

CHAPTER-I

1.1 INTRODUCTION

Nowadays, we have remote controls for our television sets and other electronic systems, which have made our lives real easy. Have we 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. With the recent development of mobile devices (smart phones), its demand is increasing day by day and because of its' multi dimensional functionalities and most enhanced technology, the demand for advance mobile applications in daily life has also increased. As today's generation is very busy, individuals sometimes may forget to switch off various home appliances or not sure about whether the devices are on or off. Sometimes, it is also desirable for individuals to turn on few devices such as air conditioners, few lights etc. to get a comfortable, pleasant atmosphere immediately after going back home. Person with physical disability may also wish to control the devices by voice recognition system. With the advent of Smartphone, android app and related technologies, it is now possible to practically implement all the desirable functions in a home automation system. An internet based home automation system focuses on controlling home electronic devices irrespective of whether someone is inside or outside of the house. The words appliance and devices have been utilized in this paper interchangeably. Automation is the current trend, where devices are being controlled automatically. The usual operation of a home automation system till now was focused on the basic tasks of turning ON/OFF different devices either remotely or in close proximity. Technological enhancement has permitted

researchers and developers to use Bluetooth or Wi-Fi technology to connect different devices in a home automation system. Home automation systems have gained popularity in recent years, paralleling the advances in the concept of the Internet of Things. Although automation for commercial buildings is a mature technology, automation applications for residences are a relatively new development, which is gradually being adopted by consumers. Home automation involves the monitoring and control of activities such as lighting, heating, ventilation, air conditioning , electrical appliances, sound systems, security cameras, door locks, and alarms. Home automation has various advantages, such as comfort, increased security, and energy efficiency. Figure 1 shows the general home automation system. The figure shows the various home appliances such as security sensors, thermostat etc. which is controlled through the central control panel via the Internet.

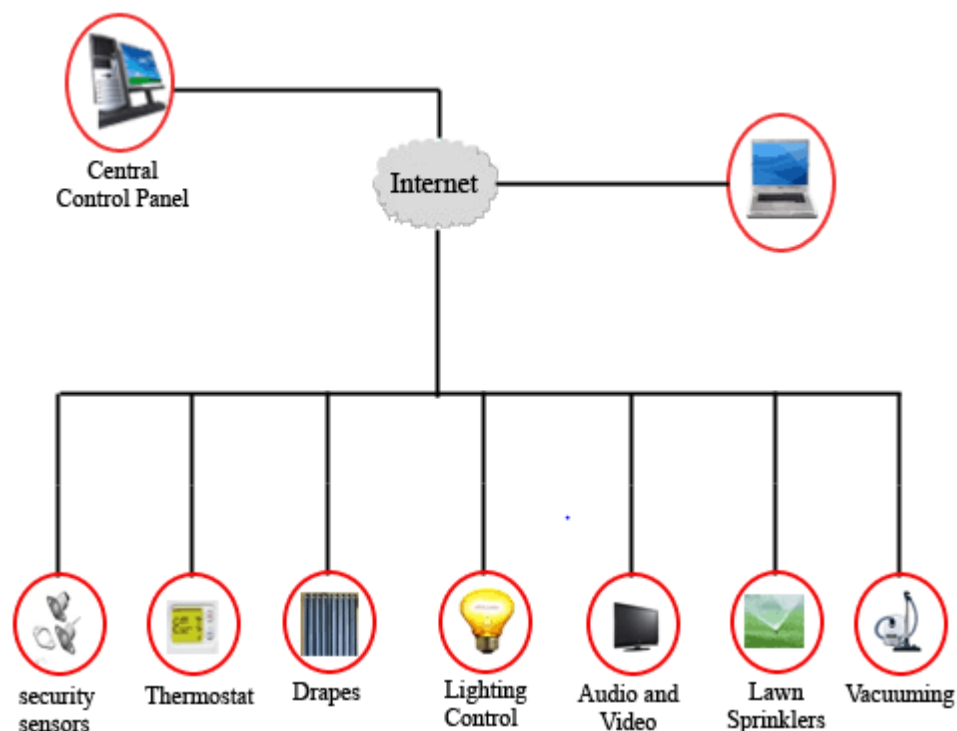


Figure 1.1 : A General Home Automation System

1.5 Project Objective

The following list of objectives must be fulfilled to successfully help elderly and disabled individuals.

1. Develop Bluetooth appliance controller: The Bluetooth will interface with the arduino to perform the desired automation. The arduino will get the signals from the Bluetooth enabled mobile phone and it will be processed.
2. Connect an application from mobile to Bluetooth module: An application needs to be installed in the mobile phone, which needs to communicate with the Bluetooth receiver HC 05.
3. Integrate the device to the controller: The foremost priority that has to be kept in mind when developing a Smart Home is that it has to be cost-efficient. The appliance controller has to be inexpensively integrated with the appliances in the house with an easy installation.
4. Test the set up and analyze the data: After the system is set-up, with the help of a mobile device and a controller, tests are conducted while data is recorded and analyzed.

1.6 Project scope and limitation

This project work is complete on its own in automatically switching on or off of an electrical appliance limited to household appliances.

1.7 Description of the Project

This project is one of the important Arduino Projects. Bluetooth based home automation using Arduino project 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. The Arduino is connected to the main PCB which has FOUR relays as shown in the block diagram. These relays can be connected to different electronic devices like Buzzer, Fan, Lights. When the user presses on the 'On' button displayed on the app for the device 1, the LED Bulb is switched on. This LED can be switched off, by pressing the same button again. This project of home automation using Bluetooth and Arduino can be used for controlling any AC or DC devices. In the demonstration, we have used DC Bulb. To drive this DC Bulb, a 9V battery is connected.

CHAPTER-II

2.1 HARDWARE REQUIREMENT

The following are the list of Components:

1. Arduino uno
2. 5V 4-channel relay module
3. 9V battery
4. HC-05 bluetooth module
5. Jumper Wires male to female
6. AC 220v/120v loads/home appliances
7. Android Phone(Bluetooth enabled)

2.2 SOFTWARE REQUIREMENT

1. Android Application
2. Arduino IDE

CHAPTER-III

3.1 BLOCK DIAGRAM

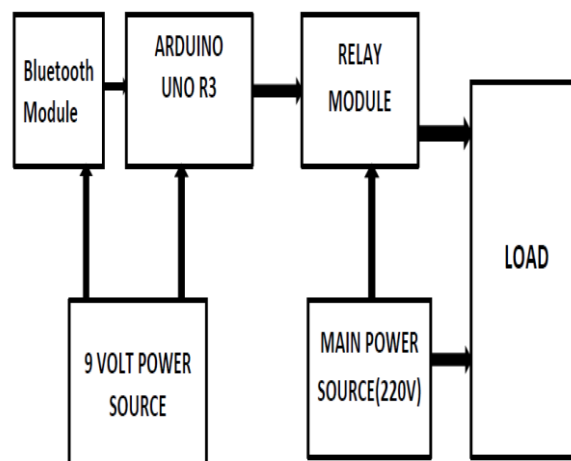


Figure 3.1: Block Diagram

3.2 CIRCUIT DIAGRAM

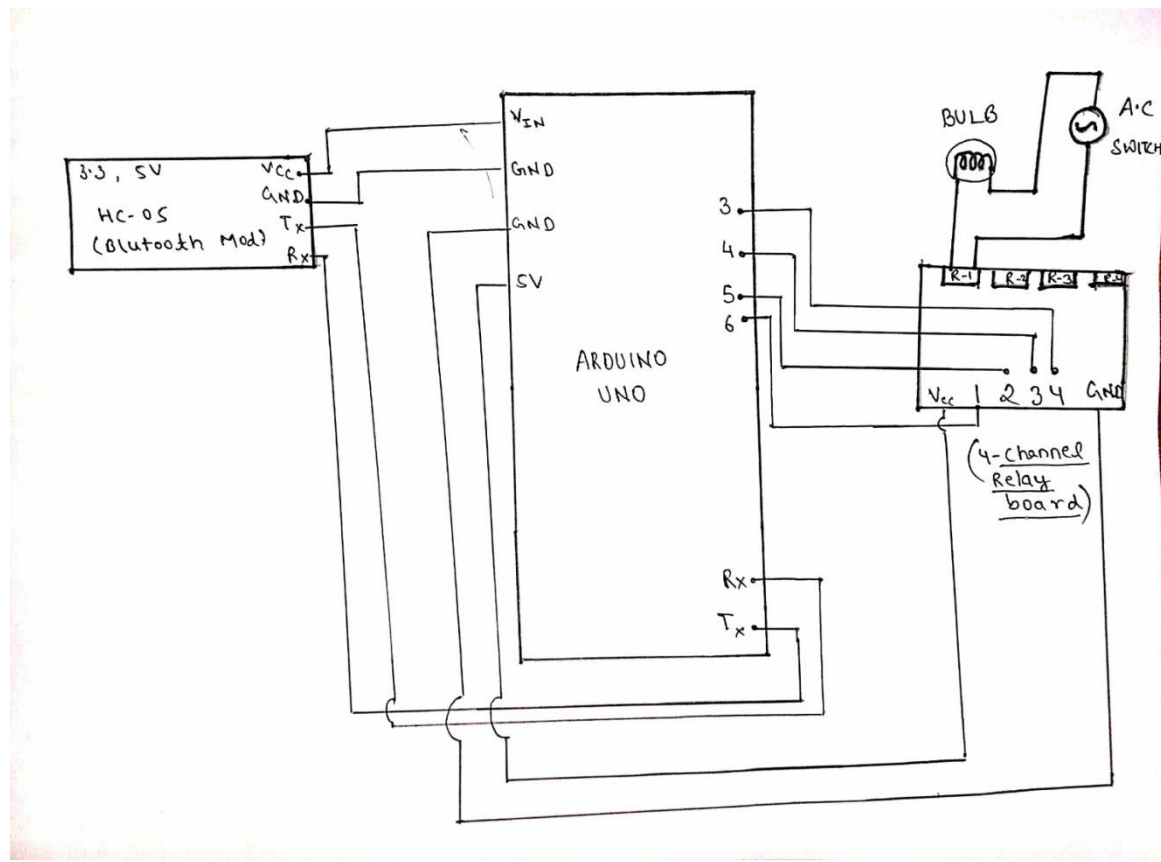


Figure 2.2: Circuit Diagram

CHAPTER-V

CODING

```
String inputs;

#define relay1 2 //Connect relay1 to pin 9
#define relay2 3 //Connect relay2 to pin 8
#define relay3 4 //Connect relay3 to pin 7
#define relay4 5 //Connect relay4 to pin 6
#define relay5 6 //Connect relay5 to pin 5
#define relay6 7 //Connect relay6 to pin 4
#define relay7 8 //Connect relay7 to pin 3
#define relay8 9 //Connect relay8 to pin 2

void setup()
{
  Serial.begin(9600); //Set rate for communicating with phone
  pinMode(relay1, OUTPUT); //Set relay1 as an output
  pinMode(relay2, OUTPUT); //Set relay2 as an output
  pinMode(relay3, OUTPUT); //Set relay1 as an output
  pinMode(relay4, OUTPUT); //Set relay2 as an output
  pinMode(relay5, OUTPUT); //Set relay1 as an output
  pinMode(relay6, OUTPUT); //Set relay2 as an output
  pinMode(relay7, OUTPUT); //Set relay1 as an output
  pinMode(relay8, OUTPUT); //Set relay2 as an output
  digitalWrite(relay1, LOW); //Switch relay1 off
  digitalWrite(relay2, LOW); //Switch relay2 off
  digitalWrite(relay3, LOW); //Switch relay1 off
  digitalWrite(relay4, LOW); //Switch relay2 off
  digitalWrite(relay5, LOW); //Switch relay1 off
  digitalWrite(relay6, LOW); //Switch relay2 off
  digitalWrite(relay7, LOW); //Switch relay1 off
  digitalWrite(relay8, LOW); //Switch relay2 off
}

void loop()
{
```

```
while(Serial.available()) //Check if there are available bytes to read
{
    delay(10); //Delay to make it stable
    char c = Serial.read(); //Conduct a serial read
    if (c == '#'){
        break; //Stop the loop once # is detected after a word
    }
    inputs += c; //Means inputs = inputs + c
}
if (inputs.length() >0)
{
    Serial.println(inputs);

    if(inputs == "A")
    {
        digitalWrite(relay1, LOW);
    }
    else if(inputs == "a")
    {
        digitalWrite(relay1, HIGH);
    }
    else if(inputs == "B")
    {
        digitalWrite(relay2, LOW);
    }
    else if(inputs == "b")
    {
        digitalWrite(relay2, HIGH);
    }
    else if(inputs == "C")
    {
        digitalWrite(relay3, LOW);
    }
}
```

```
else if(inputs == "c")
{
digitalWrite(relay3, HIGH);
}
else if(inputs == "D")
{
digitalWrite(relay4, LOW);
}
else if(inputs == "d")
{
digitalWrite(relay4, HIGH);
}
else if(inputs == "E")
{
digitalWrite(relay5, LOW);
}
else if(inputs == "e")
{
digitalWrite(relay5, HIGH);
}
else if(inputs == "F")
{
digitalWrite(relay6, LOW);
}
else if(inputs == "f")
{
digitalWrite(relay6, HIGH);
}
else if(inputs == "G")
{
digitalWrite(relay7, LOW);
}
else if(inputs == "g")
```



```
{  
digitalWrite(relay7, HIGH);  
}  
else if(inputs == "H")  
{  
digitalWrite(relay8, LOW);  
}  
else if(inputs == "h")  
{  
digitalWrite(relay8, HIGH);  
}  
inputs="";  
}  
}
```

CHAPTER-VI

DESIGN AND IMPLEMENTATION

A low cost and efficient smart home system is presented in our design. This system has two main modules: the hardware interface module and the software communication module. At the heart of this system is the Arduino uno which is also capable of functioning as a micro web server and the interface for all the hardware modules. All communication and controls in this system pass through the microcontroller.

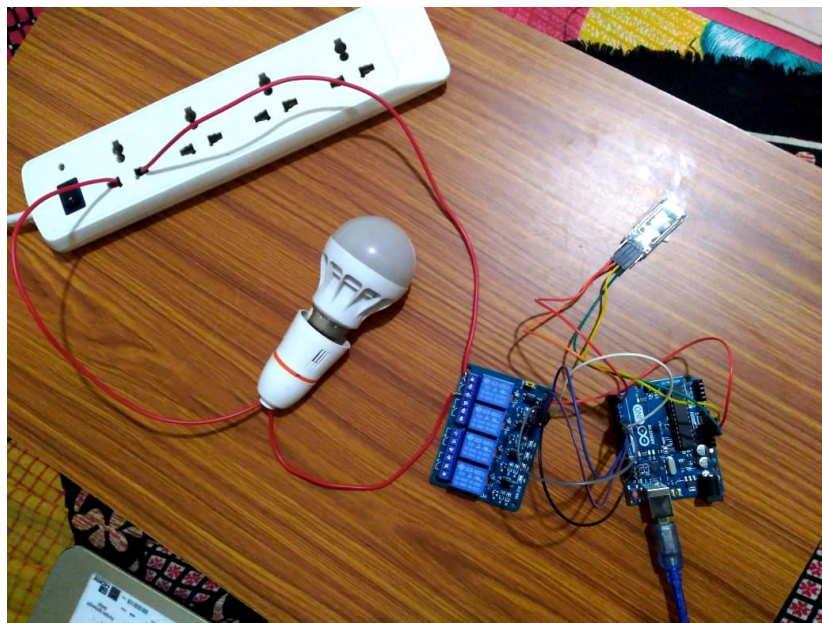


Figure 5.1: No Power Supply is given

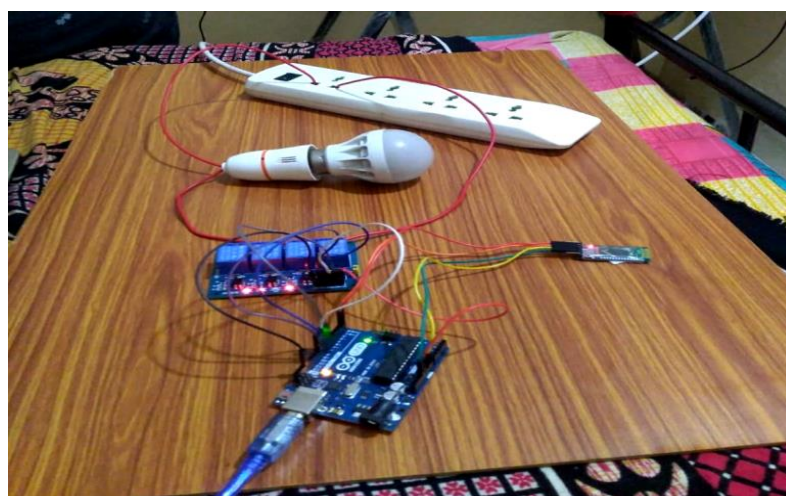


Figure 6.2: Power Supply given

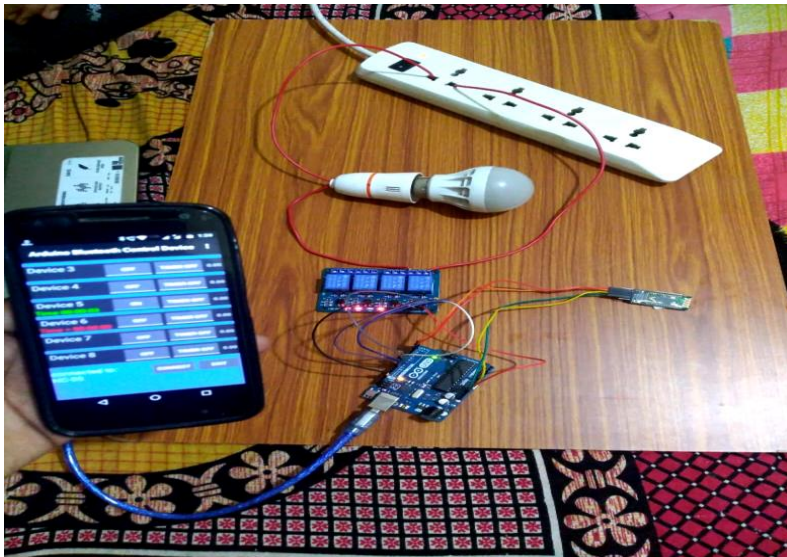


Figure 6.3: Connection Established between Mobile and HC-05 Bluetooth Module through Bluetooth

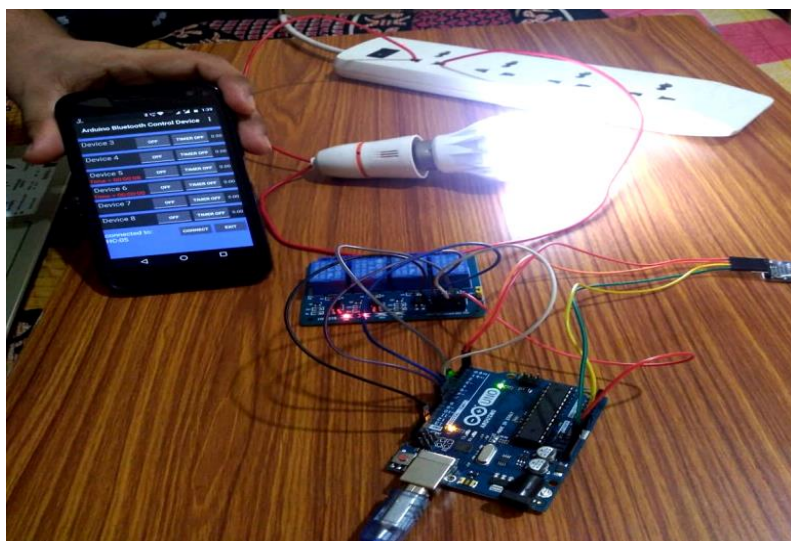


Figure 6.4: LED Starts Glowing on Selecting the ON Button on Mobile Phone

CHAPTER-VII

7.1 PROS AND CONS OF HOME AUTOMATION

7.1.1 Pros of Home Automation

1. Security

Tap your finger to turn on the lights when you get home so you worried about what's hiding in the shadows, or in your pathways. Or automate to turn on when you aren't home to look like you are to ward off potential robbers. Door locks are another automated home product that can increase your home security.

2. Energy Efficiency

Increase your home's energy efficiency by remotely powering off systems and appliances when they aren't in use. In addition to the standard home automation products that give you active control, some products actively monitor systems and arm the homeowner with knowledge, insight and guidance to achieve greater control and energy efficiency.

3. Savings

Home automation literally pays off. When you are able to use home systems and appliances only when needed, the savings will be apparent in the first utility bill. No more wasting money on lights left on when you aren't home, or spending money on gas to drive home because you forgot to lock the door. Monetary savings are apparent, but you'll also be saving time. No wasted trips home, no running through the house turning everything off, no time spent worrying about what was or wasn't turned off.

4. Convenience

Don't you hate having to rely on neighbors to watch your house when you're gone? With home automation, convenient control of your home is at your fingertips. You don't have to trust someone else with your most valued possessions.

7.1.2 CONS OF HOME AUTOMATION

1. Cost of Intelligence

Installing state-of-the-art features inside home results in a higher price tag for the property. The cost of an intelligent home that makes our lives convenient is high because some of the technology is relatively new. The cost of living expenses such as utilities, maintenance and repair of the technology can be expensive as well.

2. Technology Learning Curve

Owning a smart home means having to learn how to use your home. Unlike traditional homes, smart home technology requires you to adapt to the innovations within your living area such as security systems, air units and a remote that controls your entire house. For the technology-savvy family, the smart home will help achieve convenience faster, but for others, it will take reading manuals and learning how-to before the benefits of convenience pay off.

3. Video Surveillance

Video surveillance can be a wonderful tool in heightening security and deterring crime, but when the technology falls into the wrong hands, issues of privacy can occur. Security sensors within the doors and walls of a smart home use wireless technology to transfer signals to a central control unit that notifies emergency officials of any foreign activity.

7.2 APPLICATIONS OF THIS PROJECT

1. Using this project, we can turn on or off appliances remotely i.e. using a phone or tablet.
2. The project can be further expanded to a smart home automation system by including some sensors like light sensors, temperature sensors, safety sensors etc. and automatically adjust different parameters like room lighting, air conditioning (room temperature), door locks etc. and transmit the information to our phone
3. Additionally, we can connect to internet and control the home from remote location over internet and also monitor the safety. Future Development of the project.
4. Arduino based device control using Bluetooth on Smartphone project can be enhanced to control the speed of the fan or volume of the buzzer etc.
5. Home automation and Device controlling can be done using Internet of Things – IOT technology.
6. We can replace Bluetooth by GSM modem so that we can achieve device controlling by sending SMS using GSM modem.

CONCLUSION

The home automation system has been experimentally proven to work satisfactorily by connecting sample appliances to it and the appliances were successfully controlled from a wireless mobile device. We learned many skills and was able to work together as a team during this project. The Bluetooth client was successfully tested on a multitude of different mobile phones from different manufacturers, thus proving its portability and wide compatibility. Thus a low-cost home automation system was successfully designed, implemented and tested.

REFERENCES

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