PROJECT REPORT ON SMART HOME

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of
Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project/internship titled **"SMART HOME"**, submitted by Muhammad Sohel Rana, ID No: 151-15-4690 and Fatima Moon, ID No: 161-15-7446 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 6th December 2019.
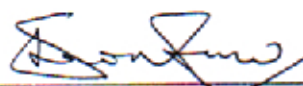
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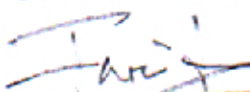Daffodil International University

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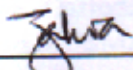
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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Ms. Zakia Zaman, Lecturer Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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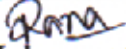Daffodil International University

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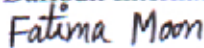Department of CSE
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We would like to express our heartiest gratitude to **Dr. Syed Akhter Hossain**, Professor and Head**,** Department of CSE, for his kind help to finish our project and also to other faculty member and the staff of CSE department of Daffodil International University.

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Finally, we must acknowledge with due respect the constant support and patience of our parents.

ABSTRACT

Home automation is becoming more popular. This can be used by an Android phone. To design a device that can be used for controlling AC Loads from a Smartphone with built-in Wi-Fi technology by using Wi-Fi module as water tank is our goal. Home automation refers to the use of computer and information technology to control home Appliances and features Systems can range from simple remote control of water tank, light, fan, ac through to micro-controller based networks with varying degrees of intelligence and automation. For saving energy and having no range to use any electronic product in home, home automation is adopted.

In modern era everything is moving towards to wireless system. We thought that why home's electric devices such as water tank, light, fan etc. could not be controlled without any wire, so we made this project. By using this project anyone can control any electronic device from anywhere.

By an Ultrasonic sensor we can monitor the water level of water tank. If the water tank is full then the ultrasonic sensor will send a signal in android phone, then we can switch off the water pump.

We decided to do this project because the water tank automation is the unique idea. Because we have never seen this system by others.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Imagine anyone is now very far from his home right now, but he doesn't sure about that his room's light either on or off. How can he check now either it is off on? But if he has a system by which he can check it and control it, he could able to check anytime from anywhere that whether his room's light is on or off. Today we all use smartphone so we tried to make a system which can be controlled by an android app that should be installed in the user's smartphone and his home should have a Wi-Fi system by this system could be connected to internet.

Home automation has made it possible to have what is often referred to as a 'smart home'. A home's electronic materials that could be controlled by home's people from anywhere through the internet, such as he can turn on or off his homes individual light or fan. This allows his to make his home an active partner in managing his busy life.

Our project Range Free Home Automation is basically a hardware product designed to control almost every digital component in your home such as fans, lights, AC and etcetera. Our final goal with this product is to bring our country one step ahead in technology and users' satisfaction.

1.2 Motivation

Around one and half year ago I went for a tour of cox's bazar for three days and when I came back to my home, I saw that my kitchen's light and my room's fan is being kept on for last three days. I forgot to turn them off, so it's a waste of energy. We know that energy is very much important for our country because our population is growing very quickly. So, I think to make a project by that I anyone can handle his homes electronic materials from anywhere of the world by using his smartphone through the internet.

1.3 Objectives

By utilizing a microcontroller to accomplish equipment effortlessness we needed to actualize a minimal effort, dependable and adaptable home robotization framework that can be utilized to remotely turn on or off any family apparatus and this is our undertaking objective.

1.4 Expected Outcome

There are some major expected outcome from our project. Some are-

- Project can be controlled from anywhere.

- Project should control any electronic goods.
- Reduce expense of electricity

1.5 Report Layout

Chapter 1 is all about the overview, motivation, objectives and expected outcome of the project.
Chapter 2 focuses on the background of the project. It elaborates the related works, summary of the work as
scope of the project. Finally list down the challenges of the project.
Chapter 3 high lights the requirement specification of our project.
Chapter 4 illustrate the design specification the project.
Chapter 5 present the implemented features of our project.
Chapter 6 concludes mentioning the limitation and future scope of the project.

CHAPTER 2

BACKGROUND

Presently a-days robotization plays significant moves in numerous fields. For example, in mechanical field robotization has an enormous piece of significance. To gathering parts robotized robot is being utilized now more often than not. This procedure has a colossal effect on creation since it is a lot quicker procedure of generation. Another model could be as human level design acknowledgment, language acknowledgment and language generation capacity. Presently in restorative segment robotization is significant likewise, for example, essential checking in electrocardiography or radiography and research center investigation of human qualities, blood plasmas cells and tissues.

To make mechanization increasingly successful now numerous individuals are work with the range free robotization framework which can be controlled from anyplace through the web and ought to be low cost. For example, Wi-Fi based home motorization system, Bluetooth based home robotization framework, Range free home computerization framework and so forth. The move of the world economy from agrarian to modern in the nineteenth century to twentieth century robotization is especially mindful.

2.2 Related Works

Home automation is a process of control home's any kind's thing that could be controlled automatically such as automated doors and windows, control any room's light, fan, AC, any kind of plugged electronic goods, pet feeding, water pump, climate controls, plant watering and so on. But there exists a difference in that home automation emphasizes more on comforts through ergonomics and ease of operation.

2.3 Comparative Studies

In recent times, for home networking wireless systems like WLAN have become more and more common. Also, the use of wireless technologies gives several advantages that could not be gained using a wired network only in home automation system.

1. **Reduced installation costs:** Most of the necessary wires are already used so Wi- Fi controlled home automation system is in user friendly budge

2. **Easy deployment, installation and coverage:** Almost from anywhere wireless noes can be mounted. Installation process and make coverage is very easier so any one can control it.

3. **System scalability and easy extension:** Deploying a wireless network is especially advantageous when, due to new or changed requirements, extension of the network is necessary. In contrast to

wired installations, additional nodes do not require additional cabling which makes extension rather trivial. This makes wireless installations a seminal investment.

4. **Attractive benefits:** As placement of wireless node is very easy so attractive requirements can be managed very easily.

5. **Integration of mobile devices:** with the wireless networks, associating mobile devices such as PDAs and Smartphone with the automation systems becomes possible everywhere and at any time. For our project we use android Smartphone by which we can control this project from everywhere.

2.4 Scope of Problem

It is a remoted system project by which user can control his / her home automation system from everywhere without using camera for switching on or off of the any electrical appliance.

2.5 Challenges

- To make a flexible database which containing 0 & 1 for on and off.
- To make this project budget friendly.
- To make this project water pump

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Business Process Modeling

The system is controlled by an android app through a database. The system also consists of two components. In this ESP8266 Wi-Fi Module based project we can control four or more channel relay outputs. This project is a basic Internet of Things (IoT). For reducing cost and making human effect we want to make home automation system with this technology.

The design of this project involved coupling several hardware components and testing at the different stages of the implementation.

Firstly, a flow chart as shown in figure 4.2 was developed for the design indicating the processes involved.
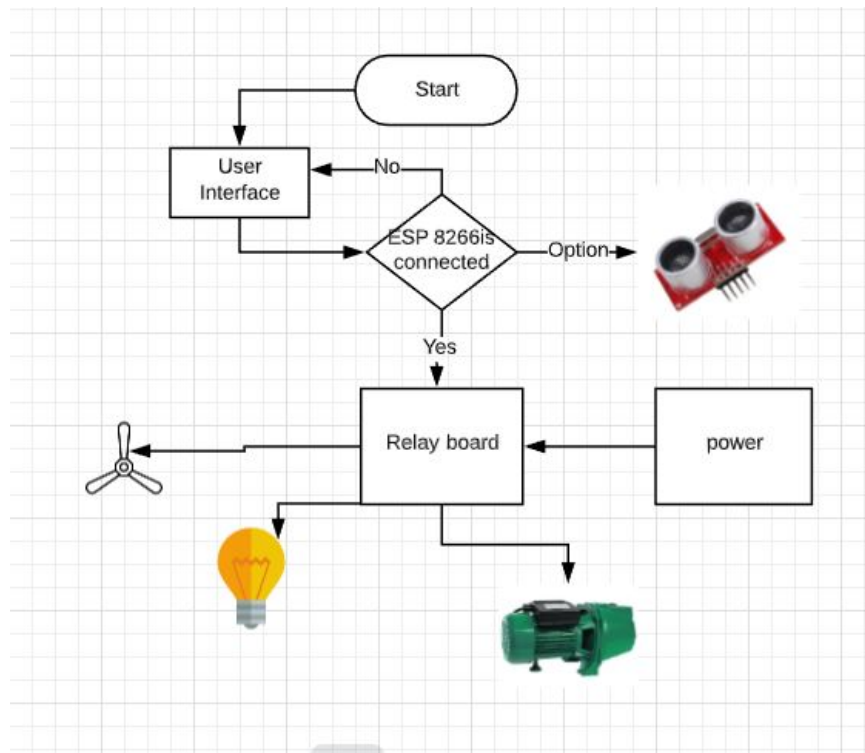The following figure 5.1 shows the flow chart of the system.

Figure 3.1: Flow chart of the system.

3.2 Requirement Collection and Analysis System Requirements

1. ESP8266 Wi-Fi Module
2. Relay Board
3. Power Cables
4. Bread board
5. Ultrasonic Sensor
6. Booster
7. Battery

Optional

1. Water Pump
2. Motor
3. Water Tank
4. Fan
5. Light
6. Android Phone

This range free Wi-Fi controlled home automation system will be able to have following Features for the end users.

1. Lighting Switches On and Off:

By this framework client can check in application whether his /her home's any room's light switch is on or off. By checking the light status client can turn on or off light switches.

2. Fan turns On and Off:

By this framework client can check in application whether his/her home's any room's fan switch is on or off. By checking the fan status client can turn on or off fan switches.

3 .Water Pump Switches On and Off:

By this framework client can check in application whether his/her home's water siphon switch is on or off. By checking the water siphon status client can kill on or the switches.

3.3 System design

Our designed home automation system uses ESP8266 microcontroller as Wi-Fi module and works through 4 channel relays. First user does command via his / her smartphone then Wi-Fi module has been instructed and then works through the relay. This process is shown in figure 4.2 bellow.
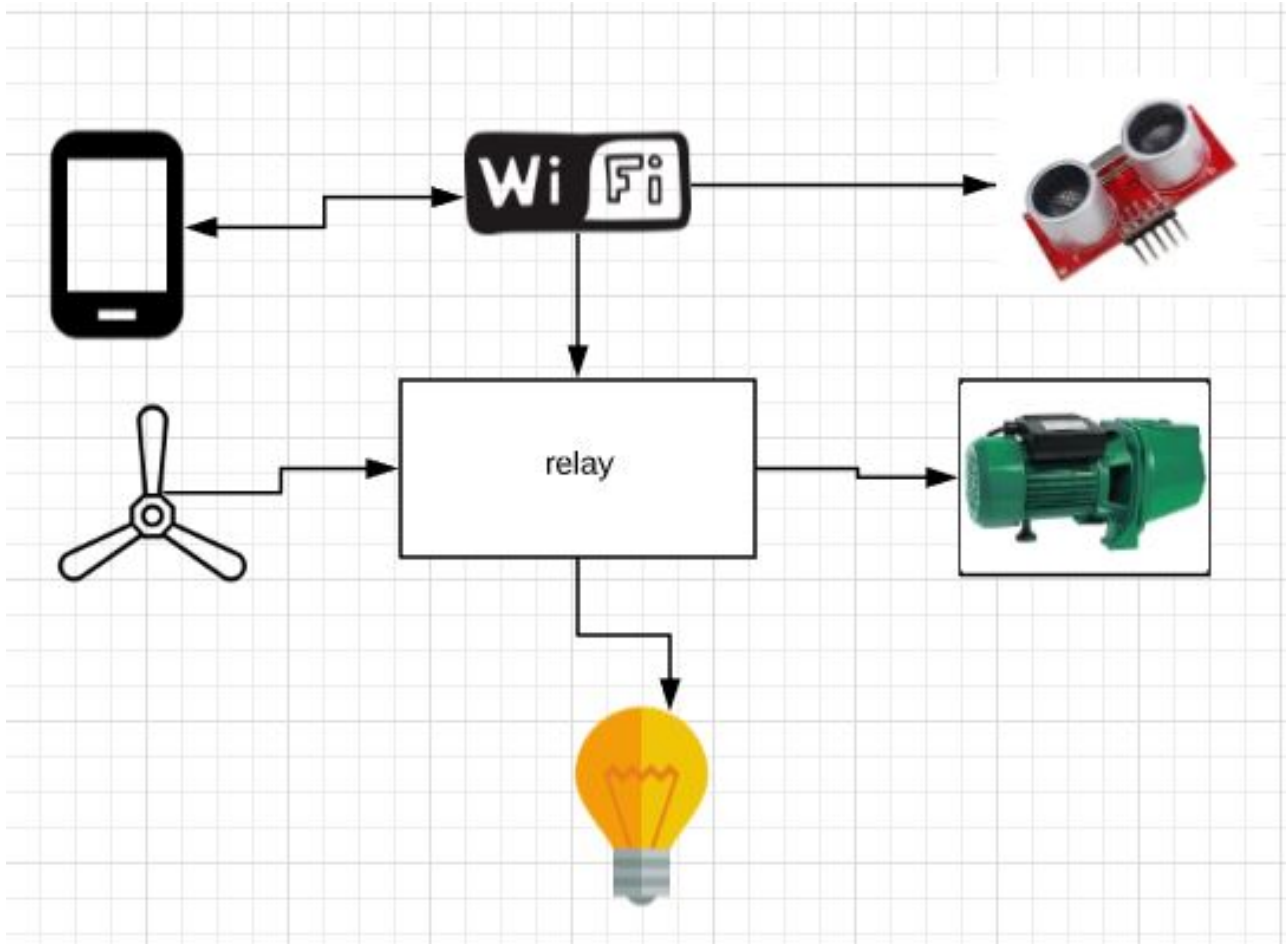

Figure 3.2: System Design of the proposed project

CHAPTER 4

DESIGN SPECIFICATION

Explicit intentional decisions in determination of suitable usage stages and equipment parts were made before the real plan of the venture work had done. For all choices minimal effort accessibility, unwavering quality, adaptability and effortlessness were given significant as need.

4.1 Preliminary Consideration

Explicit intentional decisions in determination of suitable usage stages and equipment parts were made before the real plan of the undertaking work had done. For all choices minimal effort accessibility, unwavering quality, adaptability and effortlessness were given significant as need.

4.1.1 Selection of Implementation Platform

Now-a- days home mechanization framework can be executed. in many platforms. Of the current available platforms: Arduino, Power line, Rs232, Ethernet, Bluetooth, Wi-Fi, Infrared, GSM and Microcontroller were found most suitable because of low cost availability, reliability and simplicity. In those platforms Power line and Ethernet is too expensive and Bluetooth and Infrared are unreliable, so we used Wi-Fi Microcontroller platform.

4.1.2 Selection of Hardware components

The selection of hardware components for our project were based on low cost ability, flexibility and relatability. We used ESP 8266 Node mcu Module, relay, connection wire, adapter, light, fan, motor, water pump, electric wires.

4.2 Wi-Fi Module – ESP82366

The ESP8266 Wi-Fi Module is an autonomous SOC with facilitated TCP/IP convention stack that can give any microcontroller access to your Wi-Fi organize. The ESP8266 can do either encouraging an application or offloading all Wi-Fi frameworks organization limits from another application processor. Each ESP8266 module comes pre-changed with an AT bearing set firmware, which implies, you can simply associate this to your Arduino contraption and get about as a great deal of Wi-Fi limit

As a Wi-Fi Shield offers (and that is essentially out of the case)! The ESP8266 module is an exceptionally reasonable board with a monster, and routinely creating, organize.

This module has an astounding enough prepared taking care of and limit capacity that empowers it to be consolidated with the sensors and other application unequivocal contraptions through its GPIOs with irrelevant improvement ahead of time and unimportant stacking during runtime. Its elevated level of on-chip joining considers unimportant outside equipment, including the front-end module, is expected to

include immaterial PCB zone. The ESP8266 supports APSD for VoIP applications and Bluetooth simultaneousness interfaces, it contains a self-balanced RF empowering it to work under each working condition, and requires no outside RF parts.

There is an essentially unfathomable wellspring of information available for the ESP8266, all of which has been given by shocking system support. In the Records territory underneath you will find various advantages for help you in using the ESP8266, even bearings on the most capable technique to changing this module into an IoT (Web of Things) arrangement [3]. The accompanying figure 4.4 shows a Wi-Fi module ESP8266.

Figure 4.1: Wi-Fi module ESP8266

4.2.1 Features of ESP8266

ESP8266 Wi-Fi module has such an enormous number of features in it, for instance,

- 802.11 b/g/n
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLLs, regulators, DCXO and power management units
- +19.5dBm output power in 802.11b mode
- Power down leakage current of <10uA
- 1MB Flash Memory
- Integrated low power 32-bit CPU could be used as application processor
- SDIO 1.1 / 2.0, SPI, UART
- STBC, 1×1 MIMO, 2×1 MIMO
- A-MPDU & A-MSDU aggregation & 0.4ms guard interval
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)

This module is really small but it can be used in so many Wi-Fi based projects for the features it has.

4.3 Relay Board

A hand-off is a kind of switch which is compelled by an electric stream. A hand-off makes it plausible for a low voltage low current circuit to switch a high voltage just as high current device safely - for example, a little battery-filled light marker circuit can be used to control tremendous mains controlled security lights through a hand-off.

Rather than including a mains evolving hand-off to circuits authentically, it is endorsing to use a hand-off board - for instance a financially created circuit board fitted with a hand-off, Drove marker, back EMF keeping away from diode, and easy to use screw-in terminal affiliations. These are presently open more productively than we can make them ourselves.

The least mind boggling hand-off board has just one exchange, one Drove used to show the status of the switch, one covering diode to foresee back EMF from hurting related equipment, and screw-in terminals for the voltage inputs and for the NC, NO, and COM relationship on the hand-off. Figure 4.4 shows a clear move.

Figure 4.2: A simple 4 channel relay.

Presented above is such a hand-off load up, that can acknowledge an info voltage of 12 VDC and 24 VDC, will switch mains power at flows of up to 8 Amps, and is twofold shaft so one can utilize it to turn two gadgets on or off simultaneously.

For some undertakings there will be more than one transfer required - for instance in sun powered trackers where 2+ (high current) engines must be controlled if the sun powered boards fitted to the tracker are to pursue the Sun\'s movement crosswise over AND here and there the sky. For such inevitabilities numerous transfer (otherwise known as multi-channel) hand-off sheets are accessible. These can have anything from 2 to 16 transfers fitted to a similar circuit board to make it simple to keep everything sheltered and clean. Figure 4.6 shows an a board with eight transfers.

Presented above is a magnificent hand-off board with eight (10 Amps at 250 VAC exchanging) transfers. Each hand-off has its own transistor and the circuit board has a 12 VDC association - in this manner, only a low-current sign voltage is required to control each hand-off. This sort of hand-off board is hence very appropriate to microcontroller applications, for example, PICAXE based.

Latching relays require only a single pulse of control power to operate the switch persistently. Another pulse applied to a second set of control terminals, or a pulse with opposite polarity, resets the switch, while repeated pulses of the same kind have no effects. Magnetic latching relays are useful in applications when interrupted power should not affect the circuits that the relay is controlling.

4.4 Arduino IDE:

For this situation we can utilize diverse IDE like Microsoft's visual studio yet we picked this since this IDE is considerably more coordinated with Arduino than visual studio. Arduino IDE is likewise very easy to use and simple to utilize. Figure 4.5 shows a screen capture of Arduino IDE.
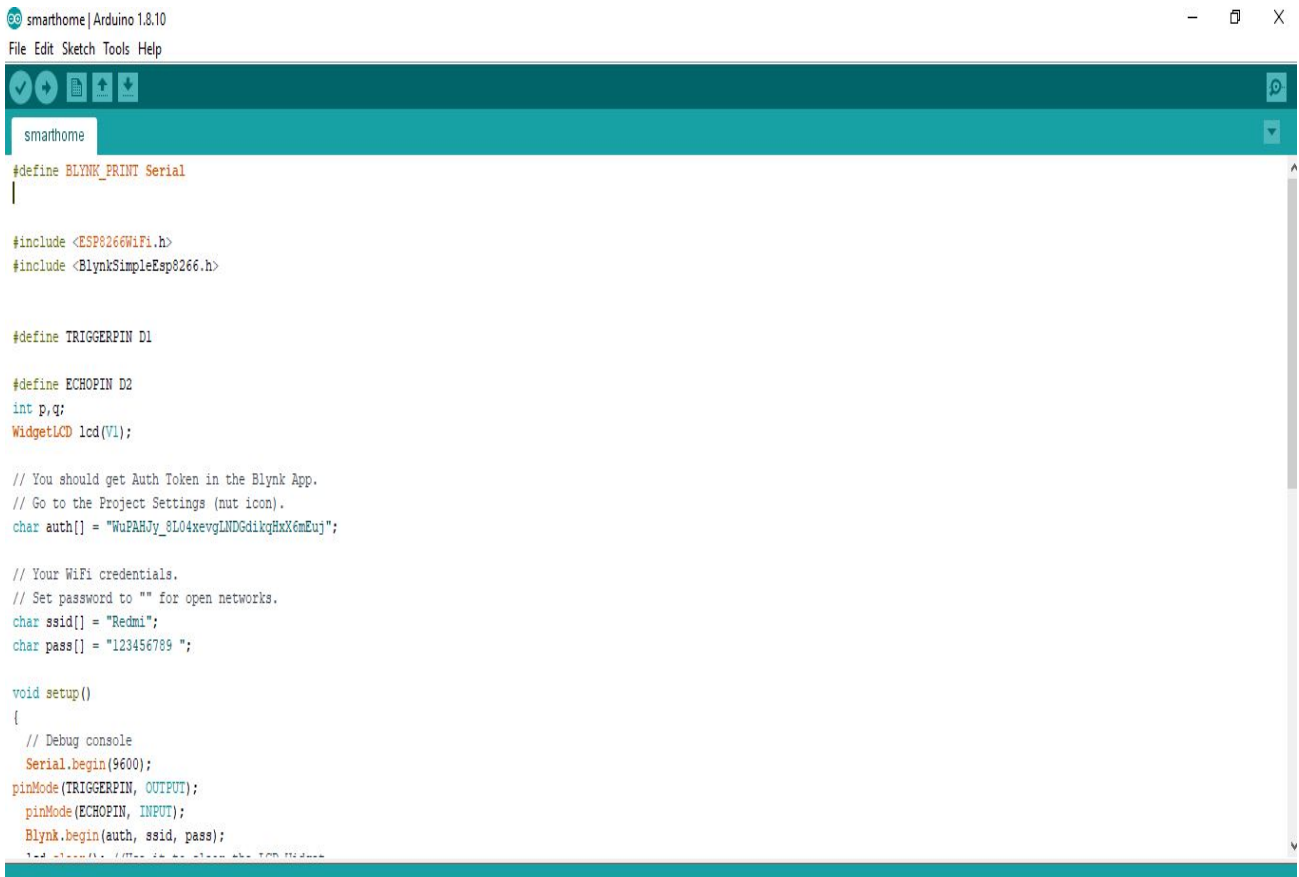
Figure 4.3: Screenshot from Arduino IDE

4.5 Ultrasonic Sensor :

Ultrasonic sensors are a sort of acoustic sensor partitioned into three general classifications: transmitters, collectors and handsets. Transmitters convert electrical sign into ultrasound, beneficiaries convert ultrasound into electrical sign, and handsets can both transmit and get ultrasound.

Along these lines to radar and sonar, ultrasonic transducers are utilized in frameworks which assess focuses by deciphering the reflected sign. For instance, by estimating the time between sending a sign and accepting a reverberation the separation of an item can be determined. Uninvolved ultrasonic sensors are essentially receivers that identify ultrasonic clamor that is available under specific conditions.

This module includes ultrasonic transmitters, receiver and control circuit. Its stable performance and high ranging accuracy make it a popular module in electronic market. There are 5 pins out of the module, VCC, Trig, Echo, GND and OUT. Best performance in 30 degrees angle; Electronic brick compatible interface; Dual transducer;

Figure 4.4: Ultrasonic sensor

4.5.1 Feature of ultrasonic sensor:

- Voltage: DC 5V;
- Current: 15mA;
- Ultrasonic Frequency: 40K Hz;
- Maximal Range: 500cm;
- Minimal Range: 2cm;
- Resolution: 1cm;
- Response time: 100MS;
- Output signal: 5V TTL level;
- Trigger Pulse Width: 10µs;
- Operating temperature: -10--+60degree;
- Storage temperature: -20--+80degree;
- Dimension (L x W x H): Approx. 44 x 20 x 18 mm;

4.6 Web Interface (Controller)

One must have this webpage in his/her mobile in order to operate this project. Figure 4.6 shows the web interface.
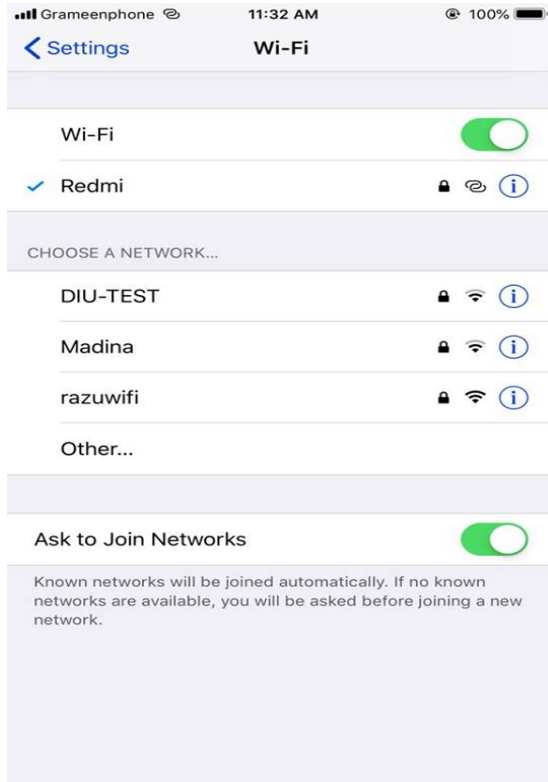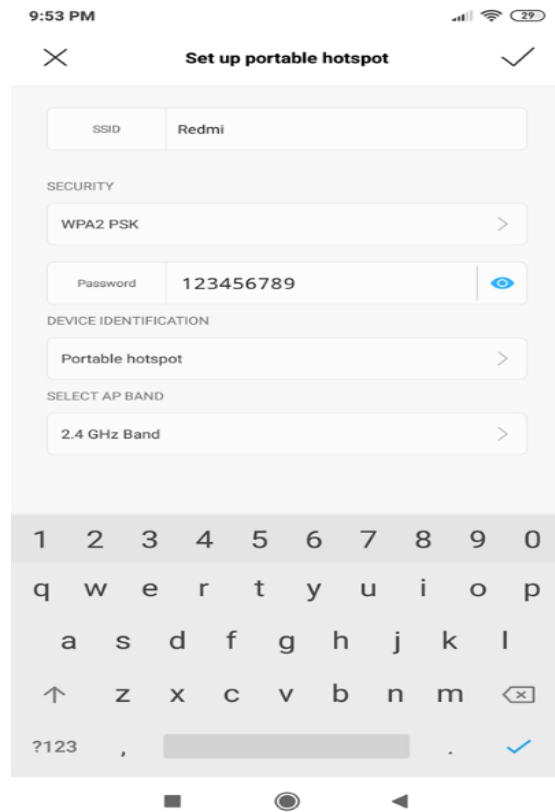
Figure 4.5: Wi-Fi name   Figure 4.6: Wi-Fi configure page
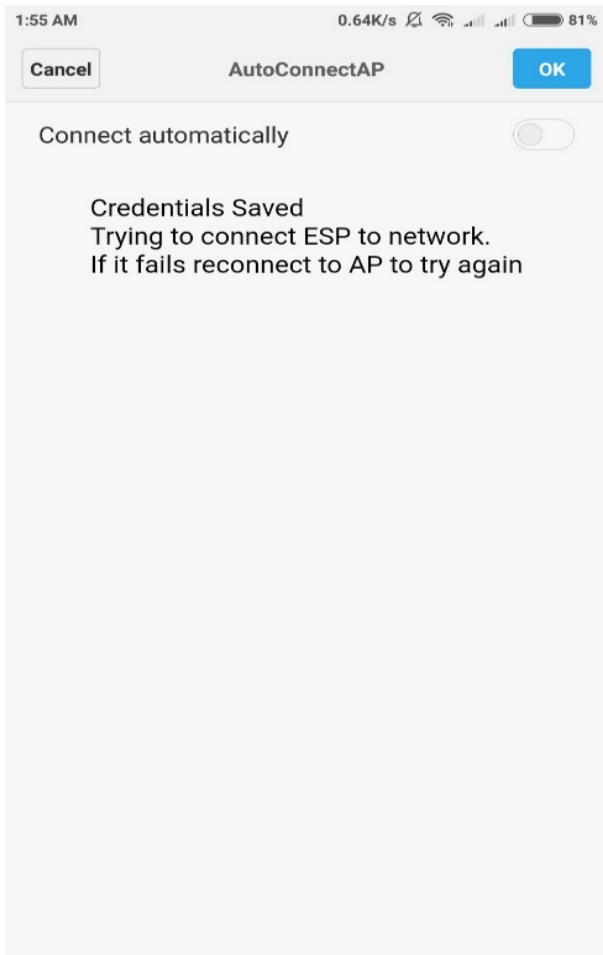
Figure 4.8: Established with Wi-Fi network
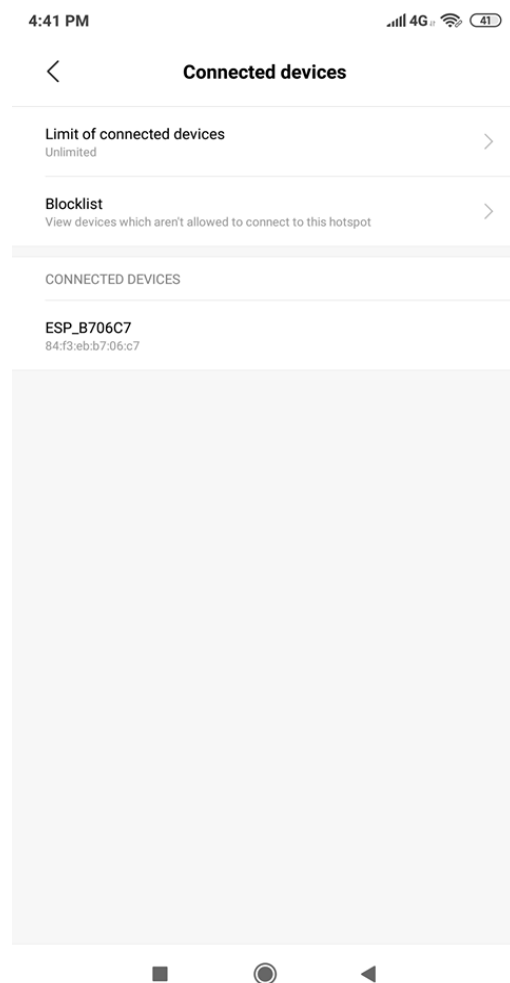
Figure 4.7: Connect with Wi-Fi network

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Writing Diagram / Layout

The following figure 5.1 shows the full wiring diagram/layout of the system.
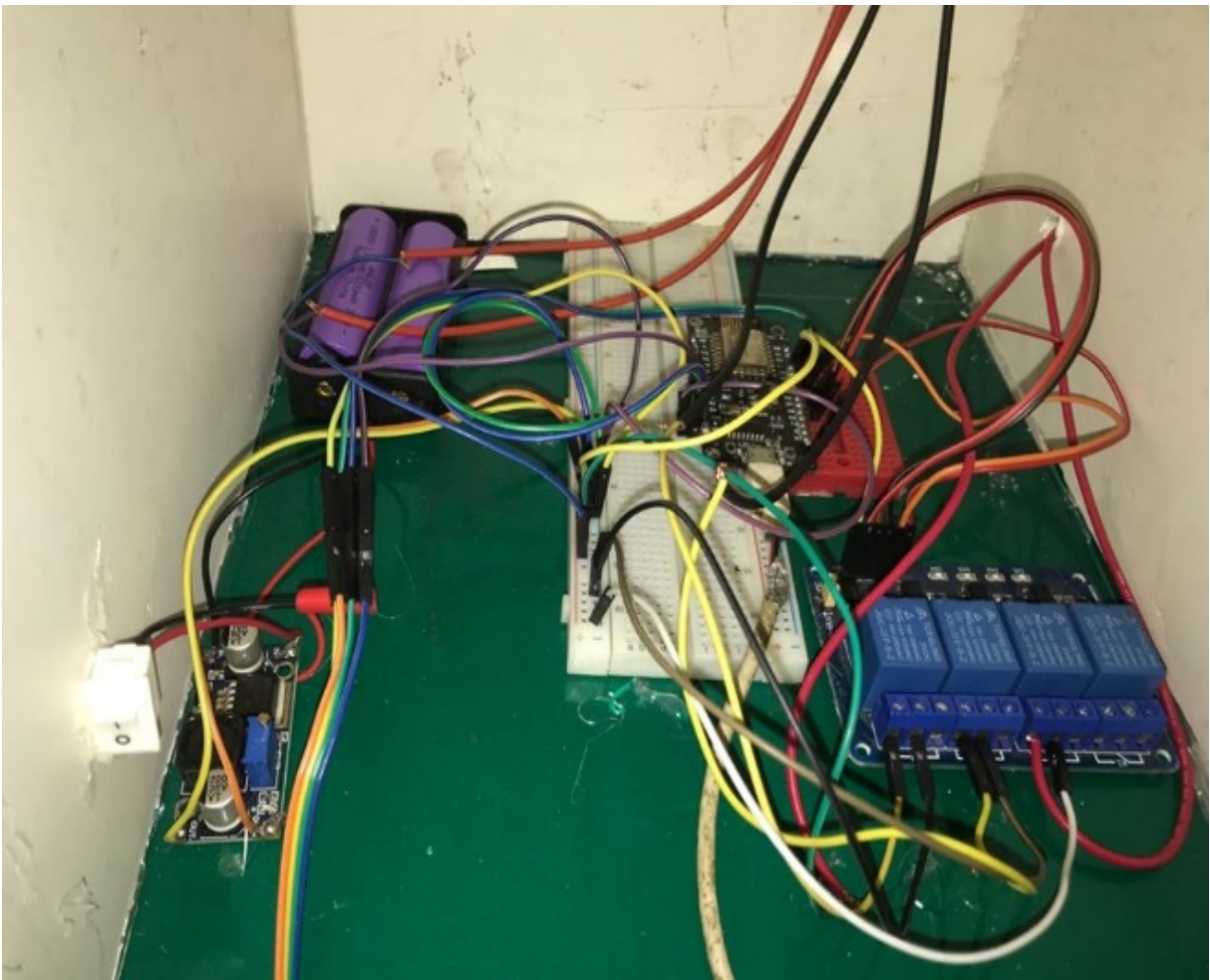
Figure 5.1: Wiring diagram of the system

5.2 Code

In this project we needed to utilize a sketch for Arduino and esp8266 Wi-Fi module where I worked with sequential ports and AT Commands. I utilized 11,12 and 13 sticks at first for this undertaking yet it is likewise entirely Possible to control more sticks by just including the underlying pinMode and computerized Write lines for that stick.

For controlling the mechanization framework through ESP8266 Wi-Fi module I made a straightforward database and android application.

5.2.1 ESP8266 Code Explanation

Here is how the Arduino Sketch works:
Whenever I click on a button in the HTML page a GET request is sent to the ESP8266

- To know when request is in progress, the Arduino looks for the string "+IPD," in the Serial buffer using Serial find.
- The code then reads the next character (the connection id, 0 in the example request above). The connection ID is needed to know which connection to close (different simultaneous requests have a different ID).

- Next we get the pin number by looking for the string "?pin=" in the serial buffer, once again using Serial find
- Now that we have the pin number we know which pin to toggle

5.3 Implementation

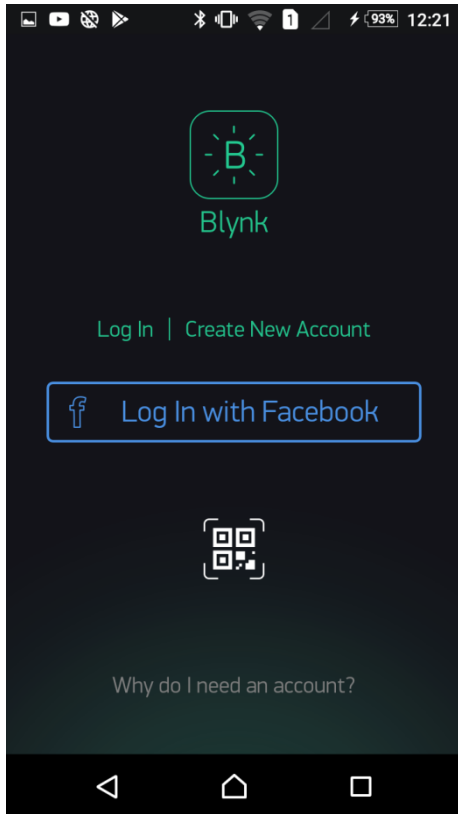Here are some pictures of the developed prototype. Figure 5.4 shows the developed prototype of our project.
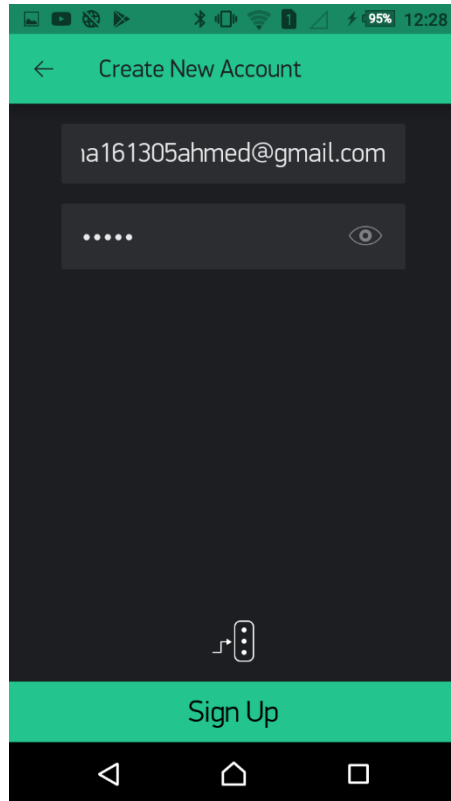
Figure 5.2: Home page
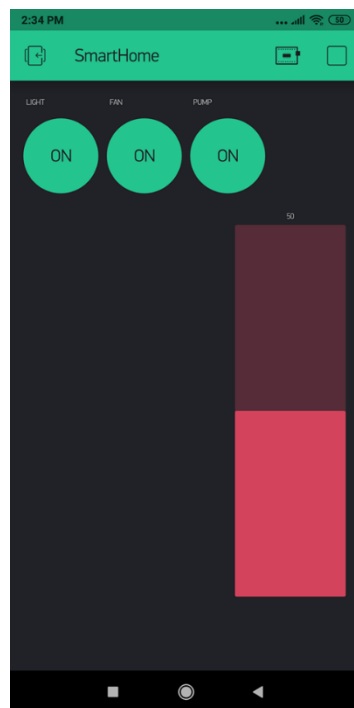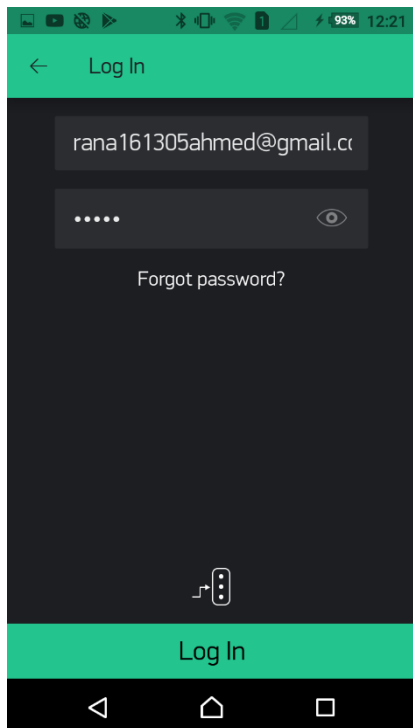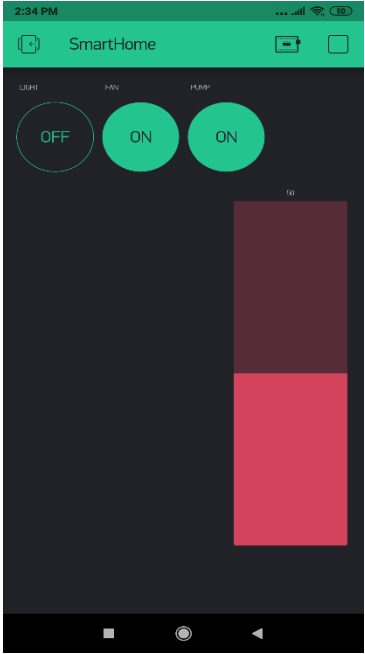

Figure 5.3: Register page

Figure 5.4: Log in page

Figure 5.5: Switch Button

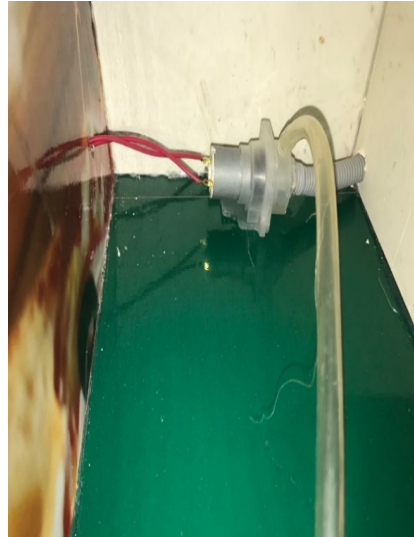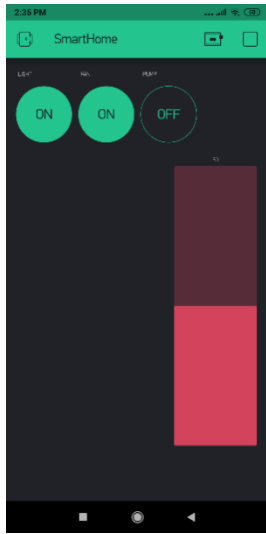Figure 5.6: Initial stage of project
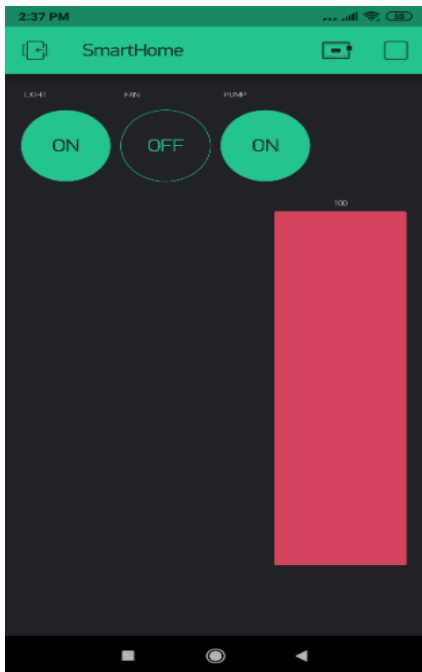
Figure 5.8: Water pump on

Figure 5.9: Fan on

Figure 6.0: Water pump, light and fan are on

CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1 Conclusion

It is discernible from this task a home robotization framework can be reasonable by utilizing locally accessible cheap segments and can be utilized for controlling different home apparatuses like water siphon, fan, light, forced air system, TV and so forth from anyplace. Furthermore, additionally, the necessary parts are minimal enough and less that the segments can be bundled in a little unspectacular holder.

This venture home robotization framework was actualized a few times and it was effective to control light and fan utilizing the application.

In this way, the home robotization framework can likewise be made by utilizing Bluetooth, infrared beam and WAP (Wireless Application Protocol) and the adjustments in the plan will likewise be less and it will at present have the option to control different home apparatuses. Furthermore, this task can be change in size or scale and it is likewise versatile.

6.2 Limitations

For implementing this project, a smartphone is must needed to control the automation system and a holder to contain this project.

6.3 Future Work

- ❖ We will work more to control more home appliances like full air-conditioning systems.
- ❖ We will try to use advanced user interface.

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4. **Study on Relay,** <https://en.wikipedia.org/wiki/Relay>, [last accessed on 02-10-2019 at 12.30 pm.]

Smart Home

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