With 54 digital I/O pins, 16 analog inputs and a larger space for your sketch it is the recommended board for 3D printers and robotics projects. This gives your projects plenty of room and opportunities maintaining the simplicity .

NFC module

NFC devices are used in contactless payment systems, similar to those used in credit cards and electronic ticket smartcards and allow mobile payment to replace or supplement these systems. This is sometimes referred to as NFC/CTLS (contactless) or CTLS NFC. NFC is used for social networking, for sharing contacts, photos, videos or files.

Ultrasonic sensor

As the name indicates, ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception.

DHT22 Temperature sensor

The DHT22 is a basic, low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds, so when using our library, sensor readings can be up to 2 seconds old

Water sensor

A water detector/sensor is an electronic device that is designed to detect the presence of water and provide an alert in time to allow the prevention of water leakage. A common design is a small cable or device that lies flat on a floor and relies on the electrical conductivity of water to decrease the resistance across two contacts.

DFROBOT Gas sensor mq-5

It can be used in gas leakage detecting equipment in consumer and industry applications, The sensitivity can be adjusted by the potentiometer. The output is proportional to the density of gas. You can use analog reading to read the data from this sensor. To ease the difficulty of using this sensor, a Gravity Interface is adapted to allow plug play. The Arduino IO expansion shield is the best match for this senor connecting to your Arduino.

DFROBOT Current sensor

This Gravity Analog 20A current sensor is based on the Hall current sensing principle. It can be used for AC or DC current measurement, has a wide voltage range, a small footprint, requires no soldering and has a high level of precision. We have added high-voltage isolation in the circuit design for safety reasons and a non-conductive acrylic plate has been attached to the bottom of the PCB to prevent accidents such as short circuits, electric shocks and any other potential danger.

Buzzer

A buzzer or beeper is an audio signaling device,[1] which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

Positive acting presensitized PCB

the positive resist coated printed circuit board (PCB) for many prototyping, educational and low volume applications. Even some high-volume applications have used Kinsten PCB to keep the full process secure and in-house. The phenolic substrate is coloured brown and is commonly seen in older electrical equipment. It is easier to cut, and drill compared to fiber-glass PC. However, it is not as robust, and is not suitable for use in situations where vibration or flexing is present. Care in soldering is recommended, as excessive soldering temperature or times can lead to charring more readily than fiber-glass substrate.

Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

Tactile push button

Little clicky switches are standard input "buttons" on electronic projects. These work best in a PCB but can be used on a solderless breadboard as shown in this tutorial . The pins are normally open (disconnected) and when the button is pressed they are momentarily closed

5mm LED: white, green, red.

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. This effect is called electroluminescence.] The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

8. Model


VOLTAS
HOT-SHOT

Model building

We have created a prototype which is constructed with the use of cardboards and thermocols. With the help of IOT ,we have created a model for Home Security in which there is a kitchen, a living room and a bedroom as a part of it. And for components we are using wires, led, batteries, bread board etc.. In this model we have implemented Security for the living room door, when the door will be open the circuit completes and we get the indication of that our door is open. With the door we attach a led connection, so whenever the door will open there is a light will on. In the bed room we have attached a circuit on window whenever the window will remain open or somebody will try to open the window, we get the indication. In the kitchen we have a fire safety alarm. wherever there is fire in the kitchen it gives a buzzer sound and that's how our home security model work.

9. Conclusion

In conclusion, the Internet of Things is closer to being implemented than the average person would think. Most of the necessary technology advancement needed for it have already been done, and some manufacturer agencies have already begun implementing small-scale versions of it. The main reason why it has not truly been implemented is the impact it will have on the legal, ethical, security and social fields. Workers could potentially abuse it, hackers could potentially access it, corporations may not want to share their data, and individual people may not like the complete absence of privacy. For these reasons, the Internet of Things may very well be pushed back longer then it truly needs to be.