

SMART HOME AUTOMATION USING BLUETOOTH MODULE

INTRODUCTION

Home automation is the use of one or more computerized remote to control basic home appliances remotely and sometimes automatically. It helps communication between one point to another without the use of cables, and this makes the system more secure. Popularly, most home appliances are all wired to the same cable that connects them to the home control panel and they require the mobility of the user to operate it, hence the need for automation.

STATEMENT OF PROBLEM

Home automation is a network of hardware, communication, and electronic interfaces that work to integrate everyday devices with one another via wireless network interfaced with Arduino UNO microcontroller boards. Each device has sensors and is connected through a bluetooth module, so you can manage them from your smartphone or tablet whether you're at home, or miles away.

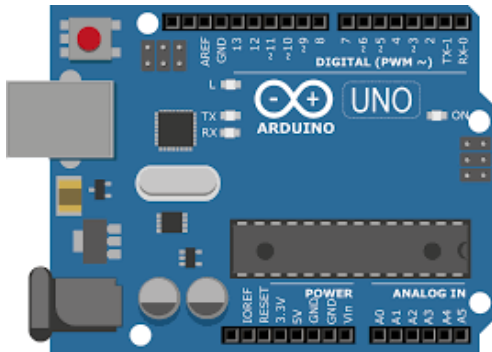
Smart home devices are one of the most popular and widely known. After all, who doesn't love being able to control home appliances remotely, with just a few taps on their smartphones?, some of the benefit of home automation system is that it keeps your home safe, keeps your home secure, keep your home safe, its convenient

COMPONENTS REQUIRED

- Arduino UNO microcontroller board
- HC-05 Bluetooth Module
- Relays
- Jumper wires
- Light Bulbs
- Breadboard

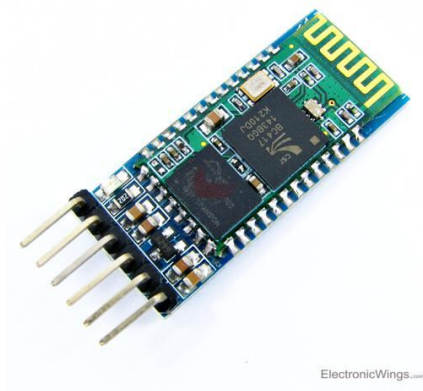
ARDUINO UNO

Arduino is an open-source platform which is used to develop electronics projects. It can be easily programmed, erased and reprogrammed at any instant of the time. There are many Arduino boards available in the market like Arduino UNO, Arduino Nano, Arduino Mega, Arduino lilypad, etc with different specifications according to their use. In this project, we are going to use Arduino UNO to control home appliances automatically.



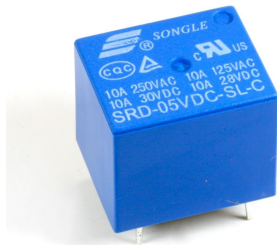
HC-05 Bluetooth Module

HC-05 is a Bluetooth module used for wireless communication. It is used mostly to establish serial two-way wireless communications between microcontrollers, smartphones, computers, sensors, etc.



Relay

A relay is an electromagnetic switch which is operated by a small electric current to turn on or off one or many bigger circuits. It consists of an electromagnet coil which converts in a temporary magnet when a small electric current is passed through it. A relatively small current is used to create a magnetic field in a coil with a core and this is used to operate a switch that can control a much larger current.



Other components include *Jumper wires* and *Breadboard* used for connection and light bulb as the load.

SOFTWARE REQUIRED

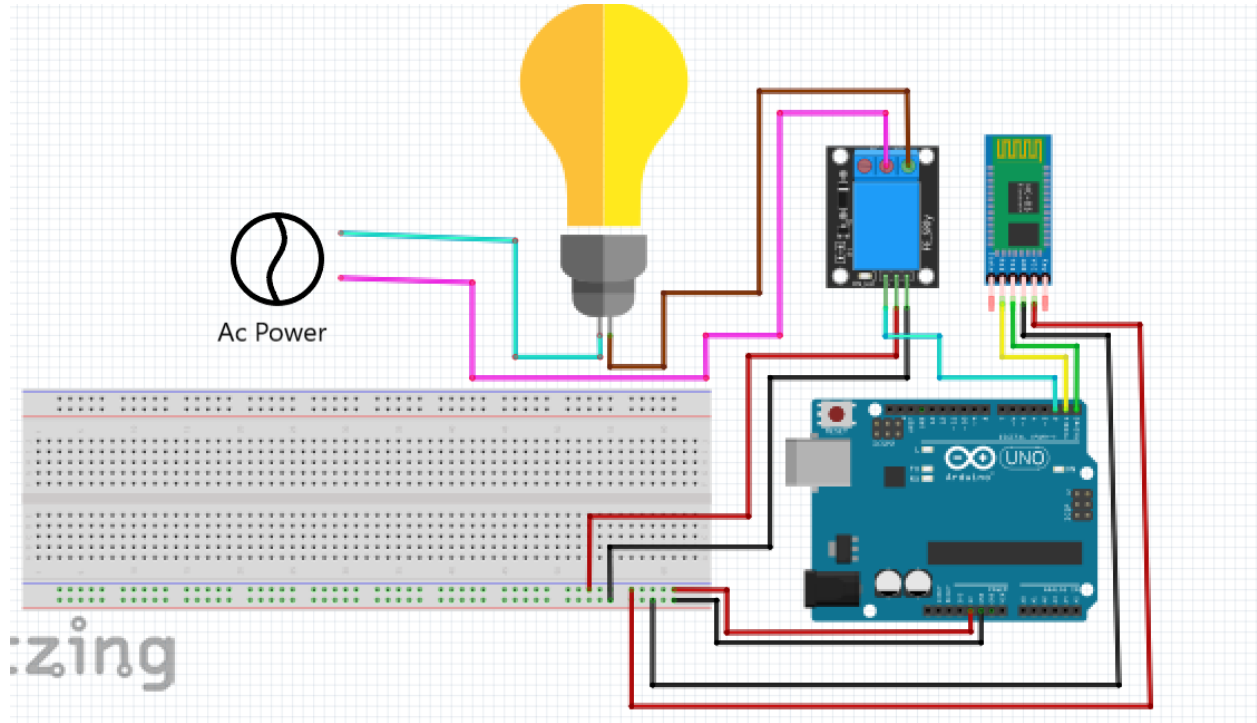
The following are the specific softwares used in this project;

ARDUINO IDE: It is an arduino programming software where the program inputted into the arduino microcontroller is written.

FRITZING: It is used in prototyping and showing the schematic diagram of the project connections.

Bluetooth Terminal HC-05 App: It is an application used in controlling the system remotely.

CIRCUIT SCHEMATICS



HARDWARE CONNECTION OVERVIEW

- 1) Connect the Arduino's +5V and GND pins to the bus strips on the breadboard, as shown in the above circuit diagram.
- 2) Power the HC-05 module by connecting the 5V and GND pins to the bus strips on the breadboard.

3) Connect the TXD pin on the HC-05 module with the RXD pin (Pin 0) on the Arduino. This connection allows the HC-05 to send data to the Arduino. The reason why we pair up TXD on the bluetooth module with RXD on the Arduino is simple. The TXD pin is used to transmit data from the bluetooth transceiver, while the RXD pin is used to receive data on the Arduino.

4) Now we need to connect the TXD pin on the Arduino to the RXD pin on the HC-05. This connection will form the second half of the two-way communication and is how the Arduino sends information to the HC-05. We don't use the STATE and EN pins on the HC-05 module, since they are not required for this setup.

The next step is to connect the Arduino to a relay module, so that we can turn the connected device ON/OFF. As shown in the circuit diagram above, we'll be connecting the relay module in series with our electrical load, so that we can break the connection when we want to turn the device off and complete the circuit when we want to turn it on.

Here's how to connect the relay module to the Arduino:

1) First, connect the 5V and GND pins of the relay module to the bus terminals on the breadboard.

2) Next, connect the IN1 pin on the relay module with PIN 4 on the Arduino. If you have a multi-channel module (2, 4 or 8 channels), you can connect IN2, IN3 ... In(n) with different digital pins on the Arduino, and repeat the steps below for configuring the other pins.

3) Now we need to connect the AC load to the relay module. If you look carefully at the terminal block on the relay module, you'll find these three terminals: C: Common, NC: Normally Closed, NO: Normally Open

We want to turn on the bulb only when we send a signal from our smartphone. That's the reason we connect the load to the NO (Normally Open) terminal, so that when the relay is triggered from the Arduino, the contact switches from the NC terminal to the NO terminal, thereby completing the circuit.

Uploading the Code

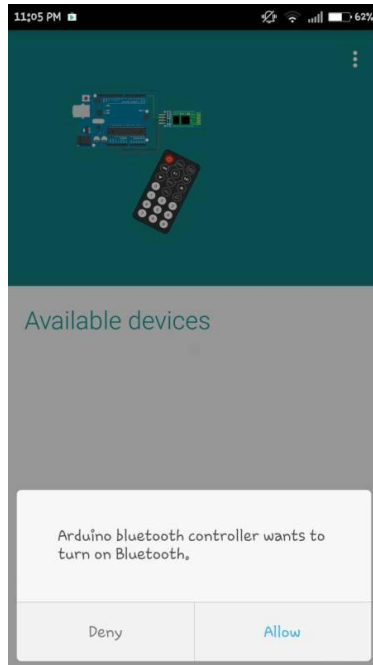
After you have successfully wired things up, the next step is to upload the code to the Arduino. In order to upload the code, connect the Arduino through the USB port on your computer and open the Arduino IDE. After that, copy the below sketch in a new window, and try to run it on your Arduino.

Controlling the bulb from your Android device

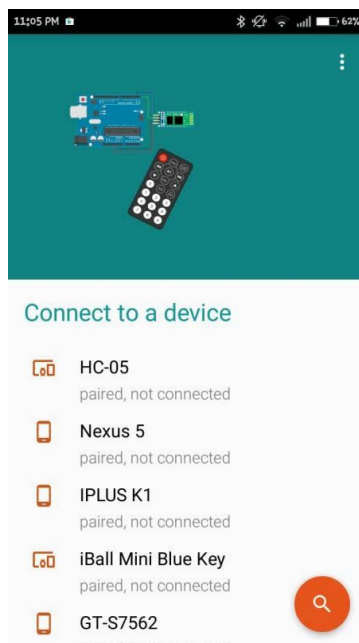
Now that we have set up the hardware and successfully uploaded the code, the next step is to control the setup from a smartphone. In order to do that, you'll need to download the Arduino Bluetooth Controller app on your Android device.

Here's how to configure your Android device to send commands to the Arduino:

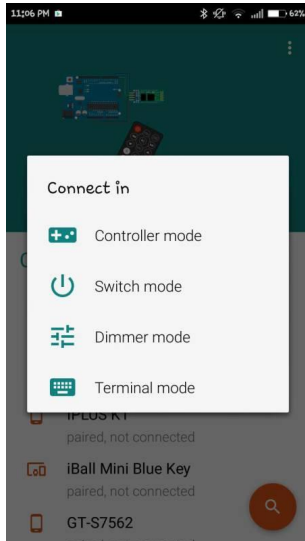
- 1) Open the app on your smartphone. It will ask for Bluetooth permissions. Click 'Allow'.



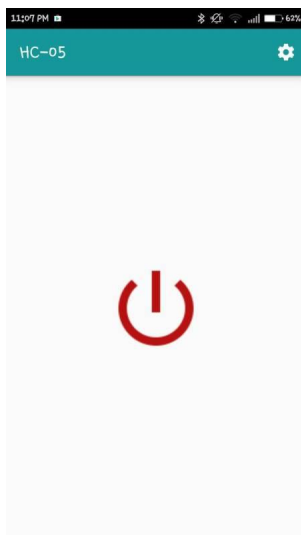
2) Next, it will list all the available devices in your vicinity. Select HC-05.



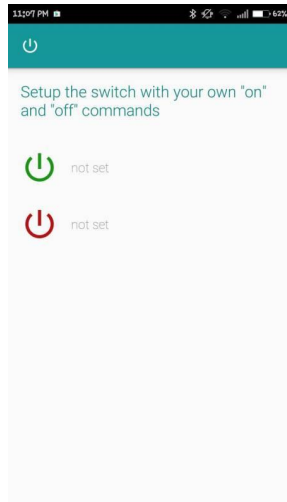
3) Once you select the device, you'll be connected to the HC-05 transceiver. The app will now prompt you to enter the mode that you wish to use. Select "Switch" mode.



4) You should be redirected to the following screen. Click on the “Settings” icon in the top-right corner of the screen.



5) It will now ask you to set values for ON and OFF. Enter '1' in the ON textbox and '0' in the OFF textbox. Click Submit.



That's it.

PROJECT CODE AND OVERVIEW

```
bluetooth $  
  
char val;  
  
int light = 2; // RELAY VALUE  
  
void setup() {  
  pinMode(light, OUTPUT);  
  
  Serial.begin(9600);  
  
}  
  
void loop() {  
  if (Serial.available()) {  
    val = Serial.read();  
    Serial.println();  
  }  
  if (val == '1')  
  { digitalWrite(light, HIGH);  
    Serial.println("LIGHT ON");  
  }  
  else if (val == '0')  
  {  
    digitalWrite(light, LOW);  
    Serial.println("LIGHT OFF");  
  }  
  delay(1000);  
}
```

Char val ; which reads the incoming data from the bluetooth module and store it into variable data. While **int light = 2;** signifies declaration of the relay which switch on and off the relay.

In the void loop, **if (Serial.available())** checks if there is any value from the bluetooth module while **val = Serial.read();** gets the value transmitted from the bluetooth module if there is any value.

```
if (val == '1') { digitalWrite(light, HIGH);  
Serial.println("LIGHT ON"); }, where if val is equal to “1” the light bulb turns on  
else if (val == '0'){ digitalWrite(light, LOW);  
Serial.println("LIGHT OFF");, or else if val is equal to “0” the light bulb goes off  
  
}
```

CONCLUSION

An Arduino based home automation system using Bluetooth and an android application has been designed and implemented. The Home automation system used an Android application and a Bluetooth technology in the design; this is because they are easy to use, fast, readily available, and reliable in communications between the remote user and devices. A low cost and highly reliable home automation system that can assist handicapped/old aged people, as well as a user-friendly device was developed.

