
# CCN University of Science & Technology

## Department of Computer Science and Engineering (CSE)

**LAB REPORT**

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# Project Name:

**Designing of Light/Fan Automation System Based on Arduino Bluetooth Interface using Android Smartphone**

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# Designing of Light/Fan Automation System Based on Arduino Bluetooth Interface using Android Smartphone


## Abstract

We are living in 21 centuries where all the things are smart and plays an important role in human life. The concept is applied to large machines or robots which help in increasing the efficiency in terms of production, energy, and time. The main objective of this project is to develop a smartphone control 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. Smart controlled automation system provides a most modern solution with smart phones. To achieve this, a Bluetooth module is interfaced to the Arduino board at the receiver end while on the transmitter end, a GUI application on the cell phone sends ON/OFF commands to the receiver where loads are connected. By touching the specified location on the GUI, the loads can be turned ON/OFF remotely through this technology.


## Introduction

Smartphones provoke a true revolution to our society. Apps are available to smartphone users for more type of connections, such as communication platforms. Bluetooth technology makes it possible for electronic devices to be linked over short distance, without needing to be connected by wires. Nowadays, we have remote controls for our television sets and other electronic systems, which have made our lives 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.

## 1.1 Project Aim:

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

## 1.2 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/off any household appliance, using a microcontroller to achieve hardware simplicity, low cost.

## 1.3 Project scope and limitation:

This project work is complete on its own in remotely and automatically switching on/off an electrical appliance not limited to household appliances and sends a feedback message indicating the new present state of the appliance.

## 1.4 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 the controller Arduino, through wireless communication, namely, Bluetooth. When the user presses on the 'On' button displayed on the app for the device the light is switched on. This light can be switched off, by pressing the same button again. Similarly, when the user presses on the "On" button displayed on the app for the device 2, the fan is switched on. The fan 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.

# Project Implementation Procedure

In this section at first, we will present required equipment of our project and then we will present project implementation procedures.

## Required Equipment

### Hardware

1. Arduino Uno R3
2. HC-05 Bluetooth Module
3. Male Female Jumper Wire
4. 220V 80W Hot Melt Glue Gun
5. 5V 2-Channel Relay Module
6. Bulb Lamp
7. 220V AC Line
8. Adapter

## Software

1. Arduino IDE
2. Arduino Drive Software
3. Proteus ISIS

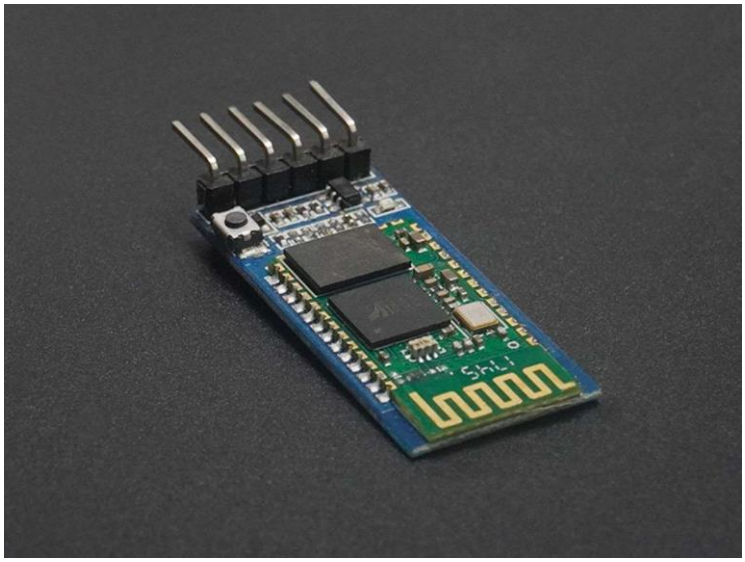
## Device

1. PC Windows 11

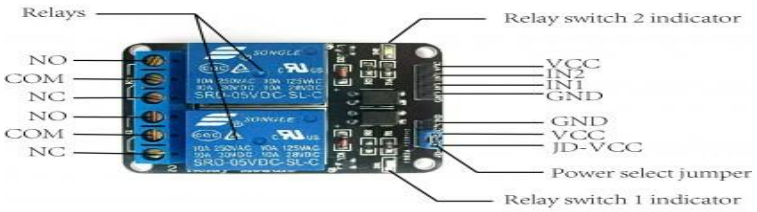
# Short description of some major equipment's is given below for more clarification:

**Arduino Uno R3** is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). Programs can be loaded on to it from the easy-to-use Arduino computer program.

**HC-05 Bluetooth module** which is designed for wireless communication. This module can be used in a master or slave configuration. Bluetooth serial modules allow all serial enabled devices to communicate with each other using Bluetooth.



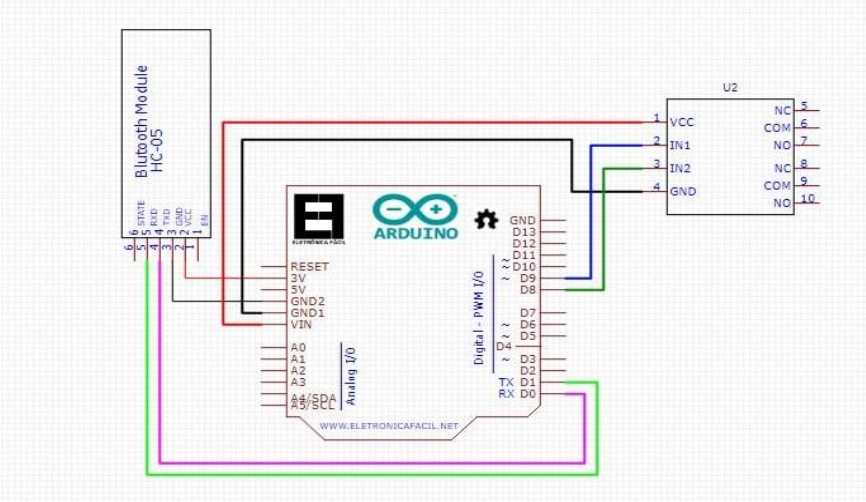
The **2 Channels Relay Module** is a convenient board which can be used to control high voltage, high current load such as motor, solenoid valves, lamps, and AC load. It is designed to interface with microcontroller such as Arduino, PIC etc. The relays terminal (COM, NO and NC) is being brought out with screw terminal. It also comes with a LED to indicate the status of relay.



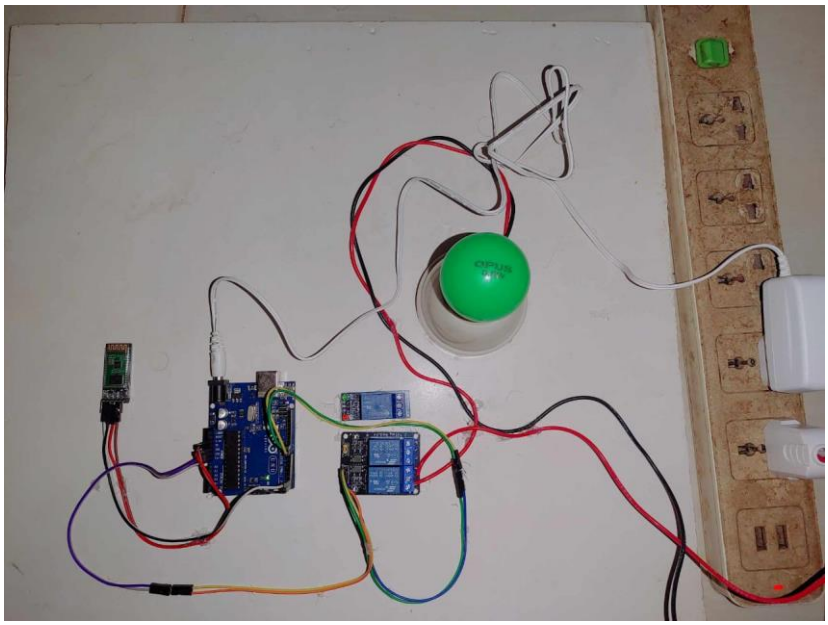

## Procedure

1. Circuit connection

All the connection of the system was completed like this circuit diagram.



After completing the setup, the circuit-



2. Now uploading the code in the Arduino Uno R3 [program is codded in Arduino language]

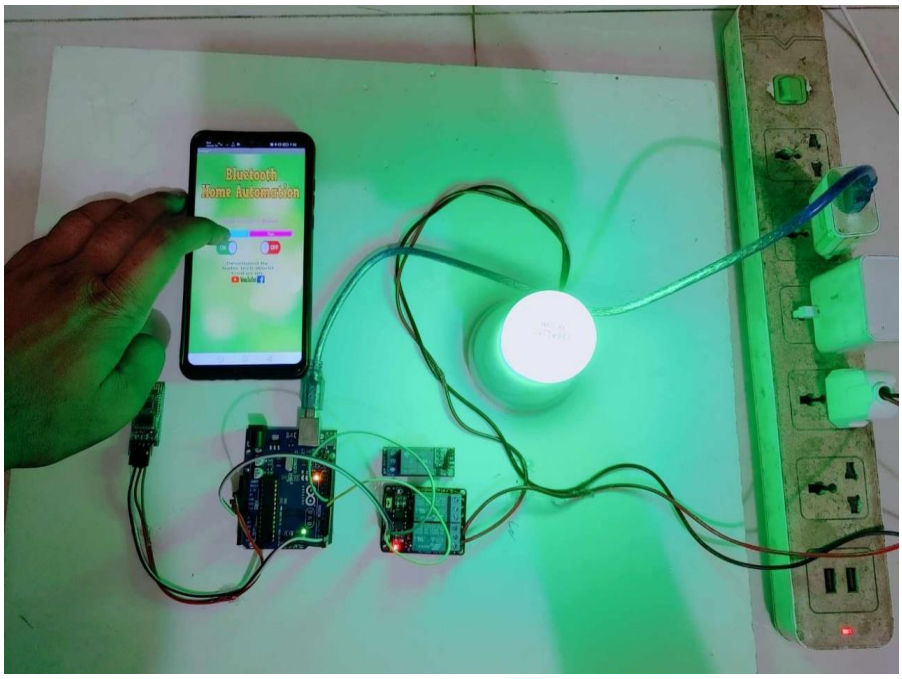
```
int load1 = 8;

int load2 = 9;

char sms;

void setup()

{

  pinMode(load1,OUTPUT);

  pinMode(load2,OUTPUT);

  digitalWrite(load1,HIGH);

  digitalWrite(load2,HIGH);

  Serial.begin(9600);

}

void loop()

{

  if(Serial.available()!=0)

  {

    sms = Serial.read();
```

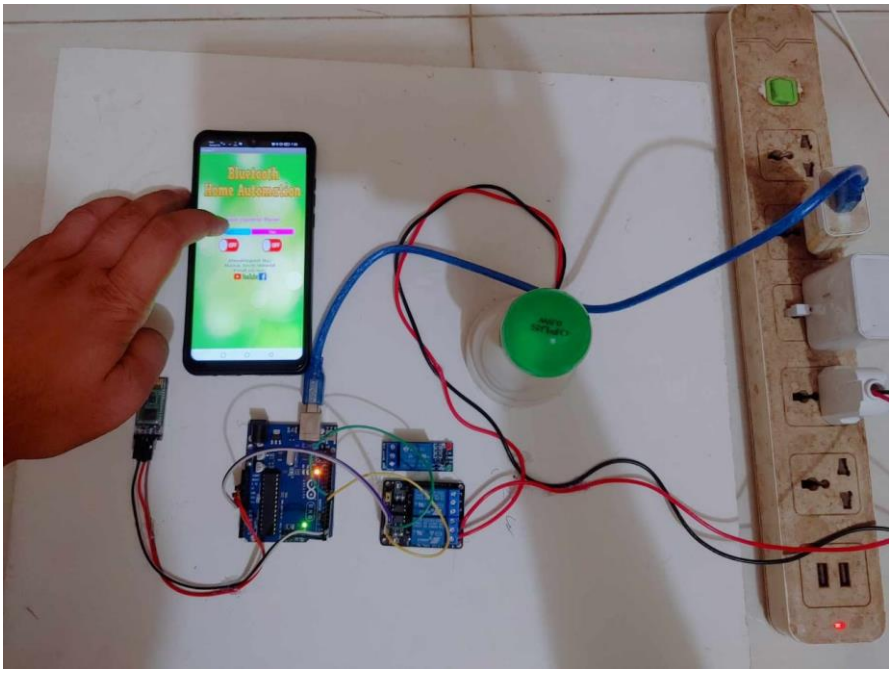
```
  }
  if(sms=='a')
  {
    digitalWrite(load1,LOW);
  }
  if(sms=='b')
  {
    digitalWrite(load1,HIGH);
  }
  if(sms=='c')
  {
    digitalWrite(load2,LOW);
  }
  if(sms=='d')
  {
    digitalWrite(load2,HIGH);
  }
}
```

3. Downloading the android application and setting up Bluetooth


## Performance Evaluation

We have implemented a system that we designed. Some response we are getting.



## Cost Analysis

| Item | Unit | Price | Cost |
|---|---|---|---|
| 5V 1A Power Adapter (High Quality) | 1 | 180 | 180 |
| Arduino Uno R3 | 1 | 790 | 790 |
| 5V 1 Channel Relay Module | 3 | 90 | 270 |
| HC 05 Bluetooth Module | 1 | 330 | 330 |
| Male To Female Jumper Wire | 1 | 80 | 80 |
| 220V 80W Hot Melt Gun | 1 | 220 | 220 |
| **Total Cost** | - | - | **1870** |

Here we used these products to design the project and the total cost is approximately 1870/-. We got these products by ordering from online that's why they need some extra cost, but while we buy something from wholesale market of course the cost will reduce. For every household electronic device, we need extra relay to control them. As we implemented first time, some products need to be bought as an asset equipment and it has increased our total cost also. Some additional cost may occur by damaging some equipment. Overall, our system outperforms the main purpose of the system for which problem's solution it proposed to.

# Pros of this project

## 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 can 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 neighbours 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.

# Cons of the project

## 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.

## Applications of this project

1. Using this project, we can turn on or off appliances remotely ie, 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 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 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 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 compatibility. Thus, a low-cost home automation system was successfully designed, implemented, and tested.

## Recommendations

For secured, ubiquitously accessible and remotely controlled lighting system, GSM module will be incorporated in the future designs since accessibility to the devices is limited within the Bluetooth range. Timer will be included to be more energy- efficient and highly scalable. It would be extended to the large-scale environment such as colleges, offices, and factories etc.