Department of Electrical and Computer Engineering
North South University

Junior Design Project

Energy Efficient and Secure Home Automation for Visually Impaired people

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Spring, 2020

AGREEMENT FORM

We take great pleasure in submitting our junior design project report on "Energy Efficient and Secure Home Automation for Visually Impaired people". This report is prepared as a junior design project. EEE/ETE 299 is a junior design course. This course involves a team of students who build and test custom designed systems, components or engineering processes. We would like to request you to accept this report as a partial fulfillment of Bachelor of Science degree under Electrical and Computer Engineering Department of North South University.

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ACKKNOWLEDGEMENT

By mercy of the Almighty we have completed our junior design project entitled "Energy Efficient and Secure Home Automation for Visually Impaired people".

Foremost, we would like to express our sincere gratitude to our advisor Rashed Shelim for his continuous support in our project progress throughout the whole semester for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped us in all the time of research, writing and completing of this project.

Our sincere thanks also goes to North South University, Dhaka, Bangladesh for providing an opportunity in our curriculum which enabled us to have an industrial level experience as part of our academics.

Last but not the least, we would like to thank our family as their inspiration and guidance kept us focused and motivated.

ABSTRACT

The main objective of this project is to develop a home automation system using an Arduino board with Bluetooth being remotely controlled by any Android OS smart phone. As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving remote controlled switches. Presently, conventional wall switches located in different parts of the house makes it difficult for the user to go near them to operate. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled home automation system provides a most modern solution with smart phones. In order to achieve this, a Bluetooth module is interfaced to the Arduino board at the receiver end while on the transmitter end, a controller application on the cell phone sends ON/OFF commands to the receiver where loads are connected. By touching the specified button on the application, the loads can be turned ON/OFF remotely through this technology. The loads are operated by Arduino board through Bluetooth module.

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Chapter-1

OVERVIEW

1.1 Introduction

Nowadays, we have remote controls for our home and other electronic systems, which have made our lives real easy. Have you ever wondered about home automation which would give the facility of controlling tube lights, fans and other electrical appliances at home using a remote control? Off-course, Yes! But, are the available options cost-effective? If the answer is No, we have found a solution to it. We have come up with a new system called Arduino based home automation using Bluetooth. This system is super-cost effective and can give the user, the ability to control any electronic device without even spending for a remote control. This project helps the user to control all the electronic devices using his/her smartphone. Time is a very valuable thing. Everybody wants to save time as much as they can. New technologies are being introduced to save our time. To save people's time we are introducing Home Automation system using Bluetooth. With the help of this system you can control your home appliances from your mobile phone. You can turn on/off your home appliances within the range of Bluetooth.

1.2 Project Definition

The automation system connects with the smartphone through Bluetooth. The smart phone sends control signals to switch home appliances ON or OFF by an android app through Bluetooth interface. The project is built on Arduino UNO and is used to control LEDs and four home appliances connected to the Arduino through relays.

Home automation or domestics is building automation for a home, called a smart home or smart house. A home automation system will control lighting, climate, entertainment systems, and appliances. It may also include home security such as access control and alarm systems. When connected with the Internet, home devices are an important constituent of the Internet of Things

A home automation system typically connects controlled devices to a central hub or "gateway". The user interface for control of the system uses wall-mounted terminals, tablet or desktop computers, a mobile phone application, or a Web interface, that may also be accessible off-site through the Internet.

While there are many competing vendors, there are very few worldwide accepted industry standards and the smart home space is heavily fragmented. Manufacturers often prevent independent implementations by withholding documentation and by litigation. Home appliances like fan, Bulb, AC, automatic door lock are controlled by Home automation system using Arduino Uno with Bluetooth module.

The paper mainly focuses on the monitor and control of smart home by Android phone and provide a security based smart home, when the people does not present at home.

CHAPTER-2

Existing System

And Solutions Adopted

2.1 Introduction

Technology is advancing every day. Having a smart home is becoming a necessity. Some years ago, everyone thought smart homes as a luxury thing to have, but today they have become an important part of our lives. There are many reasons to turn your home into a smart home.

2.2 Efficiency

With a one-touch button or portable application, you'll be able to control numerous gadgets or systems. With the assistance of the smart device, you'd be able to operate your heating and cooling, additionally activate and switch off lights with one click from anywhere in your house. This is often not just an efficient procedure but it'll also facilitate your save electricity.

2.3 Convenience

Having a smart home allows you to deal with many electric gadgets and systems in the house. Turn on fan, turn on lights, turn on TV, control garage door and monitor security. The following features of the smart home are enough to convince a person to turn their homes into smart homes.

2.4 Comfort

Smart homes make your life comfortable. You do not need to move everywhere in house to perform various functions. With some smart devices, you'll be able to do all household activities through applications while sitting comfortably on the sofa or in bed.

2.5 Peace of Mind

A smart home is also a serious way to give peace of mind; you'll utilize the smart device to test the doors, windows, water spill sensors, etc. Moreover, you'll also certify your garage door is correctly shut through an application.

2.6 Customization

Smart homes also allow you to own electronic things the way you prefer to own them. You'll be able to have the shades drawn automatically at a specific time, adjust the brightness of indoor also as outdoor lighting as per your choice. Similarly, you'll be able to customize every single electronic item as per your will and furthermore you'll be able to also set timings for various choices to be implemented. Apart from these benefits, there also are some essential reasons that make it necessary for you to show your home into a sensible home.

2.7 Security

Terrorism and other small crimes are now quite common and during this era, everyone wants to form their home secure. Smart homes will allow you to form your home secure still because it will allow you to observe the safety very easily through your smartphones.

2.8 Utility Bills

The world is getting expensive day by day and people are also getting very concerned about their utility bills. Smart home makes sure you save electricity bill and reduce your power and water bills. Often it's observed that lights remain on because of the laziness of standing up and turning them off. A sensible home will allow you to show off lights and other electronic items even after you are in bed and visiting sleep. It'll prevent an enormous amount of money.

2.9 Life-saving home alarms

Fire and theft is only a pair of events that may annihilate your home or undermine the lives of friends and family. Smart home devices can cause you to responsive to such events through alarms and notifications which may be enough to avoid wasting your life.

2.10 Existing Systems

Almost every commercially available home automation systems are all-in-one solutions which require that everyone controllable appliances are from the identical company or must be approved as compatible with said company's system. Moreover these systems normally include a proprietary, dedicated device that acts because of the center. To regulate the system from multiple locations, additional control devices must be purchased. These complex systems usually must be integrated when the building is made and must be planned. They're also difficult to upgrade or replace once installed. The investment adds up considerably and is financially infeasible in most cases. These drawbacks hinder the recognition of such systems.

2.11 Proposed System

The aim of the proposed system is to produce a low-cost solution for a home automation system that overcomes the above drawbacks. Our system provides basic control of appliances at a fraction of the value of commercially available systems. The concept of a proprietary control device is finished away with because the system will be controlled from a Bluetooth enabled mobile device. There's no need for a specialized server system as a typical desktop PC can act because the server. Nowadays most users already own the requisites like a smartphone. Hence the value of the system is considerably reduced. The system will be easily integrated into an existing electrical system of a building because of its simplified design. It may be easily installed

for just one room if one so desires. Modifications to the prevailing electrical system are minimal, thereby reducing installations costs.

2.12 Summary

This chapter gave a plan about previous works on Home Automation System and also the pros and cons they need. There have been a pair of works done before and has some similarities with our work. A segment of using Bluetooth has little closeness to our idea. The way of not using extra peripherals and connectivity was addressed here. Smartphone-based monitoring system can reduce the value of additional software and devices, as in present almost every students possess a Smartphone.

CHAPTER-3

SYSTEM DESIGN

3.1 Introduction

This Home automation project is one of the most important Arduino project. Arduino based Home automation using Bluetooth helps the user to control any electronic device using Device control app on their Android smartphone. The android app sends commands to the controller – Arduino, through wireless communication, namely Bluetooth. For the Arduino to run we compiled a code and for the hardware part, we used a 4-channel relay module. The whole procedure of the project as starting from making time of contest to running codes and connecting the built in hardware functionality has been done to a great extent and tested in making of this project.

3.2 Hardware component

1) ARDUINO UNO

2) 4CHANNEL RELAY (5v)

3) BLUETOOTH MODULE HC05

4) POWER SUPPLY

5) LED

6) Motors (5V)

7) Fan

8) Connecting Wires

9) Circuit Board

10) SMARTPHONE (BLUETOOTH enabled)

3.3 Description

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or Breadboards and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

The Arduino project started in 2003 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

The name *Arduino* comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduino of Ivrea, who was the margrave of the March of Ivre and King of Italy from 1002 to 1014.

Features of the Arduino UNO:

Microcontroller: ATmega328

Operating Voltage: 5V

Input Voltage (recommended): 7-12V

Input Voltage (limits): 6-20V

Digital I/O Pins: 14 (of which 6 provide PWM output)

Analog Input Pins: 6

DC Current per I/O Pin: 40 mA

DC Current for 3.3V Pin: 50 mA

Flash Memory: 32 KB of which 0.5 KB used by bootloader

SRAM: 2 KB (ATmega328)

EEPROM: 1 KB (ATmega328)

Clock Speed: 16 MHz

Arduino Hardware Part:

Arduino is open-source hardware. The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on the Arduino website. Layout and production files for some versions of the hardware are also available.

Although the hardware and software designs are freely available under copy left licenses, the developers have requested the name *Arduino*to be exclusive to the official product and not be used for derived works without permission. The official policy document on use of the Arduino name emphasizes that the project is open to incorporating work by others into the official product. Several Arduino-compatible products commercially released have avoided the project name by using various names ending in -*duino*.

Most Arduino boards consist of an Atmel 8-bit

AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560) with varying amounts of flash memory, pins, and features. The 32-bit Arduino Due, based on the Atmel SAM3X8E was introduced in 2012. The boards use single or double-row pins or female headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed *shields*. Multiple and possibly stacked shields may be individually addressable via an I²C serial bus. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator or ceramic resonator. Some designs, such as the LilyPad, run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions.

Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default boot loader of the Arduino UNO is the opt boot loader. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS-

232 logic levels and transistor–transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its

own ICSP header. Other variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. When used with

Traditional microcontroller tools, instead of the Arduino IDE, standard AVR in-system programming (ISP) programming is used.

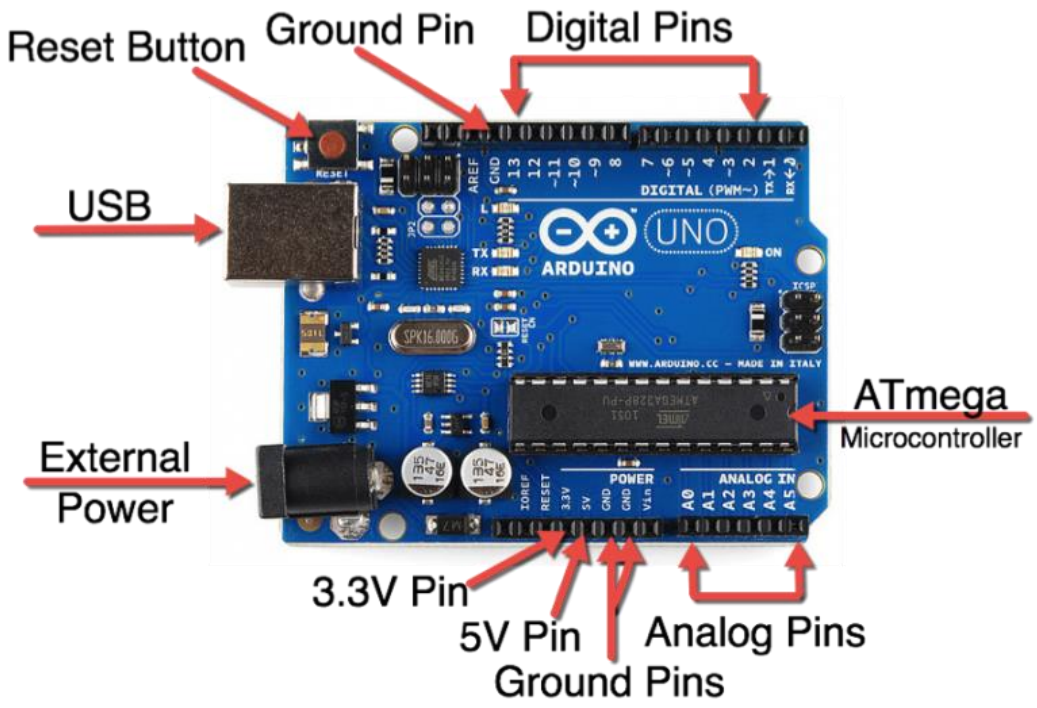


Figure 1: Arduino Uno

The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The *Diecimila*, *Duemilanove*, and current *Uno* provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.1-inch (2.54 mm) headers. Several plug-in application shields are also commercially available. The Arduino Nano, and Arduino-compatible Bare Bones Board and Boarduino boards may provide male header pins on the underside of the board that can plug into solderless breadboards.

Many Arduino-compatible and Arduino-derived boards exist. Some are functionally equivalent to an Arduino and can be used interchangeably. Many enhance the basic Arduino by adding output drivers, often for use in school-level education, to simplify making buggies and small robots. Others are electrically equivalent but change the form factor, sometimes retaining compatibility with shields, sometimes not. Some variants use different processors, of varying compatibility.

Arduino Software Part:

IDE

The Arduino integrated development environment (IDE) is a cross-platform application

(for Windows, macOS, Linux) that is written in the programming language Java. It originated from the IDE for the languages *Processing* and *Wiring*. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple *one-click* mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. The source code for the IDE is released under the GNU General Public License, version 2.

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program *avrdude* to convert the executable code into

a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

Sketch

A program written with the Arduino IDE is called a sketch. Sketches are saved on the development computer as text files with the file extension *.ino*. Arduino Software (IDE) pre-1.0 saved sketches with the extension *.pde*.

A minimal Arduino C/C++ program consists of only two functions:

setup(): This function is called once when a sketch starts after power-up or reset. It is used to initialize variables, input and output pin modes, and other libraries needed in the sketch.

loop(): After *setup()* has been called, function *loop()* is executed repeatedly in the main program.

It controls the board until the board is powered off or is reset.

Most Arduino boards contain a light-emitting diode (LED) and a load resistor connected between pin 13 and ground, which is a convenient feature for many tests and program functions.

A typical program for a beginning Arduino programmer blinks a LED repeatedly. This program uses the functions *pinMode()*, *digitalWrite()*, and *delay()*, which are provided by the internal libraries included in the IDE environment. This program is usually loaded into a new Arduino board by the manufacturer.

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.

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relayscontrol power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from

overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back. Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts.

Figure 2: 4 channel relay module

Magnetic latching relays can have either single or dual coils. On a single coil device, the relay will operate in one direction when power is applied with one polarity, and will reset when the polarity is reversed. On a dual coil device, when polarized voltage is applied to the reset coil the contacts will transition. AC controlled magnetic latch relays have single coils that employ steering diodes to differentiate between operate and reset commands.

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relayscontrol power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

The Arduino Relay module allows a wide range of microcontroller such as Arduino, AVR ,PIC, ARM with digital outputs to control larger loads and devices like AC or DC Motors, electromagnets, solenoids, and incandescent light bulbs. This module is designed to be integrated with 2 relays that it is capable of control 2 relays. The relay shield use one QIANJI JQC-3F high-quality relay with rated load 7A/240VAC,10A/125VAC,10A/28VDC.The relay output state is individually indicated by a light-emitting diode.

4 channel relay features:

Number of Relays: 4

Control signal: TTL level

Rated load: 7A/240VAC 10A/125VAC 10A/28VDC

Contact action time: 10ms/5ms

Applications Of Relay:

Relays are used wherever it is necessary to control a high power or high voltage circuit with a low power circuit, especially when galvanic isolation is desirable. The first application of relays was in long telegraph lines, where the weak signal received at an intermediate station could control a contact, regenerating the signal for further transmission. High-voltage or high-current devices can be controlled with small, low voltage wiring and pilots switches. Operators can be isolated from the high voltage circuit. Low power devices such as microprocessors can drive relays to control electrical loads beyond their direct drive capability. In an automobile, a starter relay allows the high current of the cranking motor to be controlled with small wiring and contacts in the ignition key.

Electromechanical switching systems including Strowger and Crossbar telephone exchanges made extensive use of relays in ancillary control circuits. The Relay Automatic Telephone Company also manufactured telephone exchanges based solely on relay switching techniques designed by Gotthilf Ansgarius Betulander. The first publics relay based telephone exchange in the UK was installed in Fleetwood on 15 July 1922 and remained in service until 1959.

The use of relays for the logical control of complex switching systems like telephone exchanges was studied by Claude Shannon, who formalized the application of Boolean algebra to relay circuit design in A Symbolic Analysis of Relay and Switching Circuits. Relays can perform the basic operations of Boolean combinatorial logic. For example, the Boolean and function is realized by connecting normally open relay contacts in series, the OR function by connecting normally open contacts in parallel. Inversion of a logical input can be done with a normally closed contact. Relays were used for control of automated systems for machine tools and production lines. The Ladder programming language is often used for designing relay logic networks.

Early electro-mechanical computers such as the ARRA, Harvard Mark II, Zuse Z2, and Zuse Z3 used relays for logic and working registers. However, electronic devices proved faster and easier to use.

Because relays are much more resistant than semiconductors to nuclear radiation, they are widely used in safety-critical logic, such as the control panels of radioactive waste-handling machinery. Electromechanical protective relays are used to detect overload and other faults on electrical lines by opening and closing circuit breakers.

Bluetooth module HC05

The HC-05 is a very cool module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. There are many android applications that are already available which makes this process a lot easier. The module communicates with the help of USART at 9600 baud rate hence it is easy to interface with any microcontroller that supports USART. We can also configure the default values of the module by using the command mode. So if you looking for a Wireless module that could transfer data from your computer or mobile phone to microcontroller or vice versa then this module might be the right choice for you. However do not expect this module to transfer multimedia like photos or songs; you might have to look into the CSR8645 module for that.

The HC-05 has two operating modes, one is the Data mode in which it can send and receive data from other Bluetooth devices and the other is the AT Command mode where the default device settings can be changed. We can operate the device in either of these two modes by using the key pin as explained in the pin description.

It is very easy to pair the HC-05 module with microcontrollers because it operates using the Serial Port Protocol (SPP). Simply power the module with +5V and connect the Rx pin of the module to the Tx of MCU and Tx pin of module to Rx of MCU as shown in the figure below:

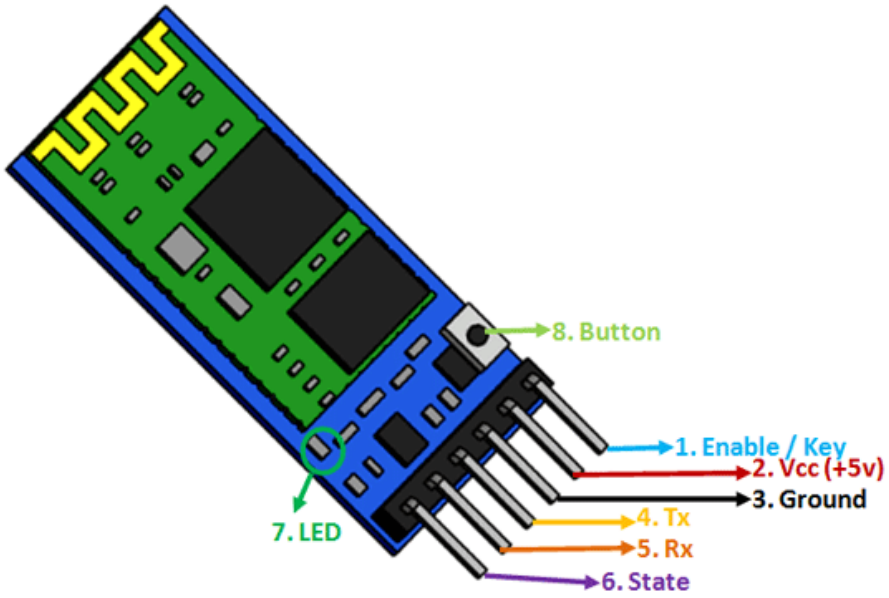


Figure 3: Bluetooth module HC05

Pin Description:

The HC-05 Bluetooth Module has 6pins. They are as follows:

ENABLE:

When enable is pulled LOW, the module is disabled which means the module will not turn on and it fails to communicate. When enable is left open or connected to 3.3V, the module is enabled i.e. the module remains on and communication also takes place.

Vcc:

Supply Voltage 3.3V to 5V

GND:

Ground pin

TXD & RXD:

These two pins acts as an UART interface for communication

STATE:

It acts as a status indicator. When the module is not connected to paired with any other Bluetooth device, signal goes Low. At this low state, the led flashes continuously which denotes that the module is not paired with other device. When this module is connected to/paired with any other Bluetooth device, the signal goes High. At this high state, the led blinks with a constant delay say for example 2s delay which indicates that the module is paired.

BUTTON SWITCH:

This is used to switch the module into AT command mode. To enable AT command mode, press the button switch for a second. With the help of AT commands, the user can change the parameters of this module but only when the module is not paired with any other BT device. If the module is connected to any other Bluetooth device, it starts to communicate with that device and fails to work in AT command mode.

HC-05 Default Settings:

Default Bluetooth Name: ,HC-05

Default Password: 1234 or 0000

Default Communication: Slave

Default Mode: Data Mode

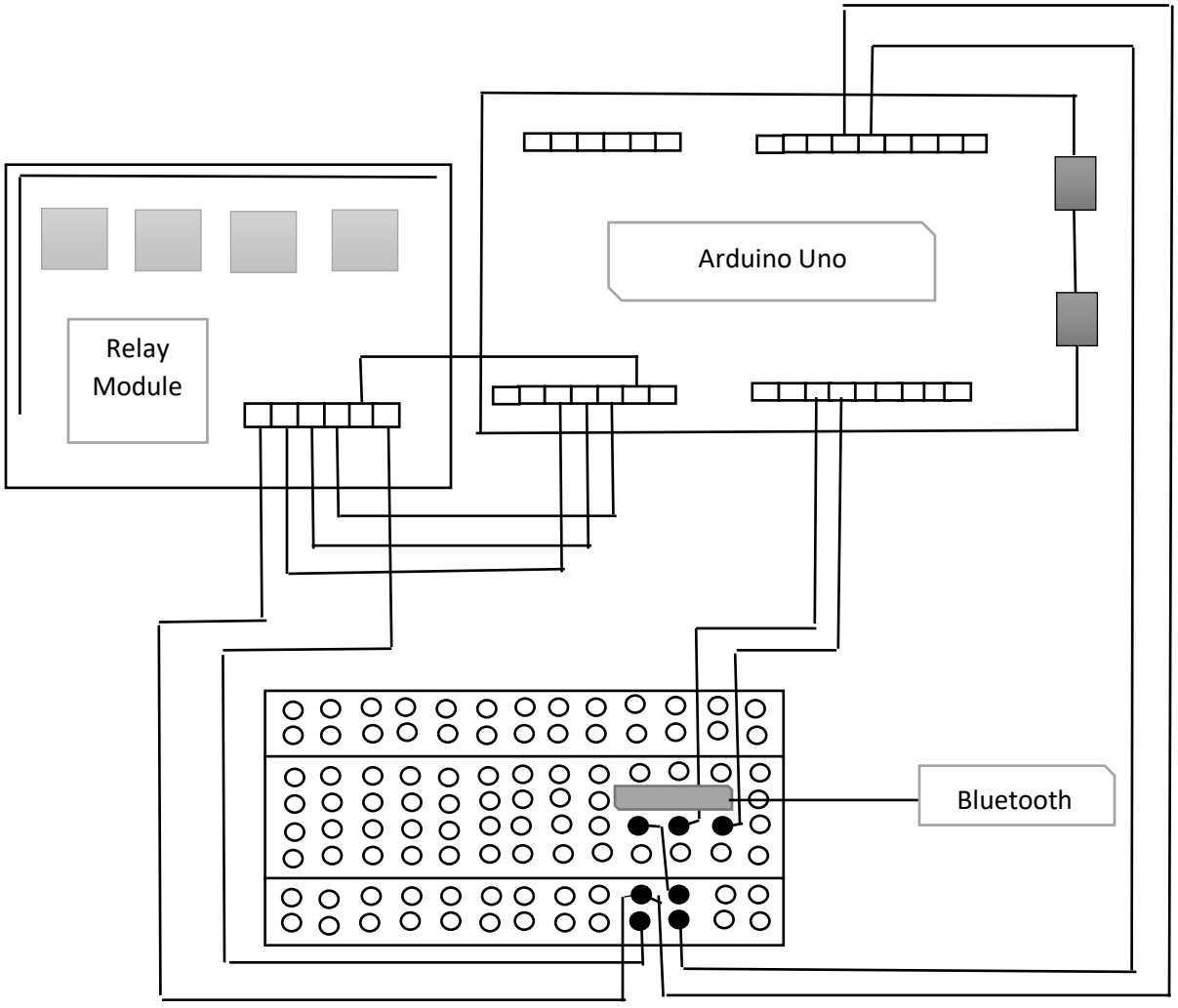
Data Mode Baud Rate: 9600, 8, N, 1

Command Mode Baud Rate: 38400, 8, N, 1

Default firmware: LINV

3.4 Circuit Diagram

For better understanding let's see the circuit schematics of the relay module in this configuration.



3.5 Block Diagram

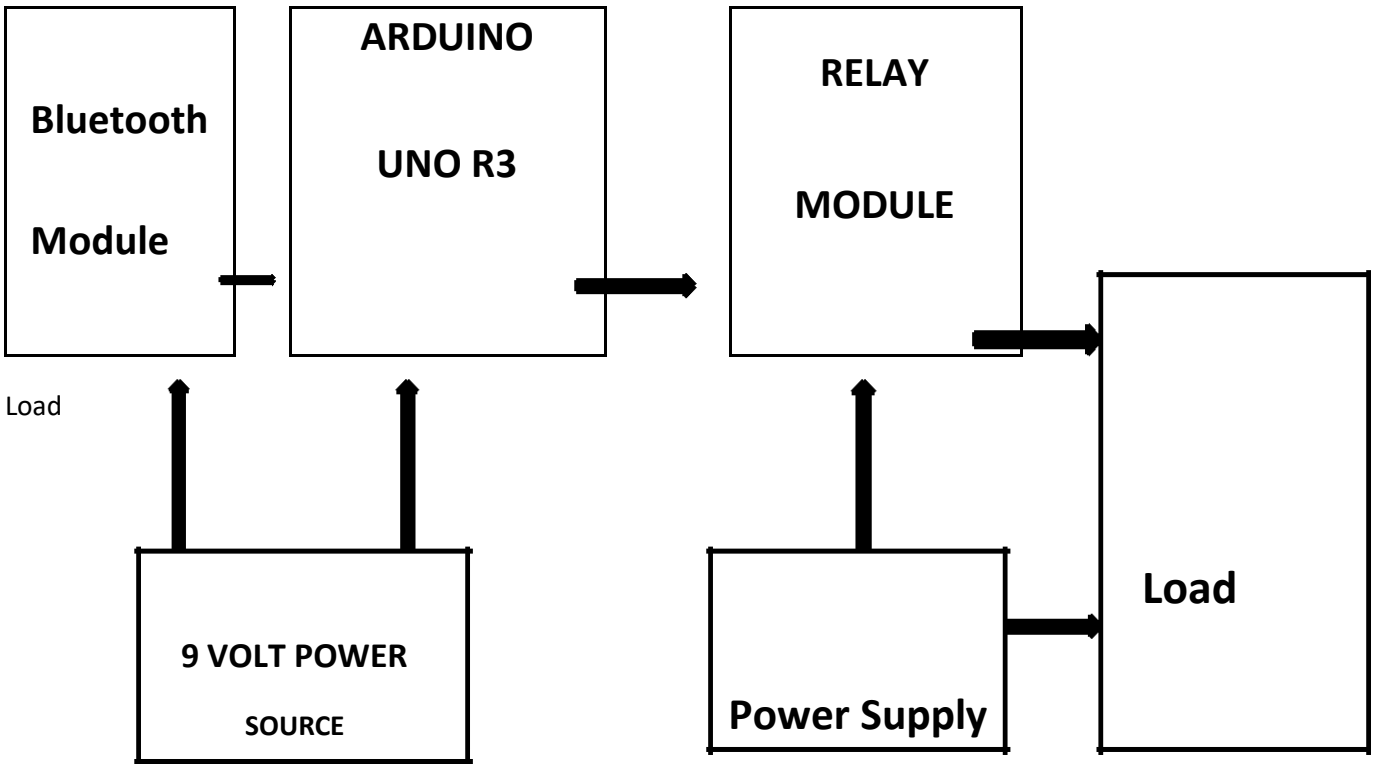


Figure 4 : Block Diagram of Home Automation System using Arduino and Bluetooth Module

3.6 Running code

For the project we compiled a code for Arduino to work through a 4-channel relay module via bluetooth.

Code:

```
#include <SoftwareSerial.h>

SoftwareSerial mySerial(10,11); //Pin10 RX , Pin 11 TX connected to


#define relay1 2

#define relay2 3

#define relay3 4

#define relay4 5

char val;

void setup() {

pinMode(relay1,OUTPUT);

pinMode(relay2,OUTPUT);

pinMode(relay3,OUTPUT);

pinMode(relay4,OUTPUT);

digitalWrite(relay1,HIGH);

digitalWrite(relay2,HIGH);

digitalWrite(relay3,HIGH);

digitalWrite(relay4,HIGH);

mySerial.begin(9600);

Serial.begin(9600);

}

void loop() {

//cek data serial from bluetooth android App

if( mySerial.available() >0 ) {

val = mySerial.read();
```

```
Serial.println(val);
}
//Relay is on
if( val == '1' ) {
digitalWrite(relay1,LOW); }
else if( val ==
'2' ) {
digitalWrite(relay2,LOW);}
else if( val == '3' ) {
digitalWrite(relay3,LOW); }
else if( val == '4' ) {
digitalWrite(relay4,LOW);}
//relay all on
else if( val == '9' ) {
digitalWrite(relay1,LOW);
digitalWrite(relay2,LOW);
digitalWrite(relay3,LOW);
digitalWrite(relay4,LOW);
}
//relay is off
else if( val == 'A' ) {
digitalWrite(relay1,HIGH);}
else if( val == 'B' ) {
digitalWrite(relay2,HIGH); }
else if( val == 'C' ) {
digitalWrite(relay3,HIGH); }
else if( val == 'D' ) {
digitalWrite(relay4,HIGH);}
//relay all off
else if( val == 'I' ) {
```

digitalWrite(relay1,HIGH);

digitalWrite(relay2,HIGH);

digitalWrite(relay3,HIGH);

digitalWrite(relay4,HIGH);

}

}

3.7 Application Program

We uploaded it to Arduino by this Arduino app from Pc. This is very efficient and can store a large number of records and requires a little configuration.

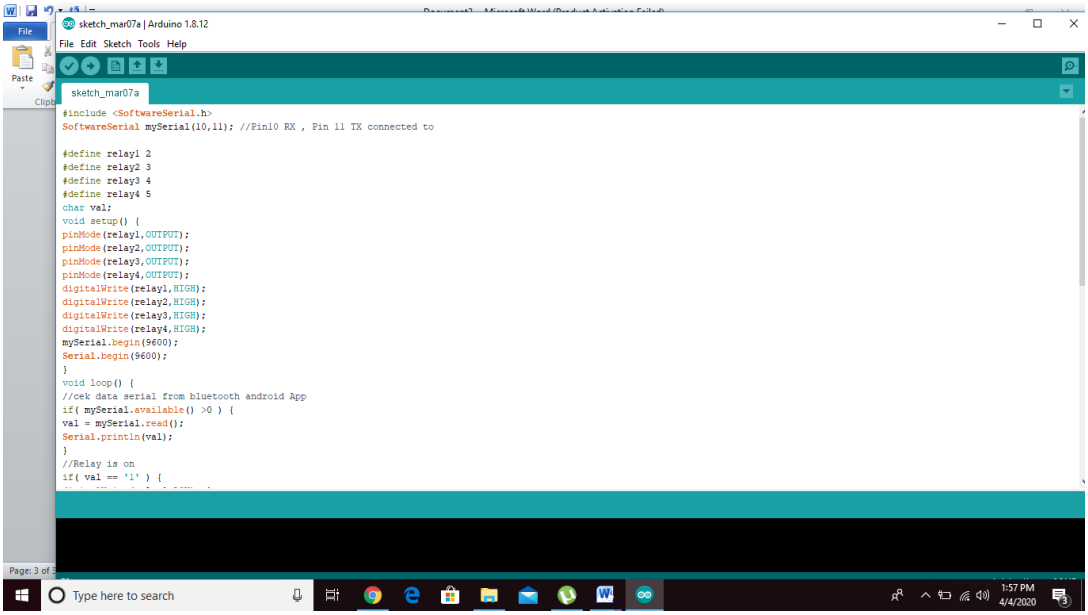
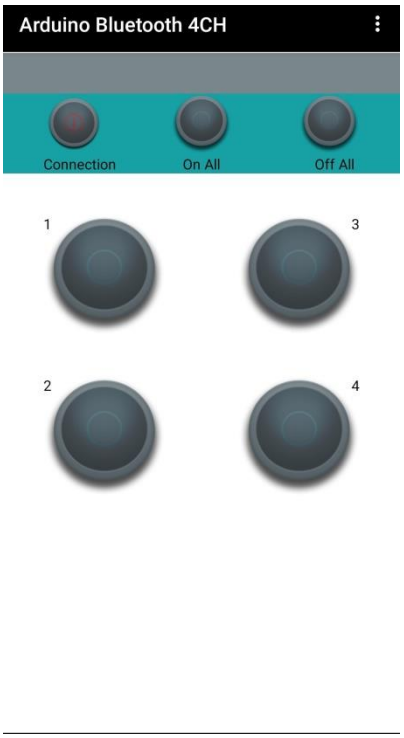


Figure 5: Code uploading through Arduino app.

Programming in Arduino app is simple, user friendly and easy to upload. Before uploading the code we removed the Rx and Tx pin from Bluetooth module.

Also we used a Bluetooth controller app for 4-channel relay called “Arduino Bluetooth Controller”. This app has 4 switches to on off and it’s easy to connect with the Arduino.


ARDUINO BLOETOOTH
RELAY 4 CHANNEL
©merahkemarun


Arduino Bluetooth 4CH
Connection
On All
Off All
1
3
2
4

CHAPTER-4

Methodology

4.1 Introduction

This chapter we are going to talk about how we planned our project timeline and also give us clear idea and view about the implementation and the steps we have taken for hardware and software implementation as well as our methodology in our project.

4.2 Project Layouts:

We created this timeline as to work step by step to finish our project in right time.

Period	Types of Activity
Week-1	Collect information from different sources, websites, faculty ,links and social media
Week-2	Make proper concept with individual idea and thoughts, cost analysis and submission the project proposal
Week-3	Equipment collection and gain the knowledge of how to communicate the project and insure the idea of making standard project
Week-4	Make digital imagination of simulation and insure the accurate measurement of design
Week-5	Test the equipment properly and build up the circuit with carefully according the design
Week-6	Remove the circuit design mistakes and attached all individual things properly and work for it's appropriate decoration
Week-7	Test all the parts and parcel of project and test the project part by part with caution
Week-8	Show the activity of the design to the faculty and according to his advice we extension other activity
Week-9	All kind of data analyzing and insure that everything is going according the blue print or design
Week-10	Collecting all members opinion, thought and advice and write the report, binding it
Week-11	Keep in hand a period of week to remove or adding anything of project
Week-12	Submission the junior design project

4.3 Work according to the timeline:

We divided the work between our group members as from the first weak. Two members will do the software work and will find the code suitable for our project. Other two members will do the hardware work and also buy them.

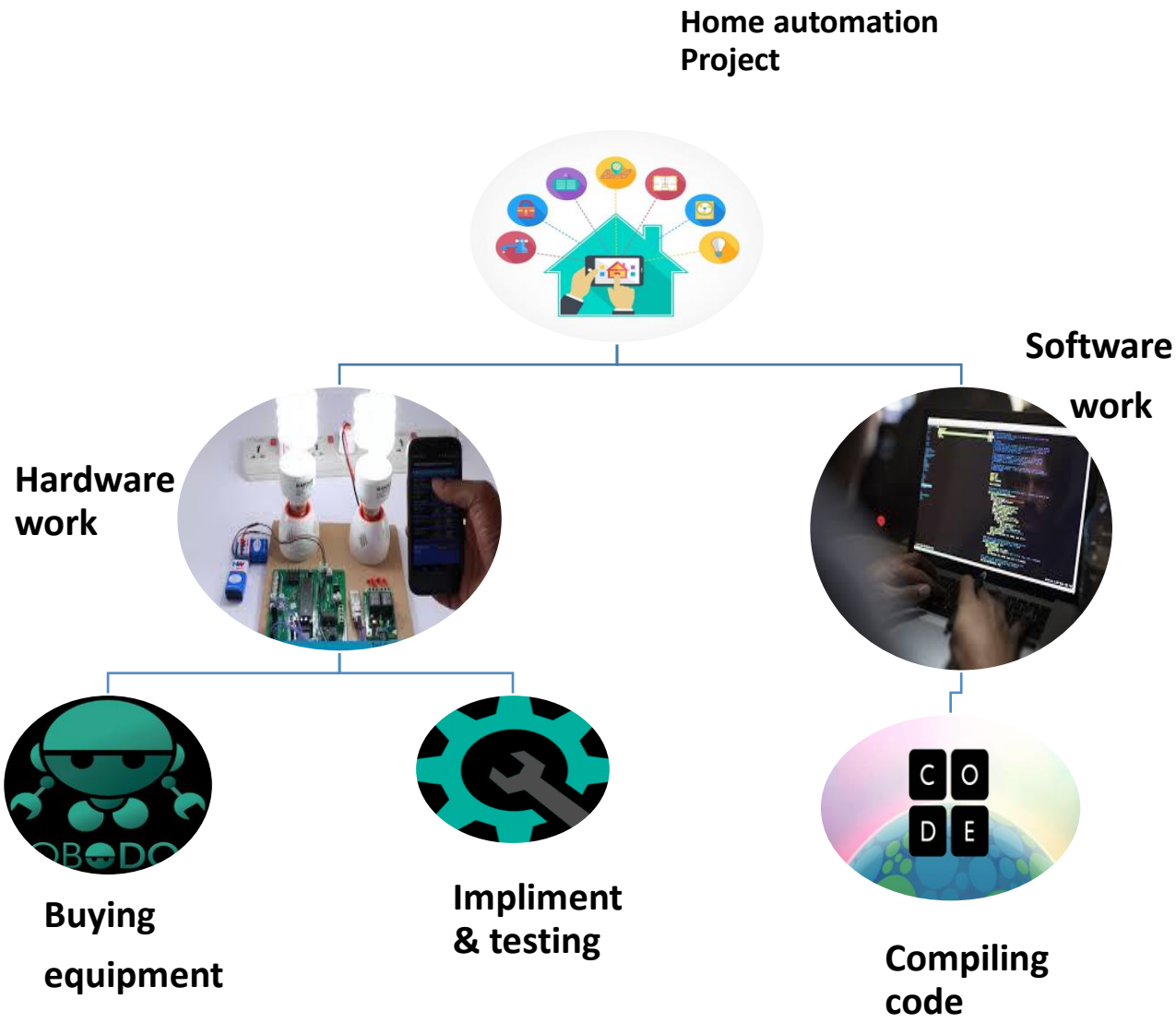


Figure 6: Work Dividing

Here’s all the equipment we bought:

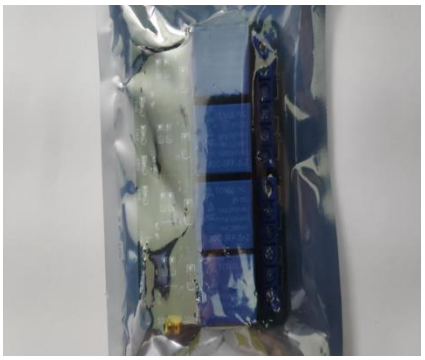


Figure 7 : Relay module

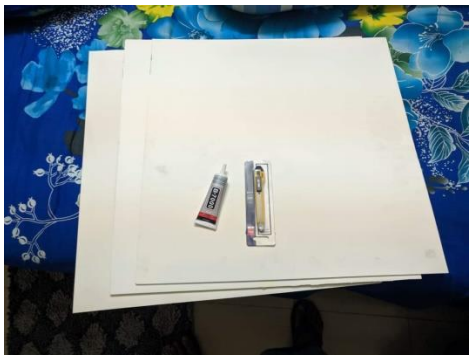


Figure 8: Wood board and gum

Figure 9: 9V battery

Figure 10 : Motors (5V)

Figure 11: Wire

Figure 12 : Bluetooth module HC05

Figure 13 : Arduino Uno

We updated every weeks work via our journal and weekly report. All the week didn't go with our plan. But at the end made the circuit and run it successfully and we also made a video of it.

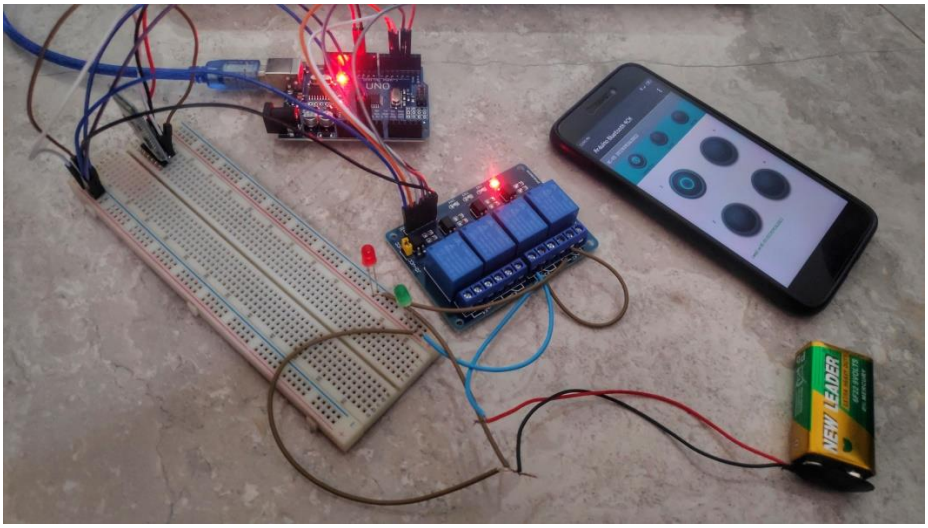


Figure 14 : Running the project via Bluetooth.

CHAPTER-5

Future Work

5.1 Introduction

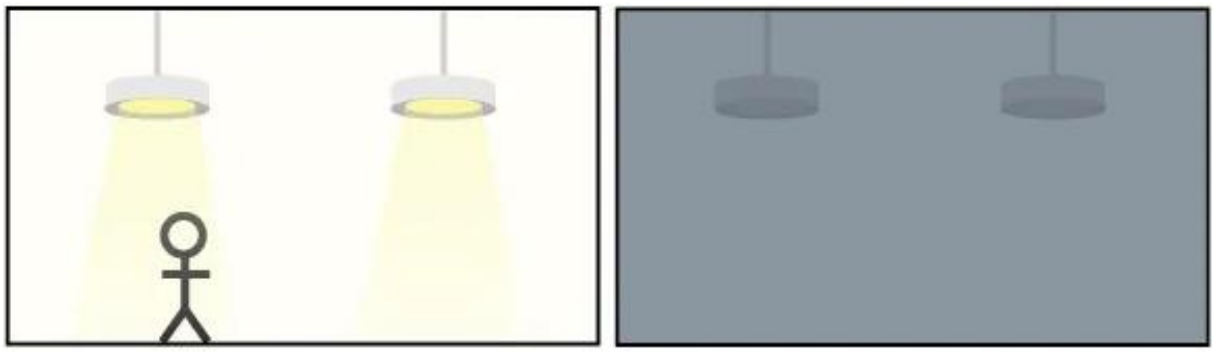
The future of smart homes appears like they'll only still grow in popularity, which suggests the way we live our day to day lives is getting ready to change drastically. Technology is improving at an exponential rate, and smart home technology is not any exception.

5.2 Artificial Intelligence

Smart homes are able to track our location inside a home, either via an electronic pin that we decline our clothes or electronic sensors inside the house. The house will know where we are, and it'll use this information to accommodate and even anticipate our needs.

5.3 Smart Lighting

Smart lighting automatically adjusts itself by detecting the presence of an occupant within the room – when the occupant exits, the lights will either dim or shut off entirely.



Lights **on** with occupant

Lights **off** without occupant

5.4 Smart Locks

Comparatively to smart lighting, smart locks may be programmed in line with our needs. Visitors may be granted or denied access supported specified identifiers.

5.5 Home Monitoring

When people leave for vacation, most ask their neighbors to stay an eye fixed on their homes for them while they're away.

What if there was some way for the house to watch itself?

Smart security systems will be able to monitor the house and report any unexpected incidents to the homeowner.

Additionally, smart homes can monitor elderly people living on their own. People who would rather be fine living on their own will have an additional hand to help them, reminding them to require their medication, and confirm day-to-day tasks are completed successfully and safely. Just in case anything happens – such an unexpected fall – emergency services are often notified and automatically allowed inside to assist.

CHAPTER-6
DEVELOPMENT WITH STANDARD QUALITY

6.1 Introduction

In this chapter we will discuss about the consistence of our task with various standards. Those standards will show how much it will service provided to us. Standards maintain the whole project condition. So we try to maintain that quality but during the corona virus condition we didn't complete whole part which is hard condition for the project. Now we discussing the standards The IEEE standards, US standards and European standards are very well known and we talked about in this part.

6.2 Experimentation

In this step, we were discussing about the necessary equipment and materials. We were studying about the similar projects, gathering the information of programming language to be used. We were developing simple algorithms and flowcharts.

6.3 Mobile app for smart home device control

Performance personalization and customized experience are the key priorities for Smart Home users. We have strong mobile team that will build end-user apps giving home owners the possibility to monitor, control and access the set-up of their smart gadgets via a familiar mobile UI. R-Style Lab will also develop mobile software that will host all home functionality under one unified interface and allow users to manage their entire park of smart devices within a single app. home security systems, smart locks, doorbells and even home appliances harness computer vision to empower home owners with the opportunity to monitor and control their property from everywhere. Having successfully

completed a number of digital imaging solutions, R-Style Lab will deliver Smart Home visual systems that send out image-based security alerts, employ facial user authentication, and rely on video analysis for ultimate Smart Home solution The goal of the Legal and Compliance department is to provide quality legal services in-house by professionals who are intimately familiar with the mission, activities, and business operations and opportunities Whether it's a line of consumer electronics products that you plan to turn into Smart Home solutions or you want to keep your customers' loyalty by making your electronics compatible with smart devices of a different make, or simply your market is product compatibility platforms – R-Style Lab has system-level programming proficiency to forward projects. Our smart technology company will develop integration layers, device drivers and embedded software to add support for your solutions in the smart ecosystem and enable product interoperability.

6.4 Development and Testing

In this phase, the development of application was performed. The bugs were identified and removed. We consulted many software experts for the evaluation of our application. Hardware design includes the design of power strip.

6.5 Literature Review:

As per our survey, there exist many systems that can control home appliances using android based phones/tablets. Each system has its unique features. Currently certain companies are officially registered and are working to provide better home automation system features. Following models describes the work being performed by others. N. Sriskanthan explained the model for home automation using Bluetooth via PC. But unfortunately the system lacks to support mobile technology.

Muhammad Izhar Ramli designed a prototype electrical device control system using Web. They also set the server with auto restart if the server condition is currently down.

Hasan has developed a telephone and PIC remote controlled device for controlling the devices pin check algorithm has been introduced where it was with cable network but not wireless communication. Amul Jadhav developed an application in a universal XML format which can be easily ported to any other mobile devices rather than targeting a single platform. Each of these system has their own unique features and on comparison to one another lacks some advancement.

Our designed system has application layer prototype. The application is able to synthesize the speech data with the help of Google Voice Reorganization. The synthesized data are analyzed and further processing is carried out. In layman words, our design system provides features of controlling the home appliances using voice commands.

The use of socket programming is performed to connect the android application with the raspberry pi. This further adds security to our system. The data are received only by the server at the specified port and data are further analyzed. Our project is different in a sense it has its own software level application to control the home appliances.

CHAPTER-7

Design Impact

7.1 Economic impact

This project is a prototype of a home automation. But we can use it on home with bigger load. But the prototype project didn't cost us much money. We build this within 3000 taka. Also, the project is built in such a way that every common people who have a smart phone will be able to use it.

7.2 Reducing physical efforts

Associated to daily activities such as the light on off or garage door open would be automatic. So, our physical efforts will be reduced and save energy.

7.3 Moral impact

This system is designed to assist and provide support in order to fulfill the needs of elderly and disabled in home. Household appliances can be easily controlled via a Mobile/Tablet.

7.4 Self-reflection

We noticed, as a diffuse and common need, the exigency of "being in control" on the environment. This need should not just be intended in terms of having information about the state of the different parts of the house (as an instance, on electrical consumption, or doors being locked/unlocked), but also and maybe mainly in terms of physical and visible organization of spaces. The space becomes a mirror of our activities, interests, and values. As an instance, some

senior people describing their entertainment activities at home showed the physical environments and objects they use as a demonstration of the suitability of their arrangements to this purpose.

7.5 Supporting awareness

Supporting awareness about remote and local environments and about personal wellbeing in such environments through numerical data collection, storage and representation on personal devices or dedicated appliances.

7.6 Security

The security of our door can assured. Also, sometimes we can't touch the switch for wet hand or the short circuit issue of the switches. This system will secure us from get shock from current.

7.7 Manufacturability

It is so easy to manufacture and less complex. We just need smartphone with Bluetooth to run it.

7.8 Limitations

Currently, the application is made for Android smart phones; other OS platform doesn't support our application. Also, sometimes Bluetooth can't cover the whole area.

CHAPTER-8

Conclusion

The project has proposed the thought of smart homes which is able to support plenty of home automation systems. A wise home contains a connection between wireless communication, sensors, monitoring and tracking. Smart homes are an outsized system that has multiple technologies and applications which are able to be accustomed provide security and control of the house easily. This project discussed light on/off, fan on/off, and opening garage door. All the features were remotely functional. During this project, an efficient approach for smart homes was proposed and implemented. A series of experiments are administrated on the proposed smart home. This shows the way to change light and fan, garage door opener. The project is implemented mainly for elderly and disabled people. Our main focus was to create their way of living easier.

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