Arduino Based Bluetooth Controlled Home Automation

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Objective

Smartphones are the new craze and they have made life easier than ever. They are portable and always in the pockets. This portability of smartphones have led the marketers and the designers to develop services and solutions around the mobile domain. There are apps to shop online, do banking, trade stocks and uncountable day to day tasks. Then how can home automation systems remain isolated from the mobile technology!

In this project, a home automation system is designed which can be controlled by any smartphone. The automation system connects with the smartphone through Bluetooth. The smart phone sends control signals to switch home appliances ON or OFF by an android app through Bluetooth interface.

The project is built on Arduino UNO and is used to control four home appliances connected to the Arduino through relays. The Arduino board is interfaced to an HC-05 Bluetooth module to pair with the smart phone.

An app named “Bluetooth Controller” is used on the smart phone which is capable of sending text strings to a paired device. The Arduino board receives the user commands in the form of numbers from the smart phone through Bluetooth interface. These numbers are assigned to the home appliances and the appliances are toggled either ON or OFF on receiving the numeric command. The Arduino sketch looks for the numeric commands from the Bluetooth module and operates relays to switch appliances.

Working:

Relays:

The 5V 2A relays are used to switch the AC appliances ON or OFF in the project. The relays are connected to the pins 10, 11, 12 and 13 of Arduino board.The phase wire from the AC supply is provided at the COM terminal of the relays. When a HIGH logic is received at the interfaced microcontroller pins, the COM point switches from NC to NO point where a relay short-circuits the phase with the neutral wire switching the supply to the appliance ON. The LEDs are connected parallel to the relay circuit with pull-up resistors in series. These LEDs give visual hint of the ON/OFF status of appliances.

HC-05 Bluetooth Module:

The Bluetooth module has six pins – Enable, VCC, Ground, Transmit Data (TxD), Receive Data (RxD) and State. The Enable and State pin are unused and so not connected in the circuit. The VCC and Ground pins are connected to the common VCC and Ground. The TxD and RxD pins of the module are connected to the pins 0 and 1 of the Arduino.

How the project works –When the circuit is powered on, the Arduino loads the required libraries and switches relays to OFF position.The Arduino waits for the numeric command to be received from the Bluetooth module. The four appliances are assigned numbers from 1 to 4. If either number is obtained as a string from the Bluetooth module, the status of the respective appliance is toggled. By default, the pins connecting to the relays have a LOW logic driving the relays to switch the appliances OFF.

If an appliance is in OFF condition and number representing it is passed through the Bluetooth app, the Arduino switches the logic at the respective pin to HIGH triggering the relay to switch the appliance ON. The change in the status of the appliance is updated and the bulb indicating supply to the appliance starts glowing due to forward biasing.
If an appliance is in ON condition and number representing it is passed through the Bluetooth app, the Arduino switches the logic at the respective pin to LOW driving the relay to switch the appliance OFF. The change in the status of the appliance is updated and the bulb indicating supply to the appliance stops glowing due to lack of forward voltage.
The numbers are transferred to the interfaced Bluetooth module from the paired smart phone. The smart phone must be paired with the Bluetooth module. Bluetooth Controller app can be used to pass the numeric commands.

Project Source Code

```
int relay1 = 2;
int relay2 = 3;
int relay3 = 4;
int relay4 = 5;
int val;

void setup() {

Serial.begin(9600);
pinMode(relay1,OUTPUT);
pinMode(relay2,OUTPUT);
pinMode(relay3,OUTPUT);
pinMode(relay4,OUTPUT);
digitalWrite(relay1,HIGH);
digitalWrite(relay2,HIGH);
digitalWrite(relay3,HIGH);
digitalWrite(relay4,HIGH);

}
```

```
void loop() {

//check data serial from bluetooth android App
while (Serial.available() > 0){
val = Serial.read();
Serial.println(val);
}

//Relay is on
if( val == 1 ) {
digitalWrite(relay1,HIGH); }
else if( val == 2 ) {
digitalWrite(relay2,HIGH); } else if( val == 3 ) {
digitalWrite(relay3,HIGH); }
else if( val == 4 ) {
digitalWrite(relay4,HIGH); }
```

```
//relay all on
else if( val == 0 ) {
digitalWrite(relay1,HIGH);
digitalWrite(relay2,HIGH);
digitalWrite(relay3,HIGH);
digitalWrite(relay4,HIGH);
}
//relay is off
else if( val == 5 ) {
digitalWrite(relay1,LOW); }
else if( val == 6 ) {
digitalWrite(relay2,LOW); }
else if( val == 7 ) {
digitalWrite(relay3,LOW); }
else if( val == 8 ) {
digitalWrite(relay4,LOW); }

//relay all off
else if( val == 10 ) {
digitalWrite(relay1,LOW);
digitalWrite(relay2,LOW);
digitalWrite(relay3,LOW);
digitalWrite(relay4,LOW);
}
}
```

Components Required –
Home Automation System:

1. Arduino UNO

Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.

2. Bluetooth module(HC-05)

HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with controller or PC.

3. 5V Relay Channel:2

A 5v relay is an automatic switch that is commonly used in an automatic control circuit and to control a high-current using a low-current signal. The input voltage of the relay signal ranges from 0 to 5V

4.Breadboard
5. Two pin plug
6. Bulb holder
7.Jumper Wires
8.Bulb

Mobile Command:
1. Any Android phone
2. Android app (Bluetooth Controller)

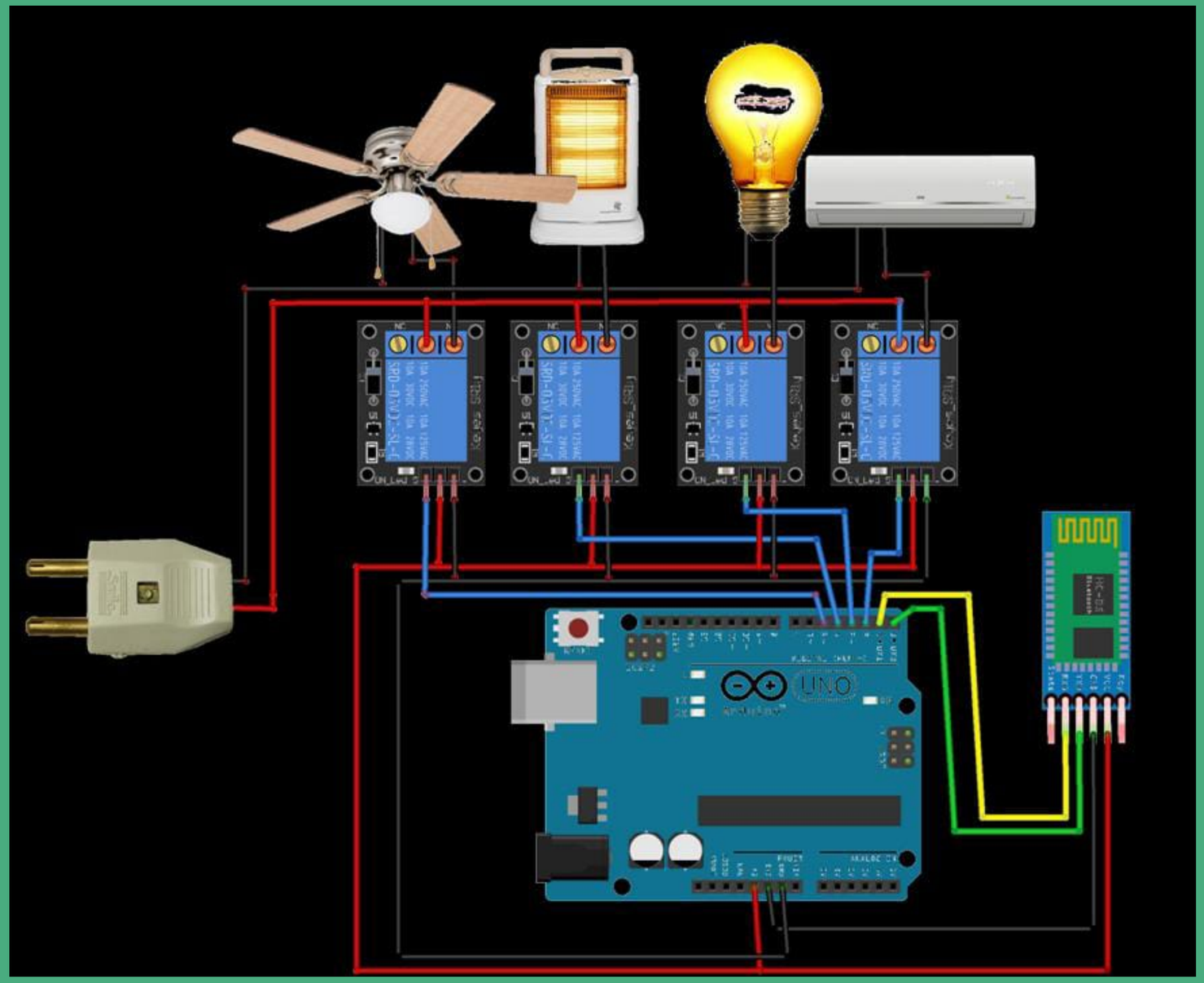

Image of Arduino based Home Automation System

Contribution:

Abhishek Dhakad: Arrangement of Required Components

Jayesh Mulchandani: Circuit Design & Video

Nayan Bargal:Circuit Design & Presentation

Ravi Verma: Coding & Troubleshooting