

# Home Automation Using Arduino Uno

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## ABSTRACT

*This project is a fine combination of Android mobile technology and embedded system. User can control Home appliances using Android mobile. An application should be installed on his/her Android mobile handset to control various home appliances. Wireless controlling technique used in this project is Bluetooth technology. This project consists of a Bluetooth receiver. This Bluetooth device is connected to the circuit which has a decoder. This decoder sends code for respective command sent by user. Then the respective device connected to the circuit will be turned on or off depending on the command given. An Android app is a software application running on the Android platform. Presented here is a home automation system using a simple Android app, which we can use to control electrical appliances with clicks are sent via Bluetooth to Arduino Uno. The home automation circuit is built around Arduino Uno board, Bluetooth module HC-05 and a 4-channel relay board. The number of channels depends on the number of appliances we wish to control. Arduino Uno is powered with a 12V DC adaptor/power source. The software program for home automation using Android app is written in Arduino programming language. The app on our smartphone sends data when we click on buttons via Bluetooth in the mobile to Bluetooth module connected with Arduino board. Arduino Uno processes the received data and controls the relay board accordingly. This project can be used to control various Home Appliances. We can control devices from a long distance, thus it gives ease of access. The operation is faster and efficient. There is no need to carry separate remote or any other controlling unit..*

**Keywords:** Arduino Uno, Bluetooth Module, Home Automation, 4-Channel Relay, Faster & Efficient

## 1. INTRODUCTION

Nowadays, people have smartphones with them all the time. So it makes sense to use these to control home appliances. Presented here is a home automation system using a simple Android app, which you can use to control electrical appliances with clicks or. Commands are sent via Bluetooth to Arduino Uno. So you need not get up to switch on or switch off the device while watching a movie or doing some work.

This project is a fine combination of Android mobile technology and embedded system. User can control Home appliances using Android mobile. An application should be installed on his/her Android mobile handset to control various home appliances. User can send commands using that application. Wireless controlling technique used in this project is Bluetooth technology. This project consists of a Bluetooth receiver. This Bluetooth device is connected to the circuit which has a decoder. This decoder sends code for respective command sent by user. Then the respective device connected to the circuit will be turned on or off depending on the command given.

## 2. COMPONENTS REQUIRED

- 2.1 Arduino Uno
- 2.2 Bluetooth Module (HC-05)
- 2.3 4 Channel / 8 Channels Relay Module (5 or 12 V)
- 2.4 Software
  - 2.4.1 Android App (be installed on the smartphone to control the appliances)
  - 2.4.2 Arduino IDE (used for programming the Arduino Uno )

### 2.1 ARDUINO UNO

Arduino is an open source electronics prototyping platform based on flexible, easy-to-use hardware and software. It is intended for artists, designers, hobbyists and anyone interested in creating interactive objects or environments Arduino Uno is based on ATmega328 microcontroller (MCU). It consists of 14 digital input/output pins, six analogue inputs, a USB connection for programming the onboard MCU, a power jack, an ICSP header and a reset button. It is operated with a 16MHz crystal oscillator and contains everything needed to support the MCU. It is very easy to use as you

simply need to connect it to a computer using a USB cable, or power it with an AC-to-DC adaptor or battery to get started. The MCU onboard is programmed in Arduino programming language using Arduino IDE.

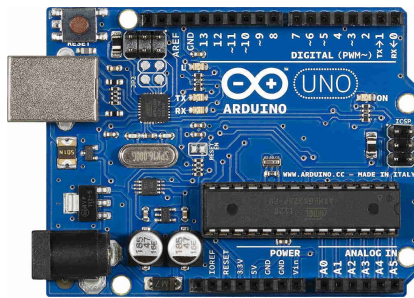


Figure 1: ARDUINO UNO BOARD

### 2.2 BLUETOOTH MODULE (HC-05)

Bluetooth module used in this project is HC-05 (Fig. 4), which supports master and slave mode serial communication (9600-115200 bps) SPP and UART interface. Using these features it can communicate with other Bluetooth-enabled devices like mobile phones, tablets and laptops. The module runs on 3.3V to 5V power supply. It has got 6 pins.

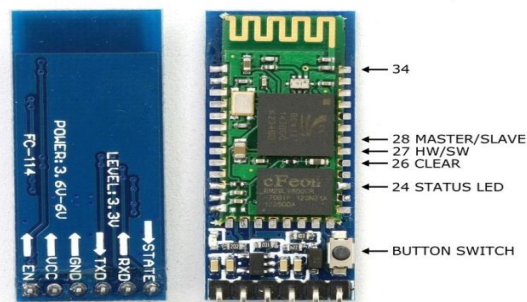


Figure 2: BLUETOOTH MODULE HC-05

### 2.3 RELAY MODULE

A relay allows you to turn on or turn off a circuit using voltage and/or current much higher than what Arduino could handle. Relay provides complete isolation between the low-voltage circuit on Arduino side and the high-voltage side controlling the load. For this project a 4 channel, 5V relay channel has been taken. This 5V 4-channel relay interface board and each channel needs a 15-20mA driver current. It can be used to control various appliances and equipment with large current. It is equipped with high-current relays that work under AC250V 10A or DC30V 10A. It has a standard interface that can be controlled directly by microcontroller.



Figure 3: 4 CHANNEL RELAY

### 2.4 SOFTWARE

#### 2.4.1 Arduino Software (IDE)

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source

software. This software can be used with any Arduino board.

### 2.4.2 Android App

An android app is used to control the appliances wirelessly. The app can be downloaded from the Google Play or can be made from MIT App Inventor 2 (creating android app online). The screenshot shown below is made by the MIT App Inventor 2. This app is now in developer stage and hence can be improved with some improvements and modifications.



Figure 4 : Android App

## 3 CONNECTION LAYOUT

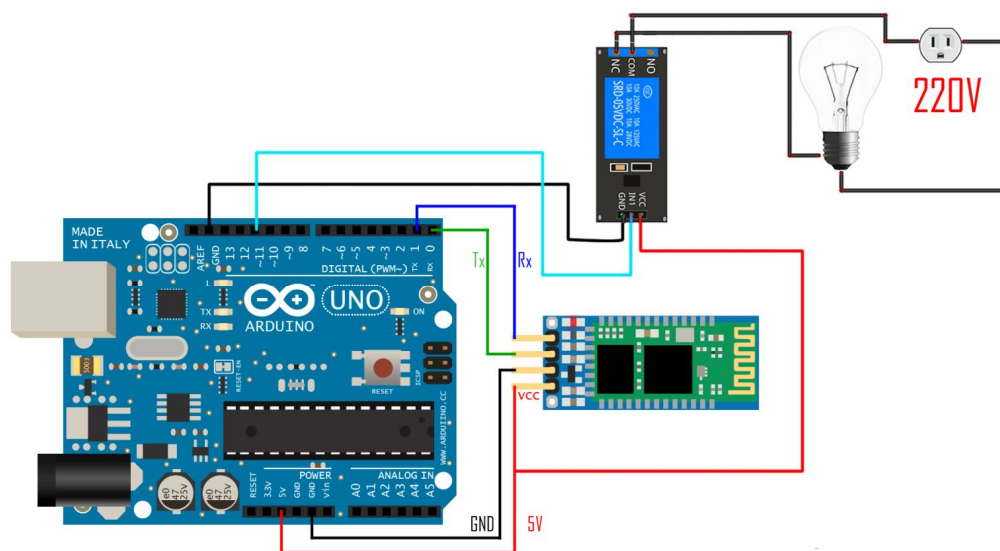
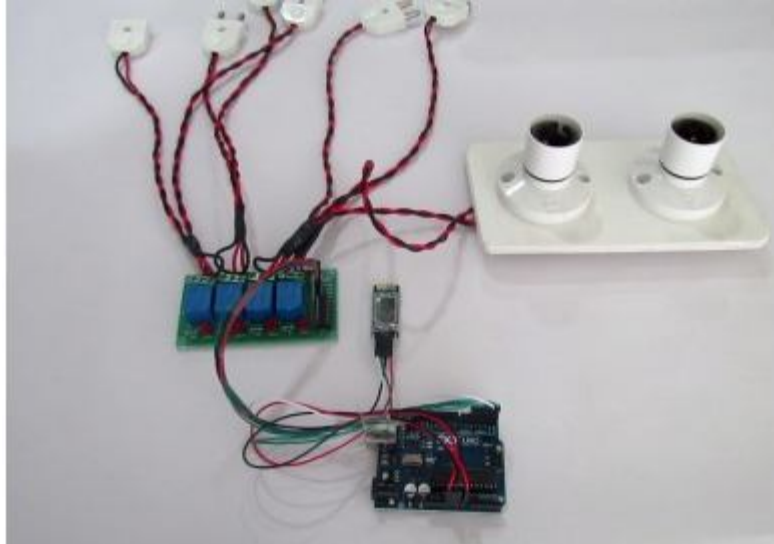


Figure 5 : Connection Layout

The above figure shows the connection of the Bluetooth module (HC-05) and the relay module with the Arduino Uno. This figure shows 1 relay connection with the Arduino Uno, similarly 9 extra relays can be connected to the Arduino Uno in the above mentioned configuration having different output pins from the Arduino Uno.

#### 4 CONNECTION AND TESTING



**Figure 6 : Connection**

Assemble the home automation circuit as shown in the circuit diagram (Fig 5). Open Arduino IDE and compile the above program (sketch). Upload the sketch to Arduino board. Switch on the power supply to Arduino by connecting it to 5V power source. Pair Bluetooth module with your Android phone. Type password '1234' (default password) of Bluetooth module. Click Bluetooth Image on the app to connect it with the Bluetooth module. It automatically connects and displays as Connected in the app.

You are now ready to control the appliances using the app. You can touch the icon to ON/OFF so to control the appliances. You can control more electrical appliances by increasing the number of channels in the relay. For instance, using an 8-channel relay, you can control up to eight devices. For this, you need to alter the source code by adding input commands.

#### Reference

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