

**A**  
**Project report on**  
**SMART IOT BASED HOME AUTOMATION DEVICE**

## Table of Contents

### NAME/TITLE OF THE PROJECT

- a. PROJECT AIM
- b. PROJECT OBJECTIVE
- c. PROJECT SCOPE AND LIMITATION

### HARDWARE AND SOFTWARE

### METHODOLOGY

- d. Description of the project
- e. Description of Hardware Required
  - i. Arduino uno
  - ii. \_Arduino Uno Pinout Configuration
  - iii. Arduino Uno Technical Specifications
  - iv. How to use Arduino Board
  - v. Communication

### RELAY MODULE

### BLUETOOTH MODULE

### BLUETOOTH MODULE INTERFACING WITH ARDUINO UNO

### DESIGNING THE CIRCUIT

### LITERATURE SURVEY

### PROGRAM CODE

### APPLICATION INSTALLATION

### CONCLUSION

### APPLICATION

### BIBLIOGRAPHY

## **NAME / TITLE OF PROJECT:-**

### **SMART IOT BASED HOME AUTOMATION DEVICE**

#### **Project Aim**

The aim of the project is to design and construct a home automation system that Will remotely switch on or off any household appliances connected to it, using Bluetooth based android application.

#### **Project Objective**

The objective of this project is to implement a low cost, reliable and scalable Home automation system that can be used to remotely switch on or off any Household appliance, using a Bluetooth module which is controllable using Mobile.

#### **Project scope and limitation**

This project work is complete on its own in remotely and automatically switching  
On or off an electrical appliance using Bluetooth module which is control by using mobile app.

## Hardware Requirement

The list of components mentioned here are specifically for different loads.

- ☐ Arduino Uno.
- ☐ Bluetooth module for connectivity.
- ☐ 9 volt battery.
- ☐ Relay Module.
- ☐ Android or IOS phone or tablet.
- ☐ Connecting wire.
- ☐ Jumpers.

## Software requirement

- ☐ Arduino compiler
- ☐ Android application

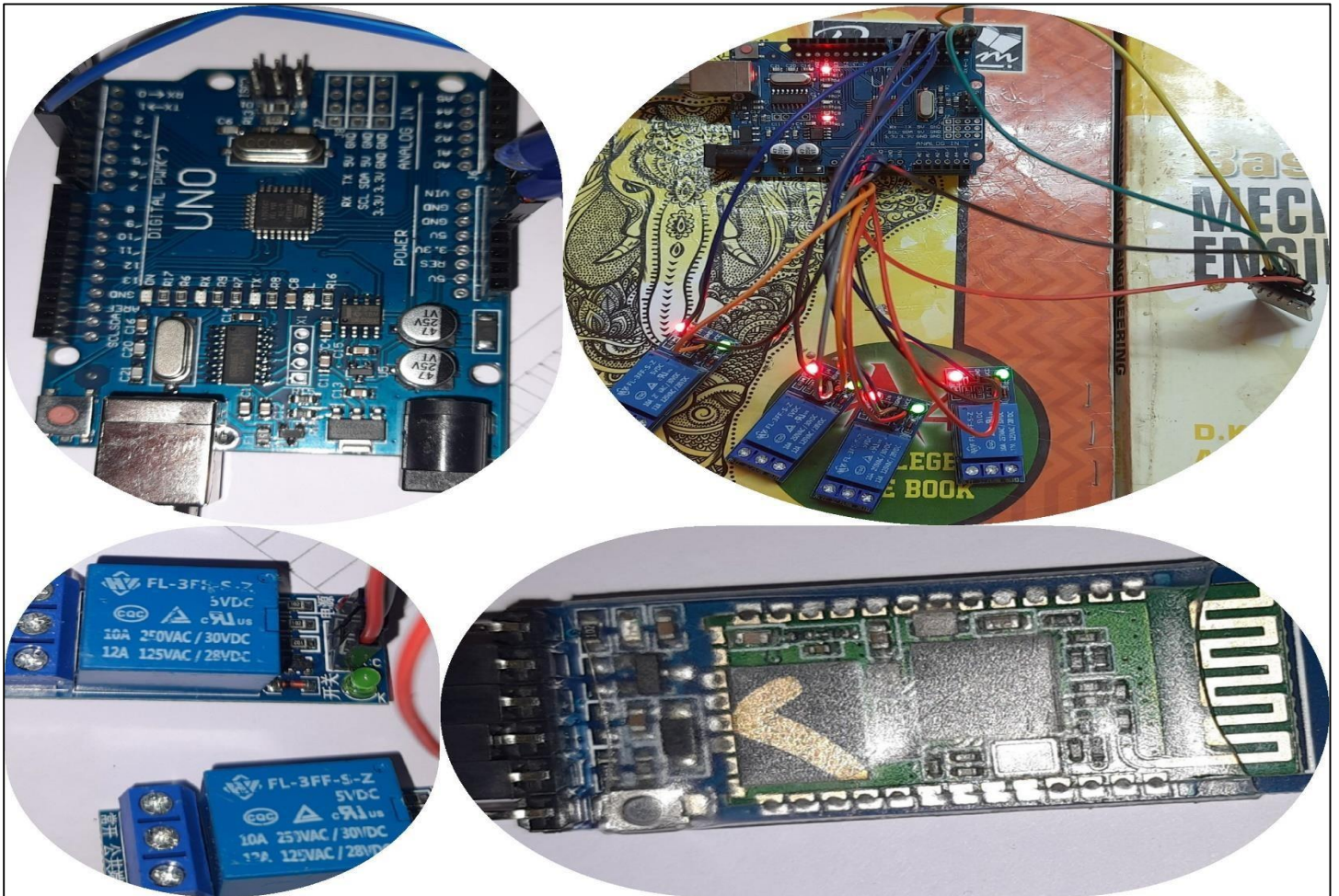


FIGURE 0:-MAIN COMPONENTS USED

# **METHODOLOGY:-**

## **Description of the project**

This project is one of the important Arduino Projects. Arduino based home Automation using Bluetooth project helps the user to control any electronic Device using Device control app on their Android Smartphone. The android app

Sends commands to controller- Arduino smart phone. The android

Sends commands to the controller-Arduino through wireless communication, Namely, Bluetooth. The Arduino is connected to the main PCB which has one Relay as shown in the block diagram,

Device 1- FAN,

Device 2- HEATER,

Device 3- LIGHT AND BULB

Device 4- A.C.

When the user presses on the on button displayed on the app for the device -1, The Fan is switched on. The fan can be switched off, by pressing the off ,by pressing the off Button again.

When the user presses on the on button displayed on the app for the device -2, The Heater is switched on. The Heater can be switched off, by pressing the off Button again.

When the user presses on the on button displayed on the app for the device-3, The Bulb is switched on. The bulb can be switched off, by pressing the off Button again.

When the user presses on the on button displayed on the app for the device- 4, The A.C. is switched on. The A.C. can be switched off, by pressing the off 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, 9v battery is connected.





Arduino Uno Pinout Configuration

Pin Category	Pin Name	Details
Power	Vin, 3.3V, 5V, GND	<p>Vin: Input voltage to Arduino when using an external power source.</p> <p>5V: Regulated power supply used to power microcontroller and other components on the board.</p> <p>3.3V: 3.3V supply generated by on-board voltage regulator. Maximum current draw is 50mA.</p> <p>GND: ground pins.</p>
Reset	Reset	Resets the microcontroller.
Analog Pins	A0 – A5	Used to provide analog input in the range of 0-5V
Input/Output Pins	Digital Pins 0 - 13	Can be used as input or output pins.
Serial	0(Rx), 1(Tx)	Used to receive and transmit TTL serial data.
External Interrupts	2, 3	To trigger an interrupt.
PWM	3, 5, 6, 9, 11	Provides 8-bit PWM output.
SPI	10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK)	Used for SPI communication.

Inbuilt LED	13	To turn on the inbuilt LED.
TWI	A4 (SDA), A5 (SCA)	Used for TWI communication.
AREF	AREF	To provide reference voltage for input voltage.

### Arduino Uno Technical Specifications

Microcontroller	ATmega328P – 8 bit AVR family microcontroller
Operating Voltage	5V
Recommended Input Voltage	7-12V
Input Voltage Limits	6-20V
Analog Input Pins	6 (A0 – A5)
Digital I/O Pins	14 (Out of which 6 provide PWM output)
DC Current on I/O Pins	40 mA
DC Current on 3.3V Pin	50 mA
Flash Memory	32 KB (0.5 KB is used for Bootloader)
SRAM	2 KB

EEPROM	1 KB
Frequency (Clock Speed)	16 MHz

## How to use Arduino Board

The 14 digital input/output pins can be used as input or output pins by using `pinMode()`, `digitalRead()` and `digitalWrite()` functions in arduino programming. Each pin operate at 5V and can provide or receive a maximum of 40mA current, and has an internal pull-up resistor of 20-50 KOhms which are disconnected by default. Out of these 14 pins, some pins have specific functions as listed below:

- **Serial Pins 0 (Rx) and 1 (Tx):** Rx and Tx pins are used to receive and transmit TTL serial data. They are connected with the corresponding ATmega328P USB to TTL serial chip.
- **External Interrupt Pins 2 and 3:** These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **PWM Pins 3, 5, 6, 9 and 11:** These pins provide an 8-bit PWM output by using `analogWrite()` function.
- **SPI Pins 10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK):** These pins are used for SPI communication.
- **In-built LED Pin 13:** This pin is connected with an built-in LED, when pin 13 is HIGH – LED is on and when pin 13 is LOW, its off.

Along with 14 Digital pins, there are 6 analog input pins, each of which provide 10 bits of resolution, i.e. 1024 different values. They measure from 0 to 5 volts but this limit can be increased by using AREF pin with `analogReference()` function.

- Analog pin 4 (SDA) and pin 5 (SCA) also used for TWI communication using Wire library.

Arduino Uno has a couple of other pins as explained below:

- **AREF:** Used to provide reference voltage for analog inputs with `analogReference()` function.
- **Reset Pin:** Making this pin LOW, resets the microcontroller.



## Communication

Arduino can be used to communicate with a computer, another Arduino board or other microcontrollers. The ATmega328P microcontroller provides UART TTL (5V) serial communication which can be done using digital pin 0 (Rx) and digital pin 1 (Tx). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The ATmega16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. There are two RX and TX LEDs on the arduino board which will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (not for serial communication on pins 0 and 1). A SoftwareSerial library allows for serial communication on any of the Uno's digital pins. The ATmega328P also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

### Relay Module:-

Relay module for **Arduino** is one of the most powerful application for **Arduino** as it can be used to control both **A.C** and **D.C** devices by simply controlling the **relay** by giving 5V. A relay is basically a switch which is operated electrically by electromagnet. A relay can be used to control high voltage **electronic devices** such as **motors** and as well as low voltage **electronic devices** such as a **light bulb** or a fan.

Relays works on the principle of electromagnetism. When the electricity is provided to the **relay** coil then it acts like a magnet and changes the state of the switch. The part which powers the relay module is completely isolated from the part which turns ON or OFF. This is why we can control a 220V appliance by simply controlling it using the 5V Arduino. you should also read getting started **projects of arduino**.



FIGURE 2:-RELAY MODULE

### **Bluetooth Module:-**

HC-05 module is an easy to use Bluetooth SSP module designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth v2.0+EDR 3Mbps modulation with complete 2.4GHz radio transceiver and Base band. It uses CSR blue core 04- External single Bluetooth system with CMOS technology and with AFH (adaptive frequency Hopping feature). It has the Footprint as small as 12.7 MMX 27 mm. Hope it will simplify your overall Design/development cycle.

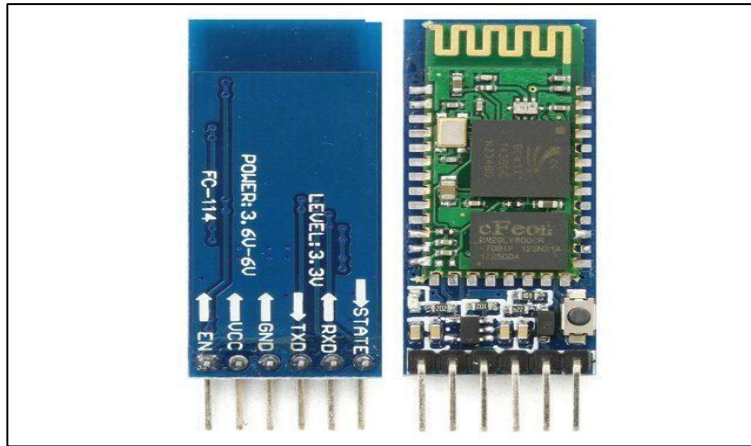


FIGURE 3:-BLUETOOTH MODULE

### **Bluetooth Module Interfacing with Arduino UNO :-**

HC-05 is a Bluetooth device used for wireless communication with Bluetooth Enabled devices (like smartphone). It communicates with microcontrollers using Serial communication (USART).

Default settings of HC-05 Bluetooth module can be changed using certain at Commands.

As Hc-05 Bluetooth module has 3.3 level for Rx/Tx and microcontroller can Decet 3.3 v level, so there is no need to shift TX voltage of Hc-05 module. But we need to shift the transmit voltage level from microcontroller to RX of Hc-05 module.

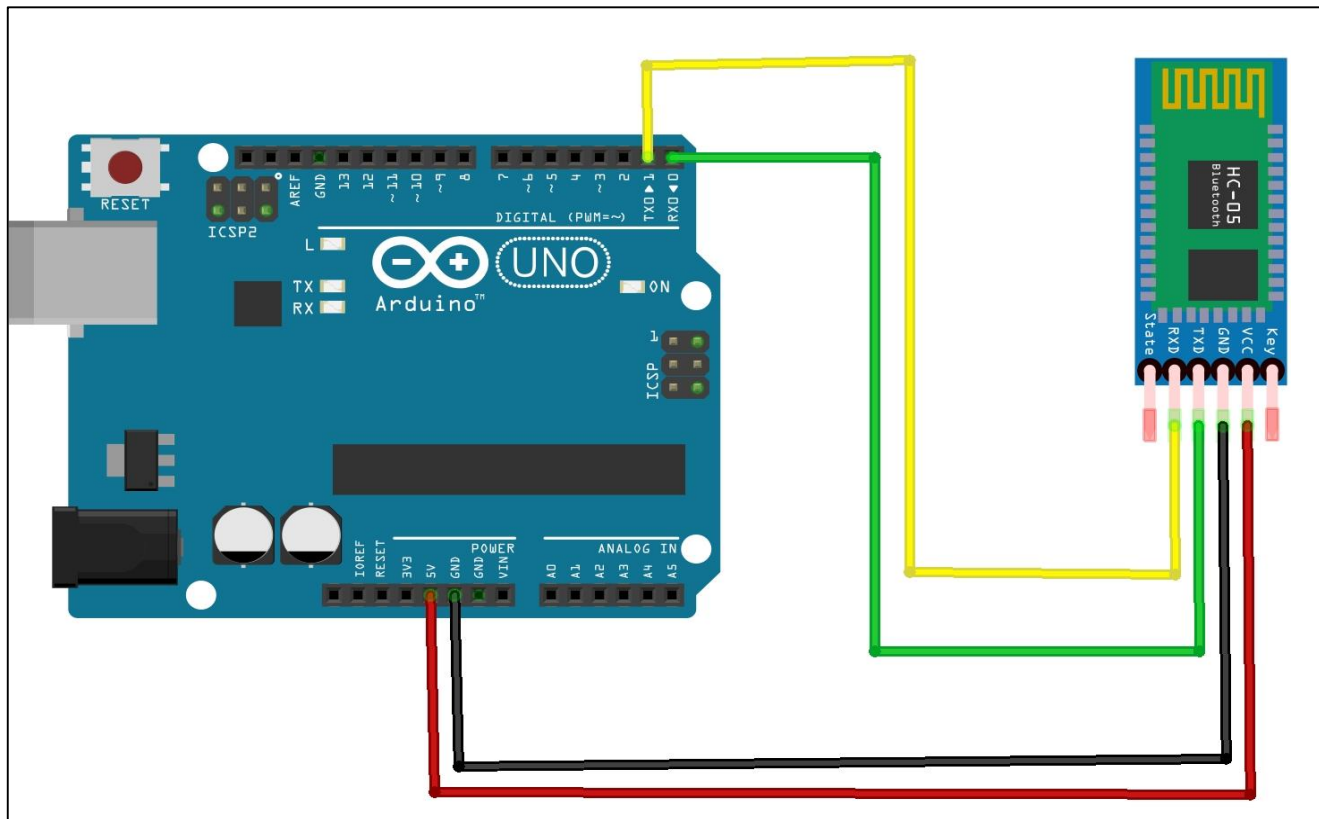


FIGURE 4:-CONNECTION BETWEEN ARDUINO BOARD

## Designing the Circuit :-

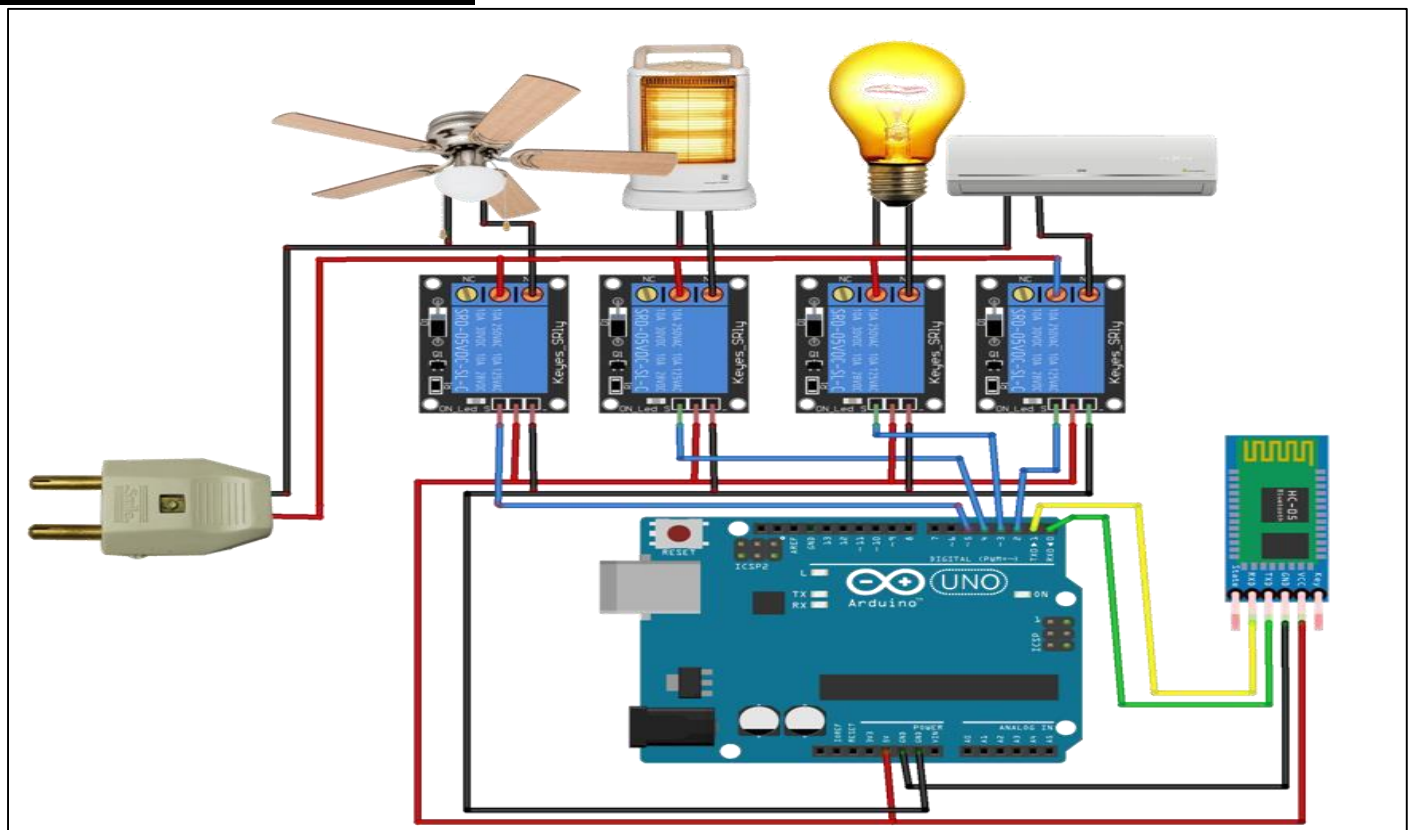


FIGURE 5:-MAIN CIRCUIT

## **LITERATURE SURVEY:-**

**1.New media art, design, and the Arduino microcontroller:-**The Arduino microcontroller<sup>1</sup> is used in art and design as an open source programmable tool to create interactive works. It can drive motors, LEDs, sensors and other components. Microcontrollers are small computing systems used for low power and low memory

**2.HIDUINO: A firmware for building driver less USB-MIDI devices using the Arduino microcontroller:-**This paper presents a series of open-source firmwares for the latest iteration of the popular Arduino microcontroller platform. A portmanteau of Human Interface Device and Arduino, the HIDUINO project tackles a major problem in designing NIMES

**3.Self-Balancing Platform for Robot/Machine Using Arduino:- M. Muthukumaran<sup>1</sup>**

This paper represents a self balancing platform and its control using Arduino. In recent years, the low-cost Arduino has become a popular prototyping platform, especially among hobbyists and also for educational purposes.

Bluetooth based Home Automation using Arduino:- This paper presents the design and implementation of a low cost but yet flexible and secure cell phone based home automation system. The design is based on a standalone Arduino BT board and the home appliances are connected to the input/ output ports of this board via relays. The communication between the cell phone and the Arduino BT board is wireless. This system is designed to be low cost and scalable allowing variety of devices to be controlled with minimum changes to its core. Password protection is being used to only allow authorized users from accessing the appliances at home.

**4.IOT Based Smart Security and Smart Home Automation 1 Sudha Kousalya Assistant Professor Dept. of ECE Aditya College of Engineering Madanapalle ,Chittoor , India**

“Internet of Things” is fast becoming a disruptive technology business opportunity, with standards emerging primarily for wireless communication between devices and gadgets in day to day human life, in general referred to as Things. This project aims at controlling home appliances and building a smart wireless home security system using Wi-Fi as communication protocol. The Home Automation can be implemented using different types of wireless communication techniques such as ZigBee, Wi-Fi, Bluetooth, GSM, etc. These existing methods have drawbacks as they work in short range. To overcome this drawbacks, we are going to implement this project “IoT based Smart security and Smart Home Automation”. The project focuses on controlling lights and fans referred as Home Automation and providing Smart security by sending an captured image through an E-mail to the owner using internet when an object is detected. By using “Node MCU” Module we are going to implement this project. This will be more helpful for Handicapped and aged people.

## **Program Code:-**

```
long int ac=2; long
int bulb=3; long int
heater=4; long int
fan=5; char x;
void setup()
{
pinMode(ac,OUTPUT);
pinMode(bulb,OUTPUT);
pinMode(heater,OUTPUT);
pinMode(fan,OUTPUT);
digitalWrite(ac,LOW);
digitalWrite(bulb,LOW);
digitalWrite(heater,LOW);
digitalWrite(fan,LOW);
Serial.begin(9600);
}
void loop()
{
if(Serial.available()>0)
{
x=Serial.read();
}
if(x=='a') digitalWrite(ac,HIGH); if
(x=='b') digitalWrite(ac,LOW); if
(x=='c') digitalWrite(bulb,HIGH);
if(x=='d') digitalWrite(bulb,LOW);
if(x=='e')
digitalWrite(heater,HIGH); if(x=='f')
digitalWrite(heater,LOW); if(x=='g')
digitalWrite(fan,HIGH); if(x=='h')
digitalWrite(fan,LOW);
}
```

## **Application Instillation:-**

From the given below link install the app from google play store to your smartphone and connect it as

Given below process:

<https://play.google.com/store/apps/details?id=com.bluetoothcontroller>

1. Turn on your smartphone Bluetooth.
2. Install and open the app.
3. Click on connect to Bluetooth
4. Click on HC-05
5. It will ask code, put code '1234' if it doesn't work then put '0000' if this step doesn't work here then. Go to step 1 and try connect manually with same codes and then follow from step 2.
6. Press OK or Connect and now you are done

In this way you can make your own home automated system using Arduino, Relay and Bluetooth Module (HC-05).



## **Application :-**

*Using this project, we can turn on or off appliances remotely, using Phone or tablet.*

*the project can be further expanded to a smart home automation System by including some sensors like lights sensors, temperature sensor, Safety sensors etc. and automatically (room temperature), door etc., and Transmit the information to our phone.*

*Additionally, we can connect to internet and control the home from Remote location over internet and also monitor the safety.*

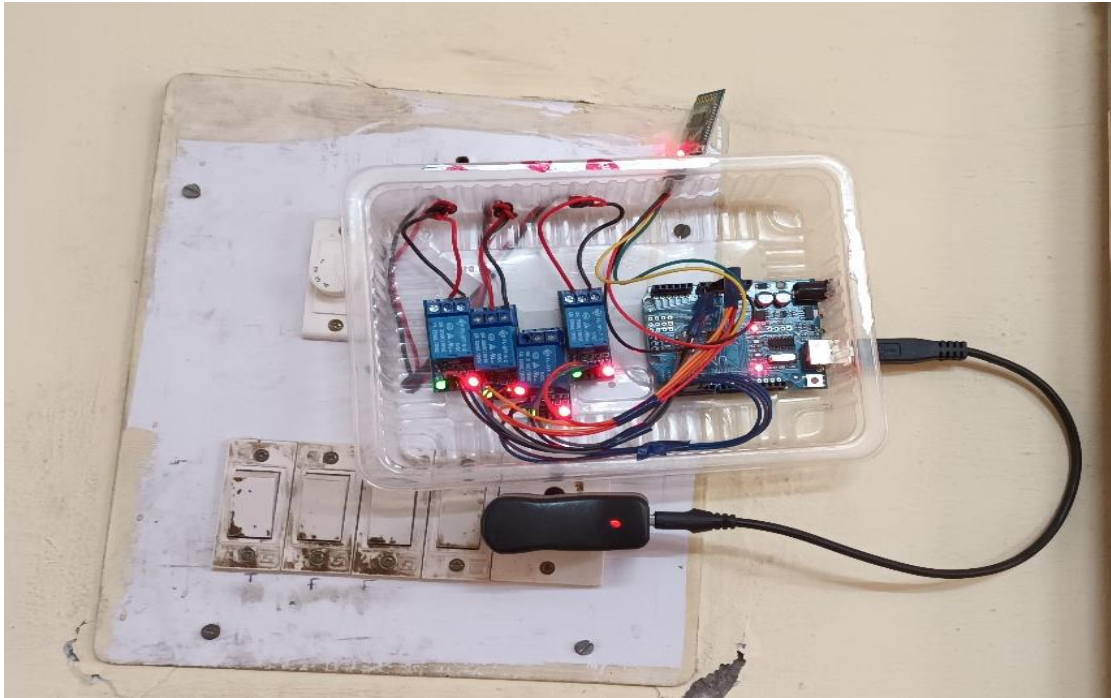
## **Conclusion**

*The home automation system has been experimentally proven to work satisfied by connecting sample appliances to it and the application were successfully controlled from a wireless mobile device.*

*We learned many skills such as soldering wiring the circuit and other tools that we use for this project 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 compatibly. Thus a low- cost home automation system was successfully designed. Implement and tested.*

## WORK DONE ON THE PROJECT TILL DATE



1. Learned the use of electromagnet relay
2. Learned the use of full size Arduino UNO board
3. Learned the use of jumpers wire to connect Arduino to relay
4. Learned all about the port available in Arduino board
5. Learned the basic of coding used to operate Arduino functions.
6. Learned to make relay with using PCB board, pins, resistor, and electromagnetic relay.
7. Applied the full setup in M.E. H.O.D. room and make all light equipment control with the help mobile phone.

## **BIBLIOGRAPHY:-**

1. <https://en.wikipedia.org/wiki/Arduino>
2. [https://en.wikipedia.org/wiki/Arduino\\_UNO](https://en.wikipedia.org/wiki/Arduino_UNO)
3. <https://arduino-app.com>
4. <https://www.arduino.cc/en/software>
5. <https://wikifactory.com/+dpa/stories/bluetooth-with-the-hc-05-module>
6. <https://arduoinfo.mywikis.net/wiki/BlueTooth-HC05-HC06-ModulesHow-To>
7. <https://play.google.com/store/apps/details?id=com.bluetoothcontroller>
8. <https://www.roboticsinsight.com/2020/12/diy-home-automation-using-arduino-relay.html>
9. <https://1.bp.blogspot.com/-DHqI1c7Bbio/Xy0JkcwwdI/AAAAAAAAAMmo/Rf2N1J9lPsUs9gA8uyusnoveozHnIncjQCLcBGAsYHQ/s16000/automation.png>
10. <https://1.bp.blogspot.com/-pp5h4UEaKlw/X-y6CxwvJGI/AAAAAAAAAMnE/B1yfzfs6nQ8c2XKAJMAOuSVPcghnuoVQCLcBGAsYHQ/s320/123.jpg>

