HOME AUTOMATION SYSTEM USING IoT

Submitted in partial fulfilment of the requirements for the degree of

Bachelor of Technology
in
Electronics and Communication Engineering

By

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DECLARATION

I hereby declare that the thesis entitled "Home Automation System Using IoT " submitted by me, for the award of the degree of *Bachelor of Technology in Electronics and Communication Engineering* to VIT is a record of Bonafede work carried out by me under the supervision of Dr. Arun Kumar Chandrasekhar.

I further declare that the work reported in this thesis has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

Place : Vellore

Date : 16.04.2023

Signature of the Candidate

CERTIFICATE

This is to certify that the thesis entitled "Resource Optimization in Fog Computing" submitted by **BASAVA PAVAN SRIRAM (19BEC0423) SENSE**, VIT, for the award of the degree of *Bachelor of Technology in Electronics and Communication Engineering*, is a record of Bonafede work carried out by him under my supervision during the period, 09.07.2022 to 30.04.2023, as per the VIT code of academic and research ethics.

The contents of this report have not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university. The thesis fulfils the requirements and regulations of the University and in my opinion meets the necessary standards for submission.

Place : Vellore

Date : 16.04.2023

Signature of the Guide

Dr. Arun Kumar Chandrasekhar

ACKNOWLEDGEMENTS

I, BASAVA PAVAN SRI RAM, would like to thank Prof. Dr. Arun Kumar Chandrasekhar for his support and guidance without which this project would never have been successful. This project has definitely thrown light into the field home automation in rural and remote areas and opened a new horizon for me. The project was also successful in enriching my practical knowledge which is a lacking quality amongst present day students. I would also like to thank sir for believing in me and encouraging me to work hard and strive to inevitably succeed.

EXECUTIVE SUMMARY

Home automation refers to the use of technology to control and automate various appliances or devices in home. by automating various aspects of the home, people can save time and energy. This project aims to provide easy automation to places like home, offices and many other places at affordable prices and this is a user-friendly project with easy interfacing and controlling method. Overall, home automation is a growing field with many exciting possibilities and is likely to become increasingly popular as more people become interested in the benefits of smart home technology.

in this project we have introduced the event of house management or automation using Arduino and internet of things. this system is suitable for real time home automation and for remotely controlling home appliances.

the future applications can be used in different sectors where internet access is available such as industrial automation and management through internet, and with improved security measures can be used in extreme restricted areas

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LIST OF ABBREVATIONS

IoT – Internet of Things

UART - universal asynchronous receiver-transmitter

AT – Attention command

1.INTRODUCTION

1.1 objective

This Internet of Things (IoT)-based home automation project aims to build a smart home system capable of automating and controlling many domestic chores like lighting, energy use, etc. The project intends to increase resident comfort, convenience, and safety while lowering energy use and utility expenses. To facilitate smooth integration with current home appliances and gadgets, the project also seeks to develop a user-friendly interface for operating and monitoring the system. The project will concentrate on system adaptation for users' shifting tastes. By supporting the usage of the system and sustainable practices, the project also hopes to encourage environmental preservation, efficiency in household operations, sustainable living and enhances the quality of life.

1.2 motivation

A large number of resource-limited devices are expected in future networks with the development of the Internet of Things which will connect to the internet simultaneously. A large number of tasks will be generated such as autonomous vehicles, virtual reality, e-healthcare and home automation. which should be offloaded to the remote cloud server or other powerful computing devices to satisfy the requirements. home automation using IoT has been carried out to be one of the potential solution to automating work of a device in home such as lighting control, energy efficient usage and allowing to integrate with home appliances in future. IoT technology always been inspiring how it enhances the quality of the living and make lives comfortable.

1.3 background

As ages pass the necessity and development of technology increases exponentially, and that necessity leads in new outcomes which helps in making life of human beings more comfortable and efficient IoT allows you to connect with things, if things are connected to a network of communication over internet continuously, the data available from them are used to perform actions. And IoT has been doing a great deal of work in many fields starting with Health, Security, Automation, Analysis, Data visualization etc.

Many article regarding home automation rise through the decade and many methods like Bluetooth interfacing, Wi-Fi interfacing, micro-controller controlled, and some advanced technologies like machine learning etc have been part of improving the home automation field

2. PROJECT DESCRIPTION AND GOALS

IoT devices are nonstandard computing devices that connect wirelessly to a network and have the ability to transmit data. IoT involves extending internet connectivity beyond standard devices such as desktops, laptops, smartphones, tablets and any non-internet enabled device including everyday objects. Any physical object can be transformed into an IoT device if it can be connected to the internet to be controlled or communicate information.

home automation using IoT is a interesting field which has the ability to change the way we live today, it generally refers to the way of automating different tasks and appliances within the house using Internet of things (IoT) technology. this evolution of technology makes connection between devices and systems and to communicate with each other and ready to be controlled via the internet.

Automation involves setting up different numbers of devices, controllers around the house and the connecting them through the IoT platform and control them according to our convenience, controlling them is the primary part of the platform it can also allow you to monitor the devices.

This project is a prototype of the home automation where it can control the lighting of the bulb such as on and off by having instructions given through Bluetooth, where the inputs come from an app application connected via Bluetooth, this whole project has different hardware parts that we use in our course period.

The electrical devices are controlled via the inputs and also those inputs are interfaced with the Wi-Fi module to add the data into the cloud and get a graphical representation of the usage of the appliances

3. TECHNICAL SPECIFICATIONS

This project can be made into three parts.

1) The connection between Arduino uno and Bluetooth module.
2) The connection between Arduino uno, Wi-Fi module and thingspeak cloud.
3) The connection between Arduino uno, two channel relay module and the electrical devices.

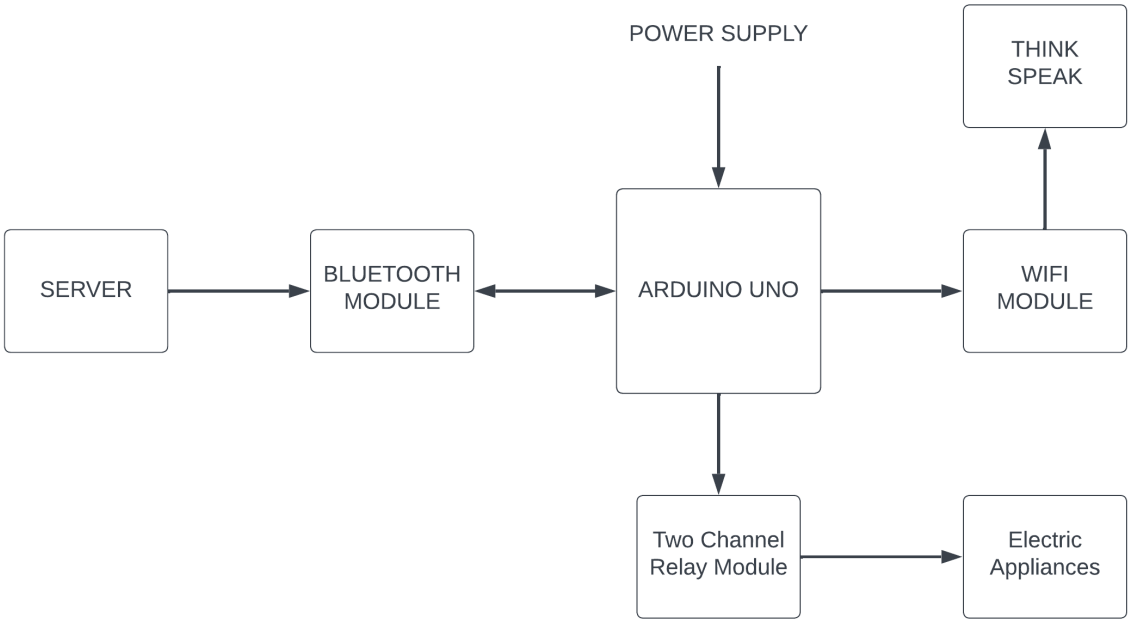

Fig 1: the basic schematic of the project

All the three are centred with Arduino and here, and the centre micro controller being an open source electronic platform, it is embedded with AT MEGA 328 controller, everything connected by different types of jumper wires i.e., male to female pin connector and female to female pin connectors, the power supply for the Arduino is given by a 9v battery and the electrical devices (the blubs) are power by an extension box which is directly connected to the household power supply switch board.

The input to the micro controller is given by the Bluetooth operated application and helps to control the devices.

The Wi-Fi module is interfaced with the AT commands or Hayes commands

4. DESIGN APPROACH AND DETAILS

4.1 design approach

This design consists of different components namely.

- Arduino uno

  This is an open-source electronic platform for easy to use, it evolved from just being an embedded environment to help building DIY to advanced products for IoT applications, this supports both hardware and software environments.

- Two channel relay module

  Two channel relay module is a convenient board which can be used to control high voltage, high current load with low voltage and current inputs, it is basically designed to interface with micro-controllers like Arduino etc.

- ESP 8266 Wi-Fi module

  This module enables micro-controllers to connect to 2.4GHz WI-FI, it uses ESP-AT firmware to provide WIFI connectivity to external host.

- HC-05 Bluetooth module

  HC-05 Bluetooth module is used as UART serial converter module and can easily transfer the UART data through the wireless Bluetooth.

- Bulb holders and electric bulbs
- Plugs (for power supply to bulbs)
- pin connectors and 2.5V gauge wires

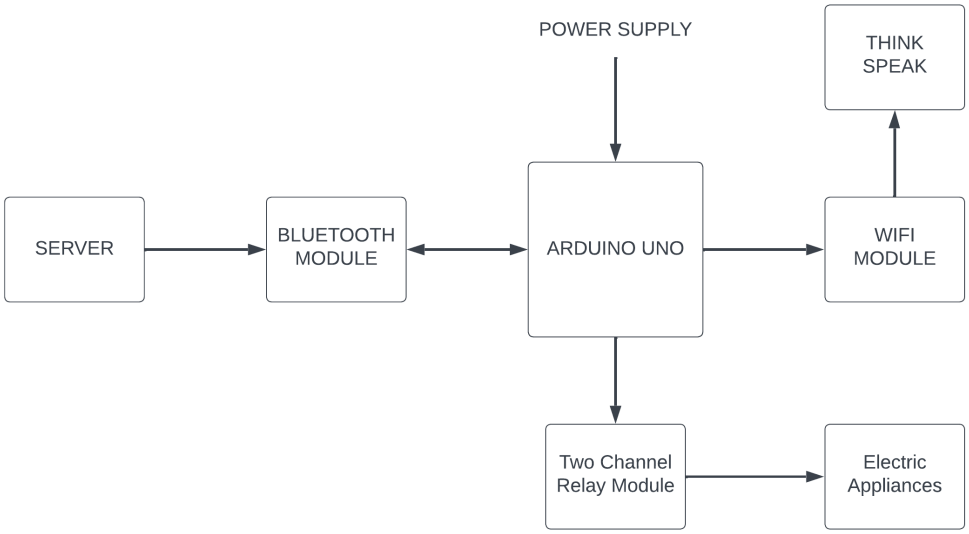

Fig 1 : the basic schematic of the project

4.2 codes and standards

```
#include<SoftwareSerial.h>

SoftwareSerial bluetooth(12,13);
SoftwareSerial esp(3,4);

#define SSID "Pavansriram" //  WIFI NAME
#define PASS "Pavansriram" //  WIfi PASSWORD

int a,b;

String sendAT(String command, const int timeout){
  String response = "";
  esp.print(command);
  long int current_time = millis();
  while(millis()-current_time < timeout){
    while(esp.available()){
      char c = esp.read();
      response += c;
    }
  }
  Serial.print(response);
  return response;
}

void setup() {
  // put your setup code here, to run once:
  bluetooth.begin(9600);// to begin the communication between Bluetooth and
arduino
  Serial.begin(9600);// to begin the serial communication
  esp.begin(9600);// begin the communication between the esp8266 and Arduino

  sendAT("AT\r\n",1000);
  sendAT("AT+CWMODE=1\r\n",1000);
  sendAT("AT+CWJAP=\""SSID"\",\""PASS"\"\r\n",2000);
  while(!esp.find("OK")){

  }
  sendAT("AT+CIFSR\r\n",1000);
  sendAT("AT+CIPMUX=0\r\n",1000);//this command is to make the multiple
connections zero to entertain only single connection


  pinMode(8,OUTPUT);
  pinMode(9,OUTPUT);
  Serial.println("TRY TO CONTROL USING BLUETOOTH");

}
```

```
void loop() {
  // put your main code here, to run repeatedly:
  bluetooth.listen();//enables the Bluetooth software serial port to listen
  if(bluetooth.available());// to check if Bluetooth is available or not
  char bt= bluetooth.read();// read data from Bluetooth and store it in bt
  /*Switch statement is a control statement that allows us to
   * choose only one choice among the many given choices
   */
   switch(bt){
     //checks the "bt" data in switch case, executes the instructions based on
the input characters to switch

     case 'A'://data received by HC-05 when device 1 off button is pressed
     digitalWrite(8,LOW);
     a=0;
     break;

     case 'a'://data received by HC-05 when device 1 ON button is pressed
     digitalWrite(8,HIGH);
     a=1;
     break;

     case 'B'://data received by HC-05 when device 2 off button is pressed
     digitalWrite(9,LOW);
     b=0;
     break;

     case 'b'://data received by HC-05 when device 2 ON button is pressed
     digitalWrite(9,HIGH);
     b=1;
     break;
    }
    String A= String(a);
    String B= String(b);
    updateTS(A,B);



}

void updateTS(String A, String B){
  esp.listen();// enables the esp8266 software serial
  Serial.println("");
  sendAT("AT+CIPSTART=\"TCP\",\"api.thingspeak.com\",80\r\n",1000);
  String cmd = "GET
/update?key=3XN3K5QIGCEYKRZL7&field1="+A+"&field2="+B+"\r\n";
  String cmdlen = String(cmd.length());
```

```
  sendAT("AT+CIPSEND="+cmdlen+"\r\n",2000);
  Serial.println("");
}
```

4.3constraints, alternatives and trade-offs

This model of project can also be made up using different micro controllers such as raspberry pi and can be more complicated, but more efficient.

But most of this type of projects use Arduino as their controlling unit as it is easy to interface and program the controller with the devices it is interfaced.

This model can be developed into, an light intensity adjustable device by interfacing some additional sensors to get more inputs and make it more productive

5. SCHEDULE, TASKS AND MILESTONES

TASKS COMPLETED	TIMELINE
PROBLEM IDENTIFICATION	26 JAN-28 JAN
LITERATURE SURVEY	29 JAN- 3 FEB
TOOLS, SCHEMATIC	4 FEB
INTERFACING THE BLUETOOTH MODULE AND WIFI MODULE	4 FEB- 6 FEB
REVIEW 2	20 FEB
INTERFACING THE RELAY MODULE WITH ELECTRICAL APPLIANCES	1 MAR-4 MAR
THINGSPEAK TUTORIAL	6 MAR
FINAL ARDUINO IDE SKETCH	10 MAR – 13 MAR
FINAL SIMULATION	3APR

Table 5.1 table of tasks and timeline

6. PROJECT DEMONSTRATION

6.1 Bluetooth interfacing

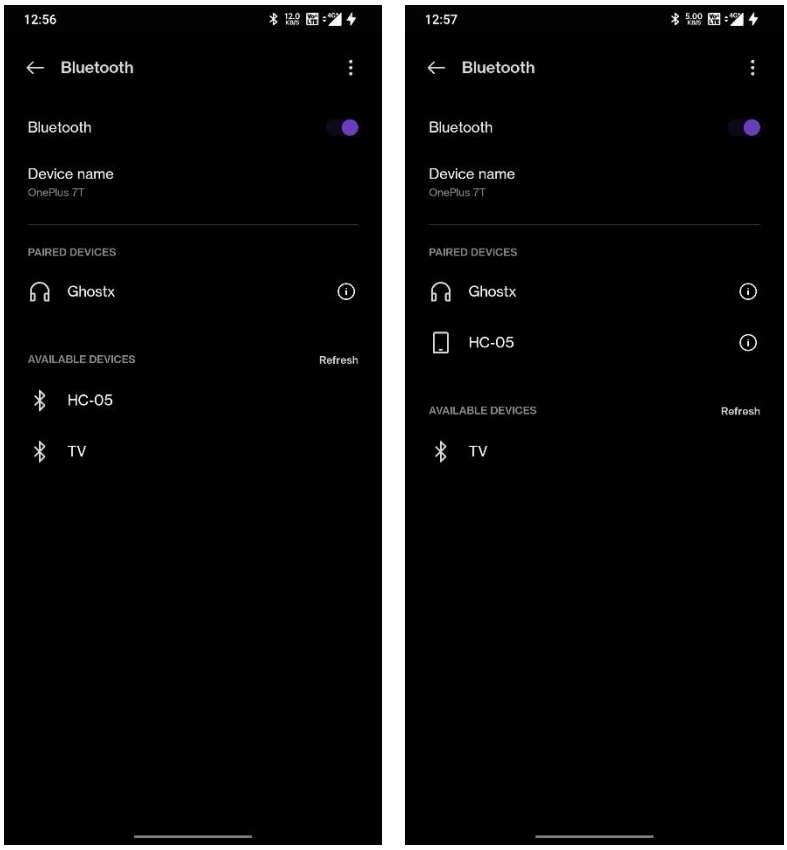

Fig 2: connection of bluetooth module to mobile

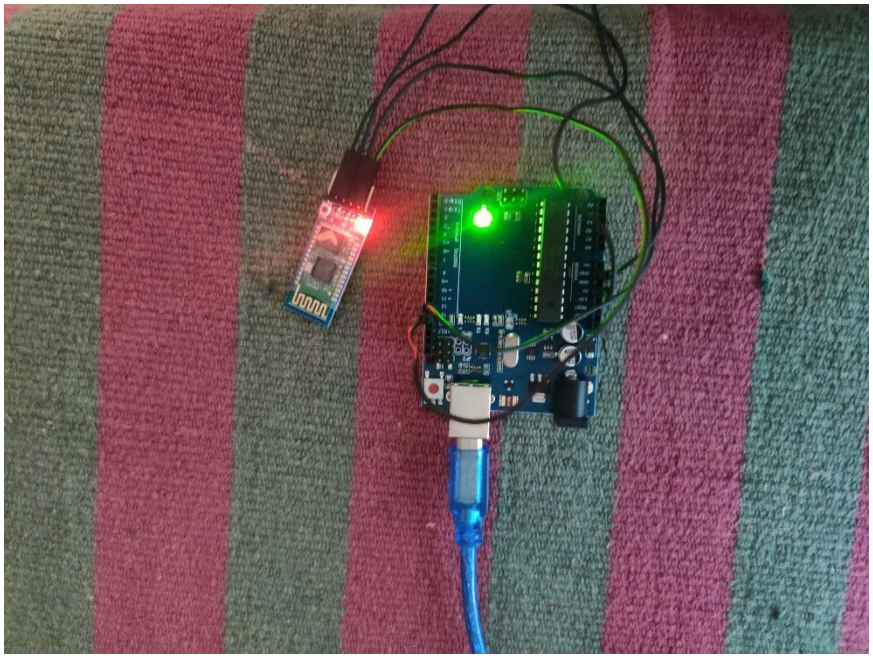

Fig 3: bluetooth module interfaced with arduino

6.2 WI-FI interfacing:

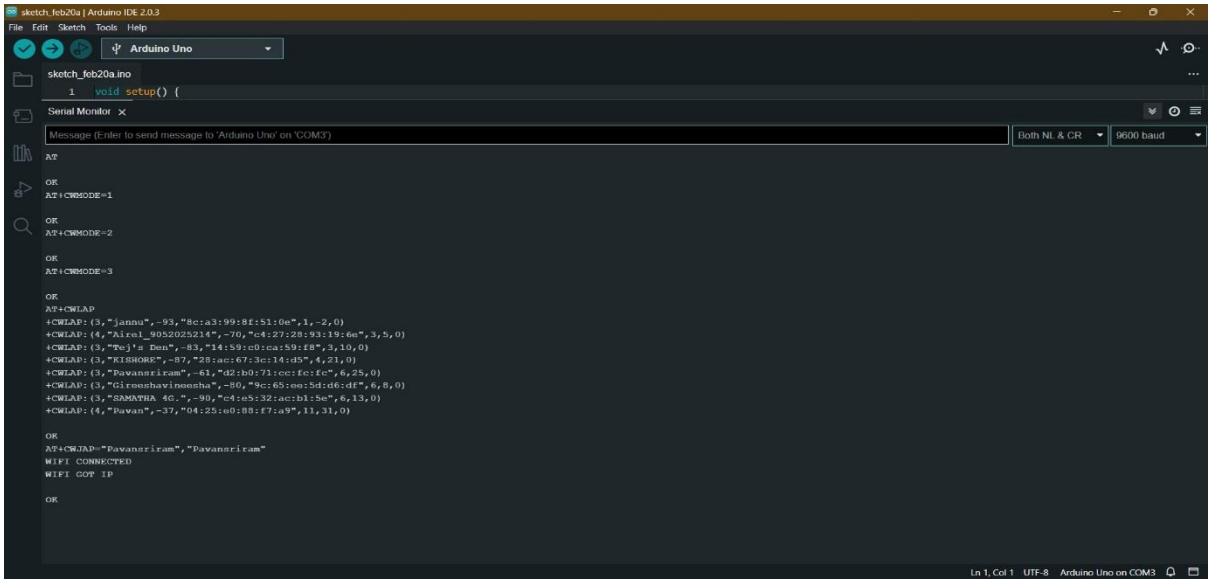

Fig 4 output for Wi-Fi module interfacing

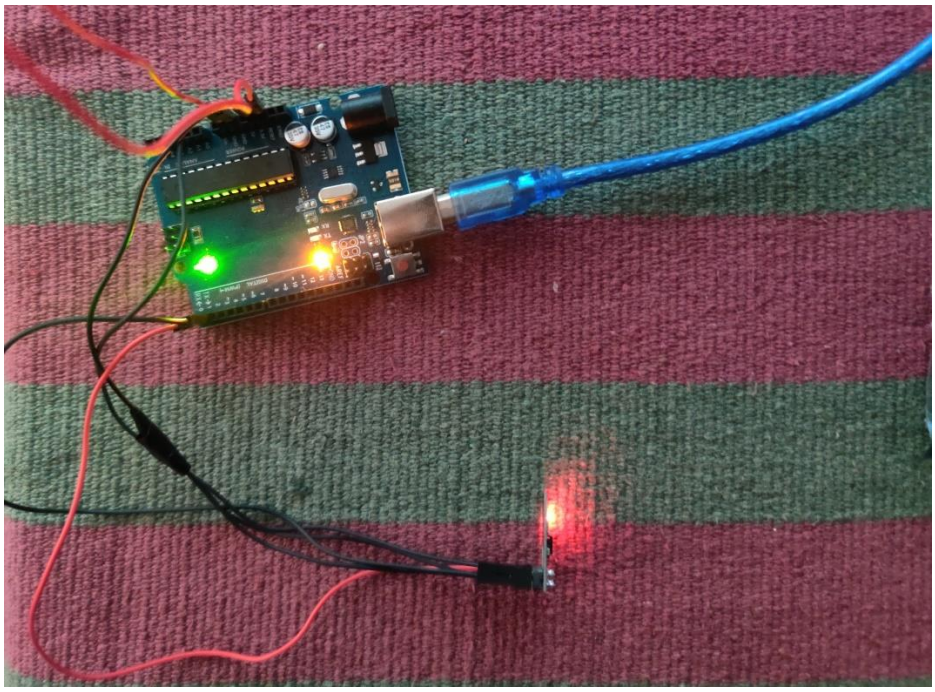

Fig 5 WI-FI interfaced with Arduino

6.2.1 commands used to interface WI-FI module:

- AT+CWMODE=<MODE> this is to set the Wi-Fi, access points
- AT+CWLAP to list out all available access points, Wi-Fi or hotspots.
- AT+CWJAP=“SSID”,”Password” makes the ESP8266 to connect/join the respective Wi-Fi/hotspot with given credentials

6.2.1.1 AT commands:

- These commands are also known as “Hayes commands”.
- Generally used to communicate with control modems, In this project we use them to control the Wi-Fi module (ESP8266).
- They operate on four parameters and those are “TEST”, “READ”, “SET” & “EXECUTION”.

6.3 Final circuit

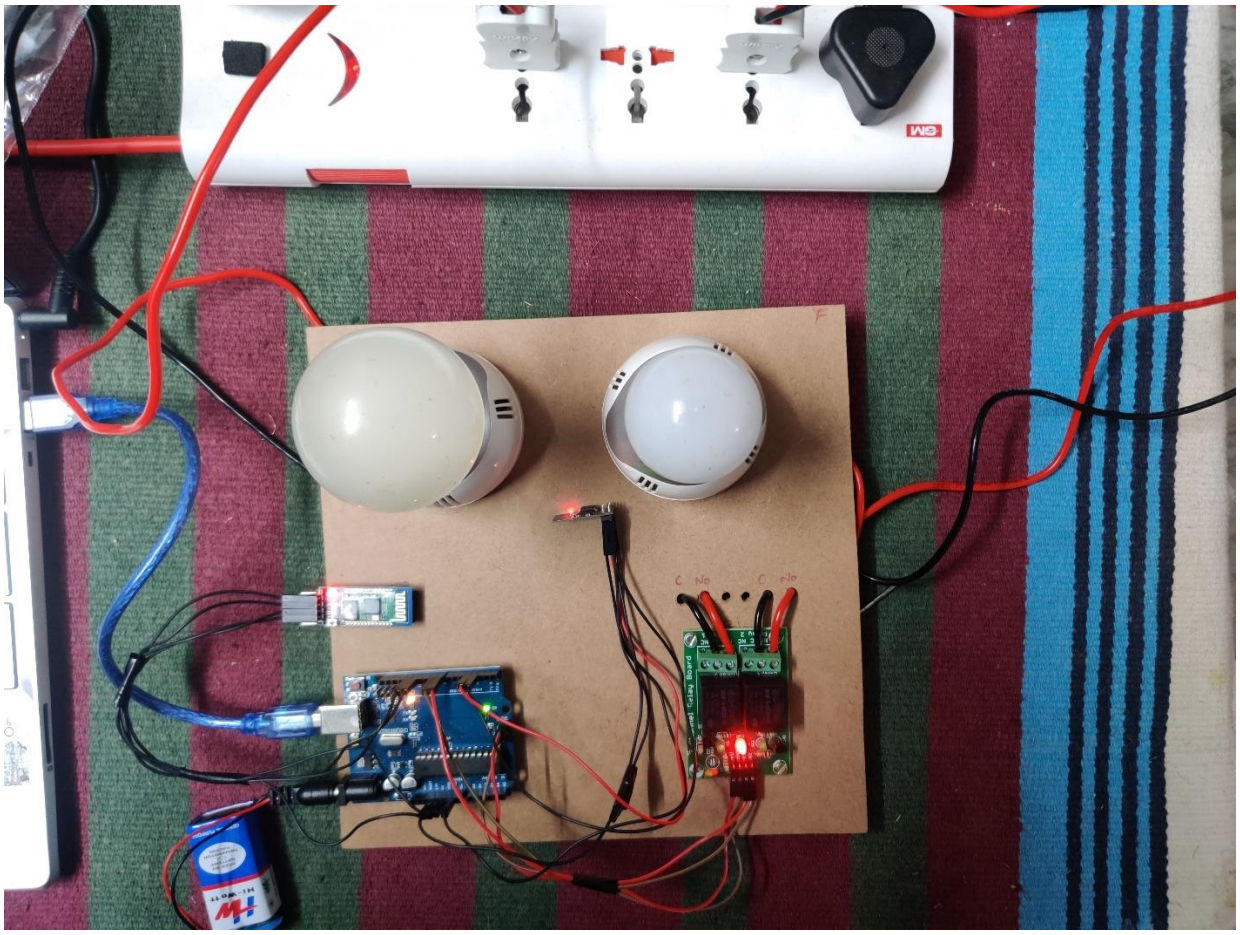

Fig 6 the final circuit of the system

7.RESULTS AND DISCUSSIONS

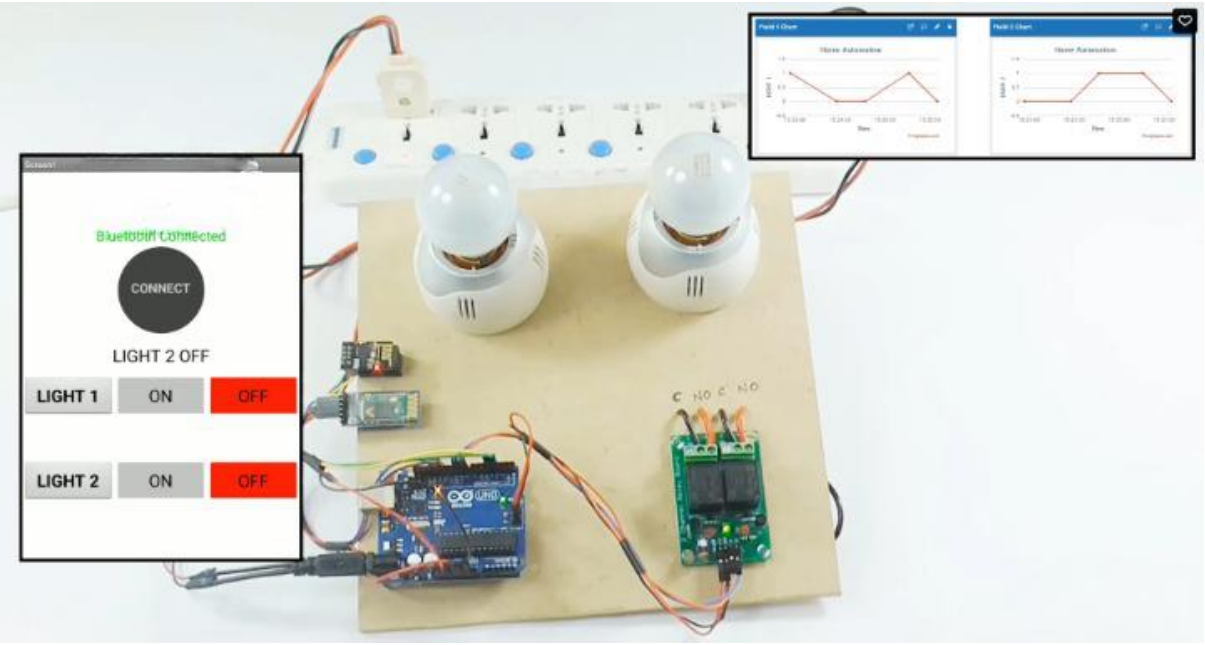

Fig 7 the final output of the system.

This figure shows the Bluetooth application used to control the bulbs and the graphic representation of the usage of the electrical appliances.

7.1 Future scopes

- can be developed into a security system by adding some sensors such as ultrasonic sensors, pressure sensors etc.

- by using more advanced micro controllers as raspberry pi this system can be built into more efficient automation system

- develop into complete Wi-Fi based system for wide range with high power source

7.2 Advantages

- Energy efficient and low powered device
- Easy to access and installation.
- Reduced number of manual switches and electrical accidents
- Less space occupancy

8. SUMMARY

Home automation refers to the use of technology to control and automate various appliances or devices in home. by automating various aspects of the home, people can save time and energy. This project aims to provide easy automation to places like home, offices and many other places at affordable prices and this is a user-friendly project with easy interfacing and controlling method. Overall, home automation is a growing field with many exciting possibilities and is likely to become increasingly popular as more people become interested in the benefits of smart home technology.

in this project we have introduced the event of house management or automation using Arduino and internet of things. this system is suitable for real time home automation and for remotely controlling home appliances.

the future applications can be used in different sectors where internet access is available such as industrial automation and management through internet, and with improved security measures can be used in extreme restricted areas

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