# Control Systems (ECE 2010)

J-component PROJECT

# Voice Controlled Home Automation System

Under the guidance of

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# Declaration

This is to declare that this report has been written by us. No part of the report is plagiarized from other sources. All information included from other sources have been duly acknowledged. We aver that if any part of the report is found to be plagiarized, we shall take full responsibility for it.

# Contents

## Abstract-

This paper presents the design of a voice recognition based home automation system for the physically challenged people unable to walk, to control the various home appliances with any other person's help. The proposed system consists of a voice recognition module, Arduino uno microcontroller and a relay circuit. The voice recognition module needs to be trained first before it can be used to recognize commands. Upon successful recognition of voice command, the Arduino turns on the intended device with the help of the relay circuit.

## Objective-

Individuals who are paralysed waist-down are unable to do simple activities like turning on various appliances. We aim to help them by developing a home- automation system using a mobile app that can turn on/off the light, fan, and night lamp via bluetooth.

## Introduction-

Nowadays, we have remote controls for our television sets and other electronic systems, which have made our lives real 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? 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 a Home Automation system using Bluetooth . With the help of this system we can control your home appliances from your mobile phone. We can turn on/off your home appliances within the range of Bluetooth.

## Literature survey

### I. VOICE RECOGNITION BASED HOME AUTOMATION SYSTEM FOR PARALYZED PEOPLE

International Journal of Advanced Research in Electronics and Communication Engineering (October 2015)
By M.Kumar, Shimi S.L

The paper presents the design of a low cost voice recognition based home automation system for the physically challenged people. The speech input from the microphone is given to the voice recognition module where the speech signal is compared with the previously stored trained voice samples. Upon successful recognition of voice command the Arduino microcontroller actuates the corresponding electrical device like turning on lights, and adjusting bed elevation using the relay module.

## II. ANDROID BASED HOME AUTOMATION SYSTEM USING BLUETOOTH & VOICE COMMAND -IMPLEMENTATION

International Research Journal of Engineering and Technology (April 2016)
By B.Pandya, M.Mehta,N.Jain,S.Kadam

The paper presents the design and implementation of an automation system that can monitor and control home appliances via android phone. It has an authentication system that only gives access to the authorized personnel.

## III. BLUETOOTH BASED HOME AUTOMATION

International Journal of Scientific Engineering and Technology Research (June 2014)

By N. Wanjale, R. Matthews, B. Mendes, M Navale

The paper describes use of Bluetooth communication to automate various appliances in the house through a mobile phone and Arduino Uno microcontroller. The system turns on the washroom light only when somebody is present in the night (using proximity sensor and Light Dependent Resistor), fire a notification alarm when the bathtub level is full and can also give a notification on the phone application, LED strip is used to change the ambience of the house by adjusting the light intensity, and also has a smoke detector and temperature indicator. This system used an Android application.

## IV. BLUETOOTH BASED SMART AUTOMATION SYSTEM USING ANDROID

International Journal of New Innovations in Engineering and Technology (April 2017)
By P.V .Gaikwad, Y.R. Kalshetty

The paper presents a Bluetooth based centrally controlled home automation system using smartphones and Arduino Uno board. Such a system will enable users to have control over lights, fan in their home and also focuses on smoke detection and temperature sensing by providing security to applications against unauthorized users.
This uses an Android application.

## V. BLUETOOTH BASED HOME AUTOMATION SYSTEM USING CELL PHONE

IEEE Transactions on Consumer Electronics (June 2011)
By R.Piyare, M.Tazil

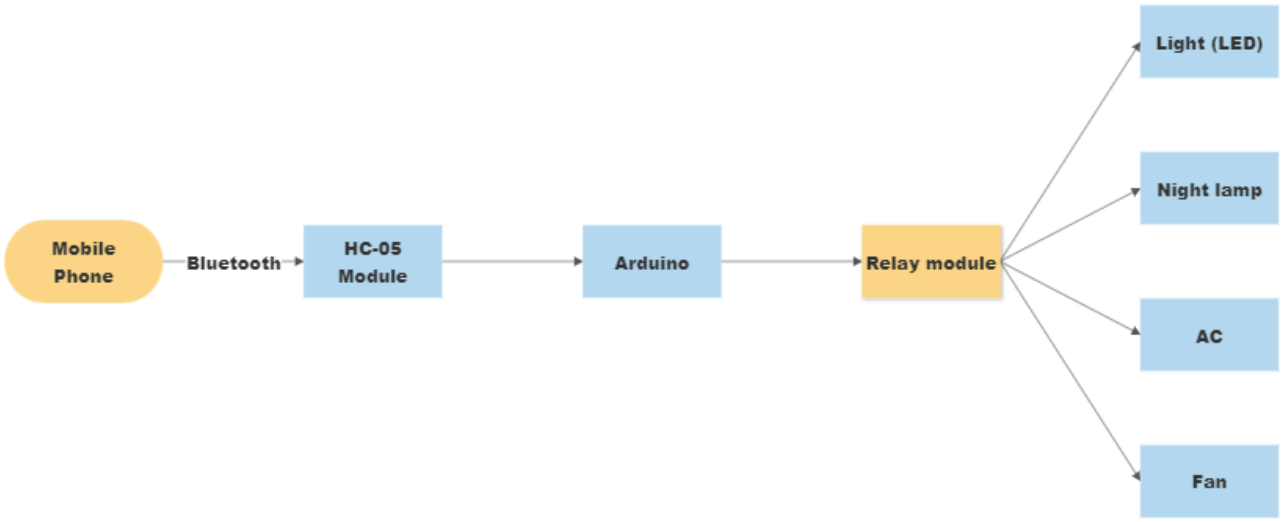
The paper presents the design and implementation of a cell phone based home automation system using a stand alone Arduino BT board. The home appliances are connected to the input/ output ports of this board via relays. The communication between the cell phone and the Arduino BT board is wireless. Password protection was used to only allow authorized users from accessing the appliances at home. This used an android application.

## VI. BLUETOOTH BASED HOME AUTOMATION SYSTEM

Microprocessors and Microsystems (May 2002)
By N. Sriskanthan, F. Tan, A. Karande

The paper proposed a system that consisted of a Host Controller (HC) implemented on a Personal Computer (PC), and a microcontroller based temperature-sensor /fan-controller, that is able to communicate with the host through Bluetooth.

## System model

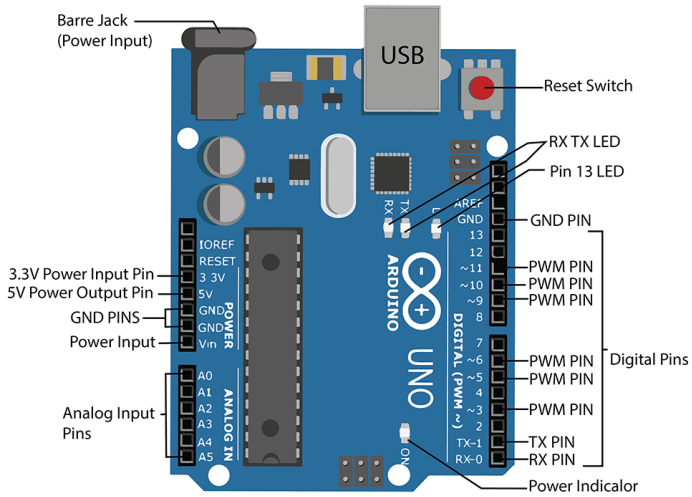



Components Used-

- Arduino UNO – 1
- HC – 05 Bluetooth Module – 1
- Mobile Phone – 1
- 5V Relay – 4
- 1 KΩ Resistor – 4
- Power Supply
- Connecting Wires
- Breadboard
- “BT voice control for Arduino” app

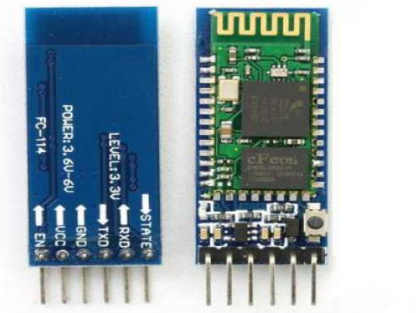
## Arduino UNO-

Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo.




## HC05 Bluetooth module-

HC-05 is a Bluetooth module which is designed for wireless communication. It has a range up to <100m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions. It is IEEE 802.15.1 standardized protocol, through which one can build wireless Personal Area Network (PAN). It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over air. It uses serial communication to communicate with devices. It communicates with a microcontroller using a serial port (USART).



## Methodology

In this project, a simple Voice Activated Home Automation system is designed. Voice commands are used to control different appliances.We will be using an app named as BT voice control for arduino .After making the necessary connections, we have to switch on the power supply to the circuit. Now, we need to pair the Phone's Bluetooth to the HC – 05 Bluetooth Module. After the device is connected, by using the app we will  start giving the voice commands. The command will also be displayed on the phone screen and later on the app will recognise the command and transfer it to the bluetooth module.
When the string "turn on light" is detected by the app, it will send the string as "*turn on light#". So, the actual message received by the Bluetooth Module is in the format of "*Message#". The reason for padding the '*' and '#' at the beginning and end of the string is to identify the starting and ending of the message. The received message is compared with some predefined strings and if the message matches with any of them, then corresponding action like turning on or turning off the load happens. We have used the following commands: "turn on AC", "turn off AC", "turn on light", "turn off light", "turn on night lamp", "turn off night lamp", "turn on fan", "turn off fan", "turn on all" and "turn off all".

## Performance analysis

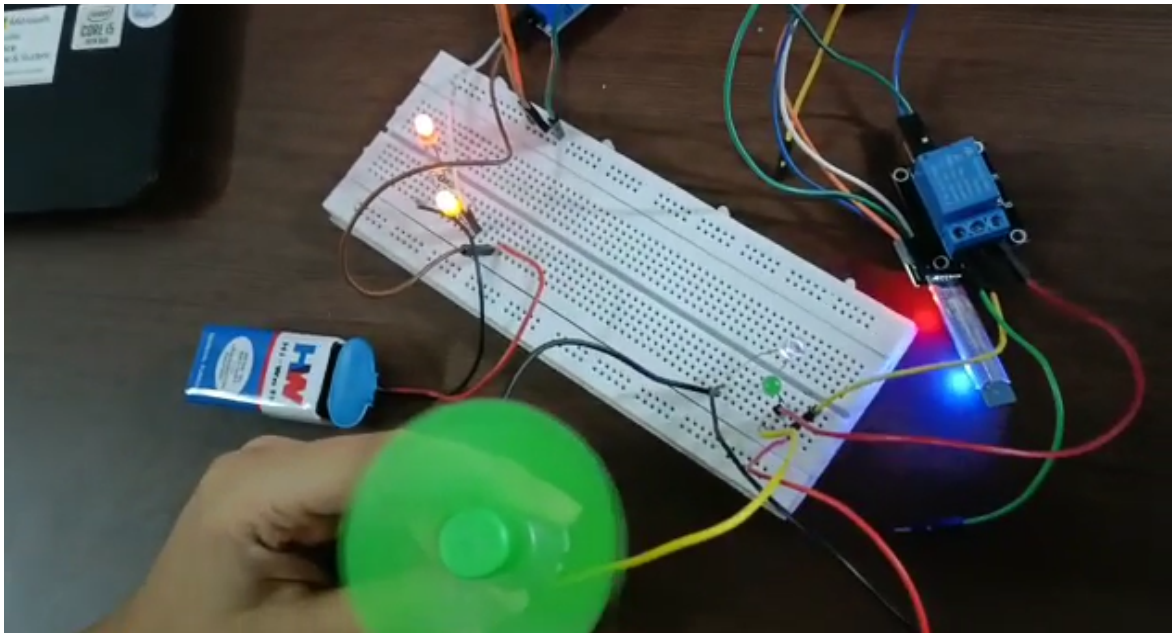
**Hardware code:**

```
String inputs;
int relay1= 8;
int relay2= 10;

void setup()
{
  Serial.begin(9600); //Set rate for communicating with phone
  pinMode(relay1, OUTPUT); //Set relay1 as an output
  pinMode(relay2, OUTPUT); //Set relay2 as an output
  digitalWrite(relay1, LOW); //Switch relay1 off
  digitalWrite(relay2, LOW); //Switch relay2 off
}
void loop()
{
  while(Serial.available()) //Check if there are available bytes to read
  {
    delay(10); //Delay to make it stable
    char c = Serial.read(); //Conduct a serial read
    if (c == '#')
    {
      break; //Stop the loop once # is detected after a word
```

```
    }
      inputs += c; //Means inputs = inputs + c
    }
    if (inputs.length() >0)
    {
     Serial.println(inputs);
     if(inputs == "turn light of")
     {
       digitalWrite(relay1, LOW);
     }
     else if(inputs == "turn light on")
     {
       digitalWrite(relay1, HIGH);
     }
     else if(inputs == "turn fan of")
     {
       digitalWrite(relay2, LOW);
     }
     else if(inputs == "turn fan on")
     {
       digitalWrite(relay2, HIGH);
      }
      inputs="";
    }
}
```

**Hardware Circuit**



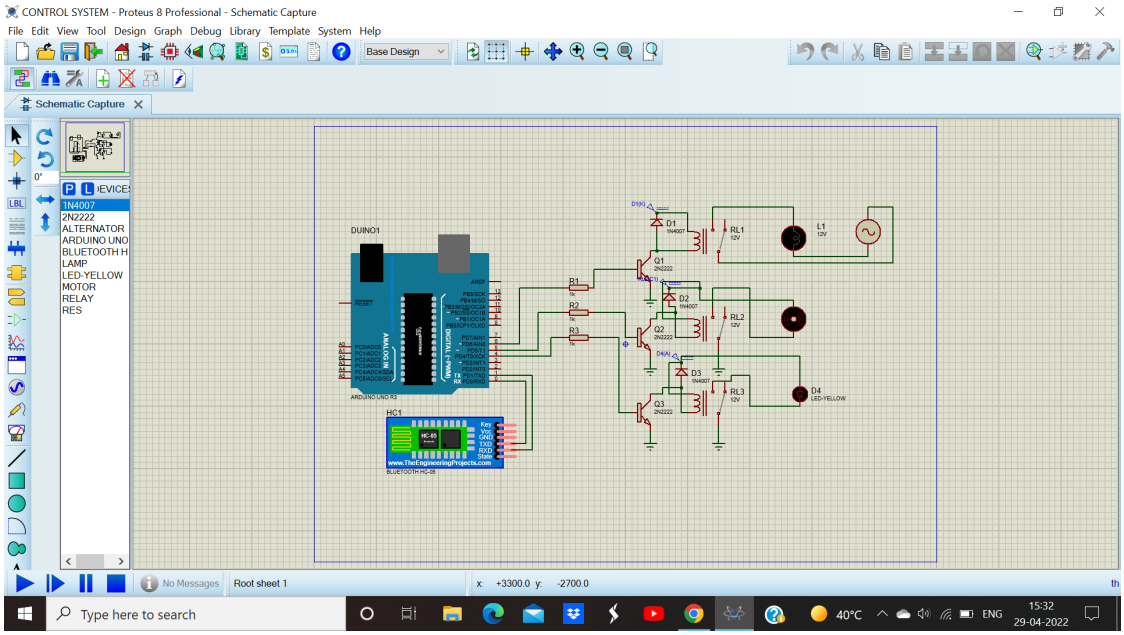
## Software code:

```
String voice;
void setup() {
Serial.begin(9600);
pinMode(6, OUTPUT);
pinMode(5, OUTPUT);
pinMode(4, OUTPUT);
}

void loop() {
while(Serial.available()){
  delay(3);
  char c = Serial.read();
  voice+=c;}

if(voice.length() >0){
  Serial.println(voice);
  if(voice == "*light on#")
  {digitalWrite(6, HIGH);}
  else if(voice == "*light off#")
  {digitalWrite(6, LOW);}
  else if(voice == "*fan on#")
  {digitalWrite(5, HIGH);}
  else if(voice == "*fan off#")
  {digitalWrite(5, LOW);}
  else if(voice == "*night lamp on#")
  {digitalWrite(4, HIGH);}
  else if(voice == "*night lamp off#")
  {digitalWrite(4, LOW);}
  else if(voice == "*all on#")
  {digitalWrite(4, HIGH);
    digitalWrite(5, HIGH);
  digitalWrite(6, HIGH);}
  else if(voice == "*all off#")
  {digitalWrite(4, LOW);
    digitalWrite(5, LOW);
  digitalWrite(6, LOW);}
  voice = "";}
}
```

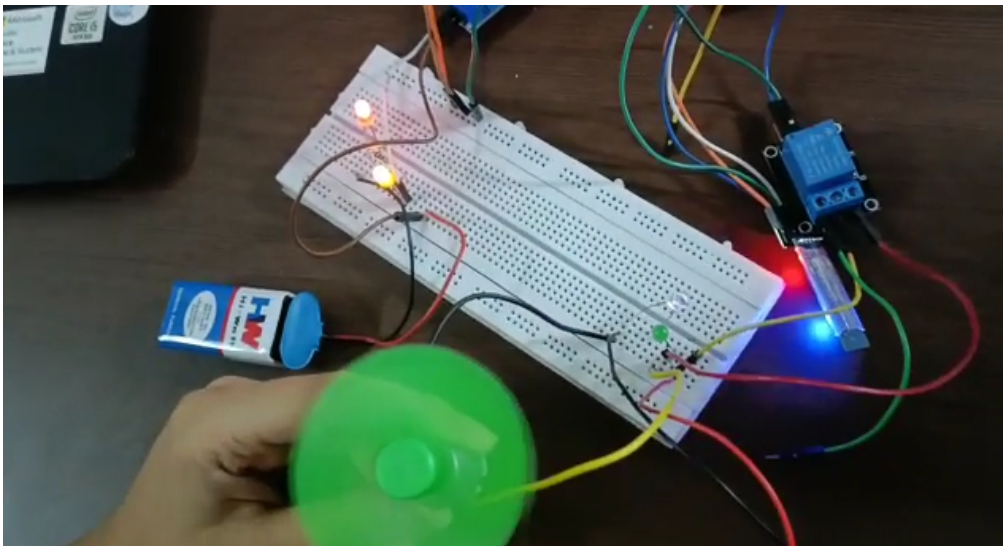
## Online Simulation




# Results and discussion

**Hardware Results** :-

When the power is supplied to the arduino , the arduino gets turned on and later on we connect the bluetooth module to the android voice controller android app and with the help of relay module a LED and a dc motor fan are connected on the breadboard.
Once we give the command (for ex. Light on, fan off) in app, the app recognises and transfer it to the bluetooth module and accordingly the relay module gets activated and results in glowing of LED and in rotation of DC fan.



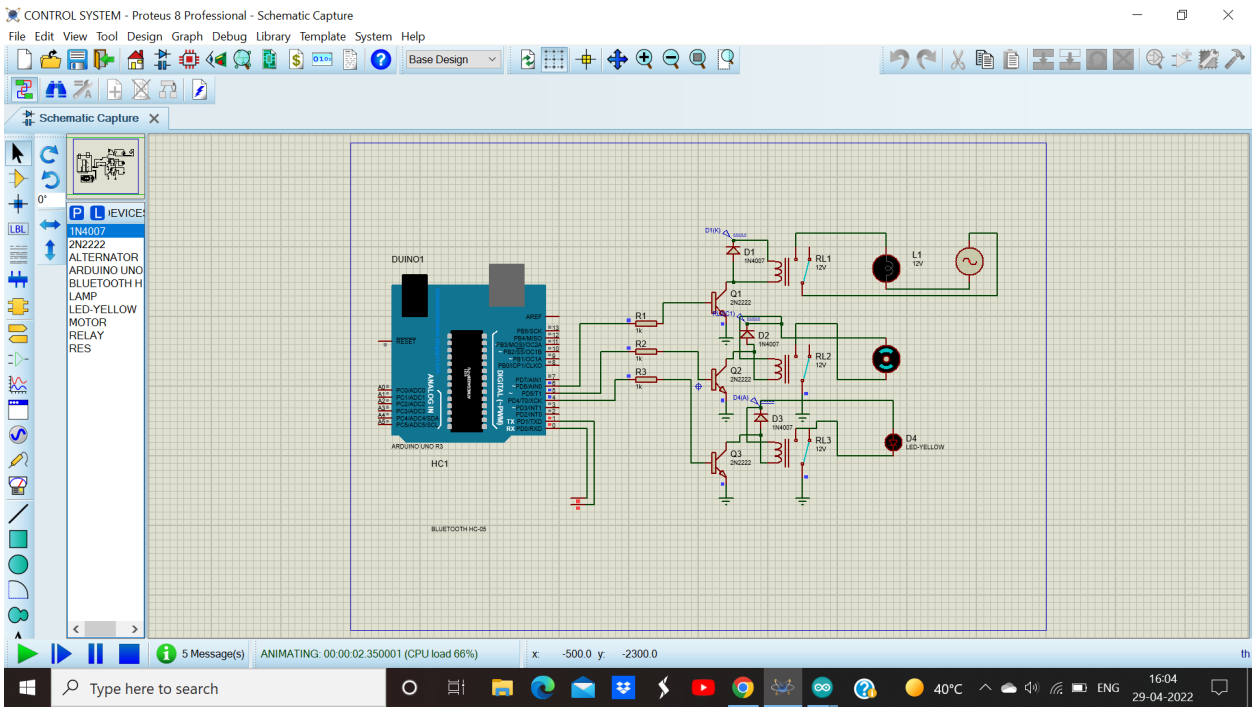
**Result 1**: -LED glows ( via command light on)

**Result 2** : - Rotation of DC fan ( via command fan on)

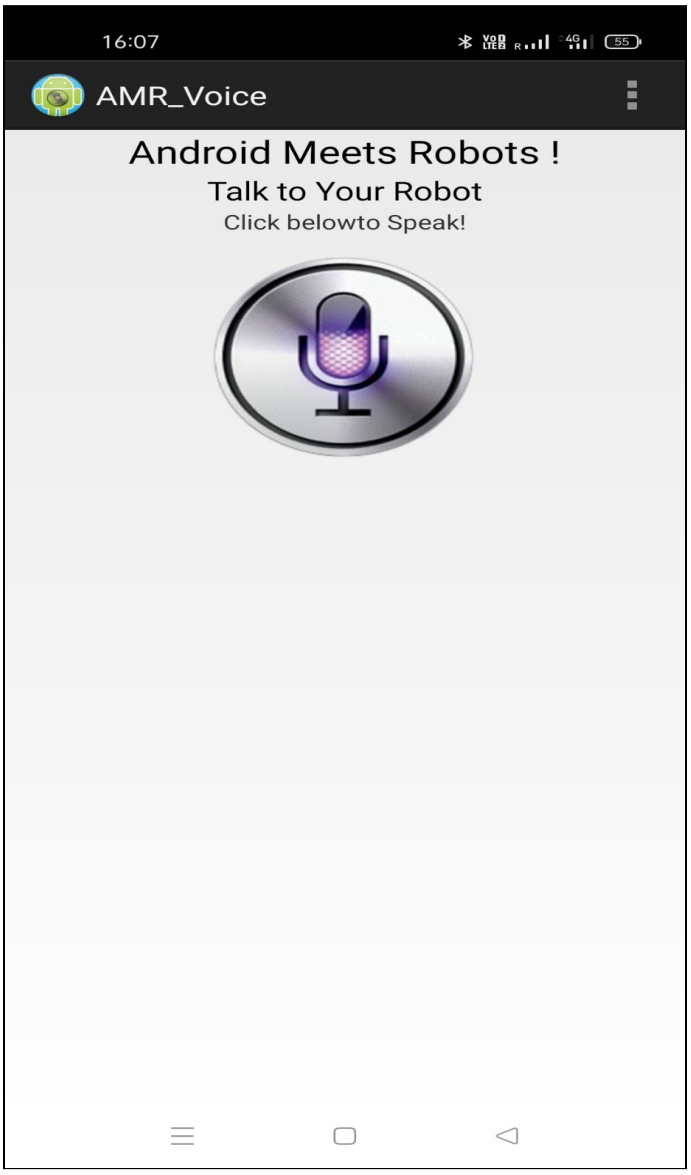
**Software Results**: -

For the online simulation, the pc bluetooth is connected to the android voice controller app and bluetooth module is added to one of the ports of the pc bluetooth . So when we run the simulation and give the voice commands ( like light on, night lamp on ) , then the voice command is recognised by the app and is transmitted to the pc and according the action takes place.

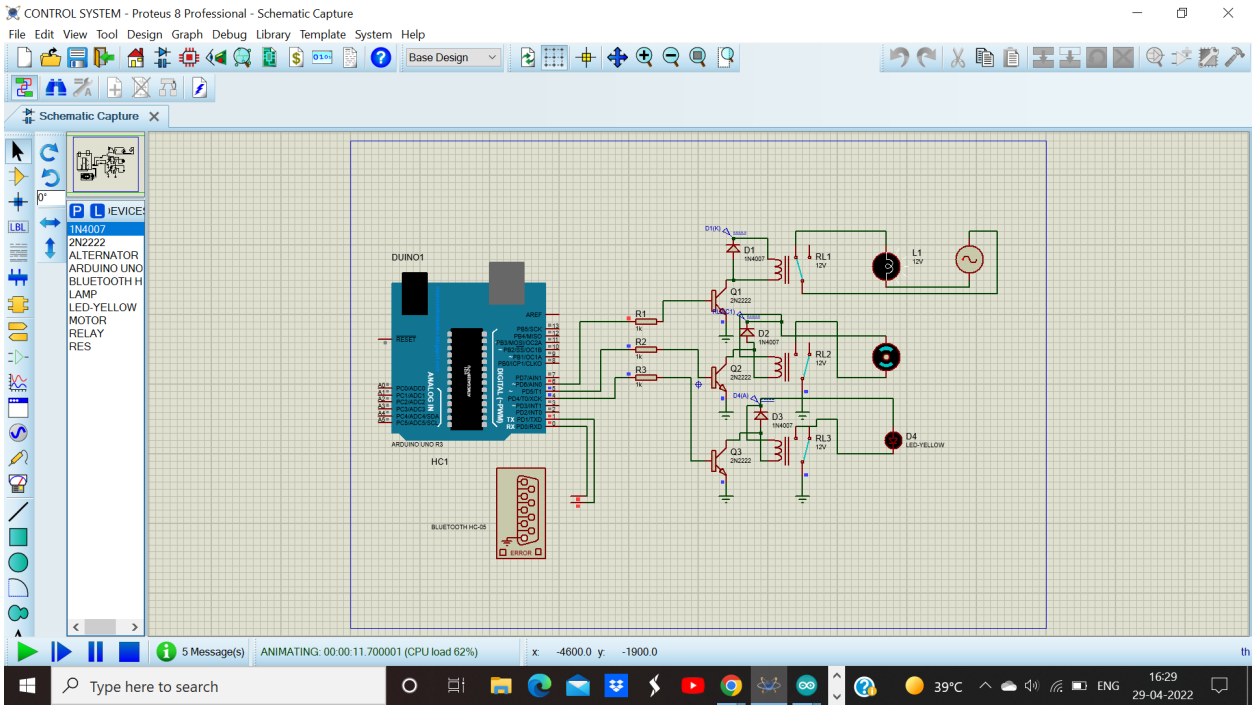
**Simulated Circuit Diagram :**



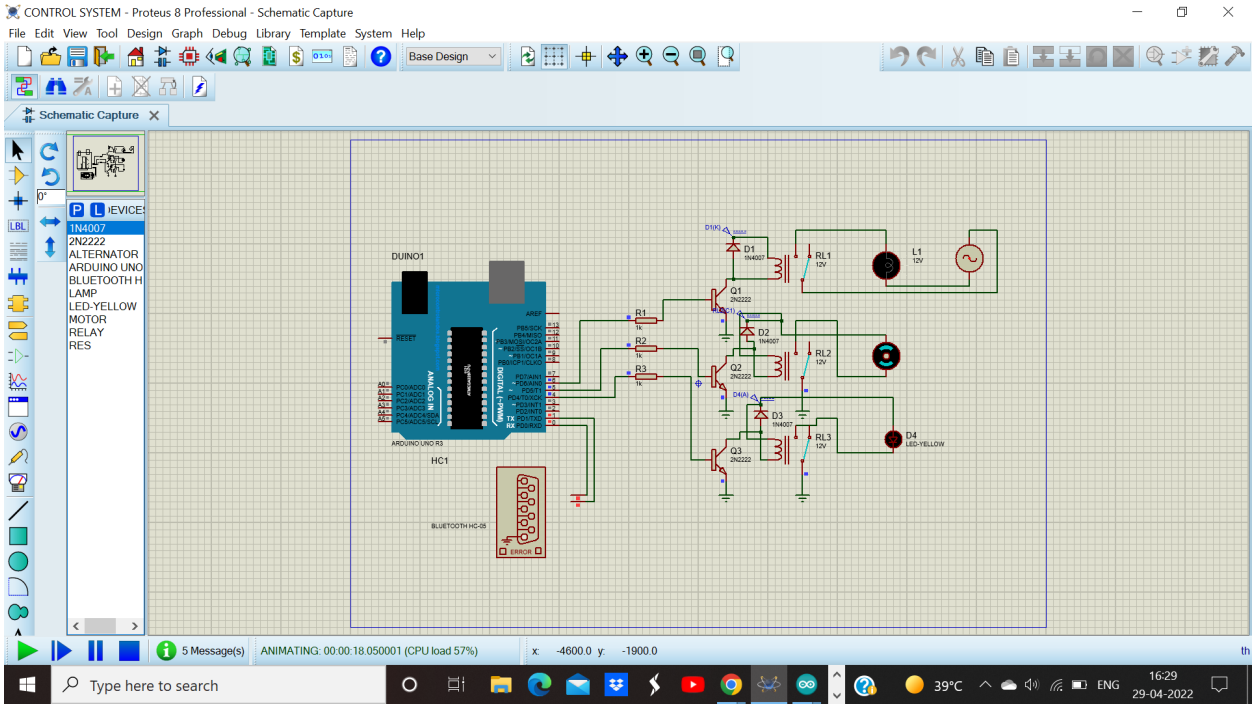
**BT Voice Controller app display:-**



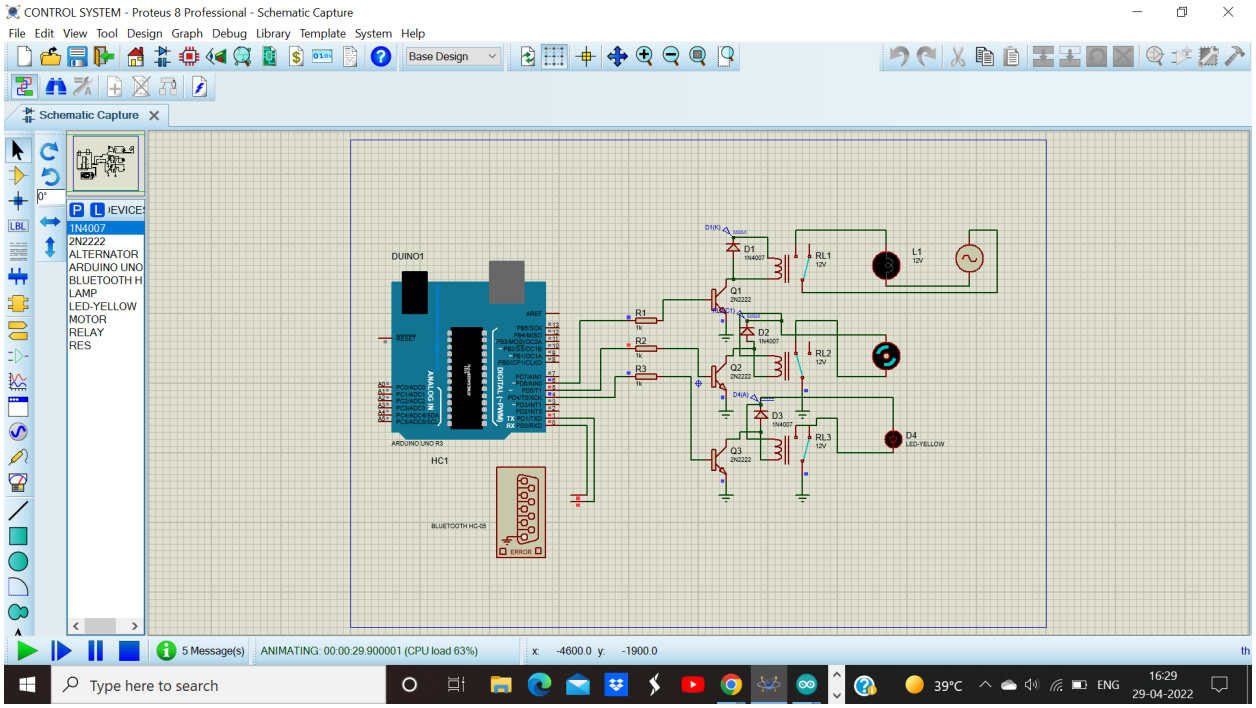
## Result 3:- When the voice command light on is given



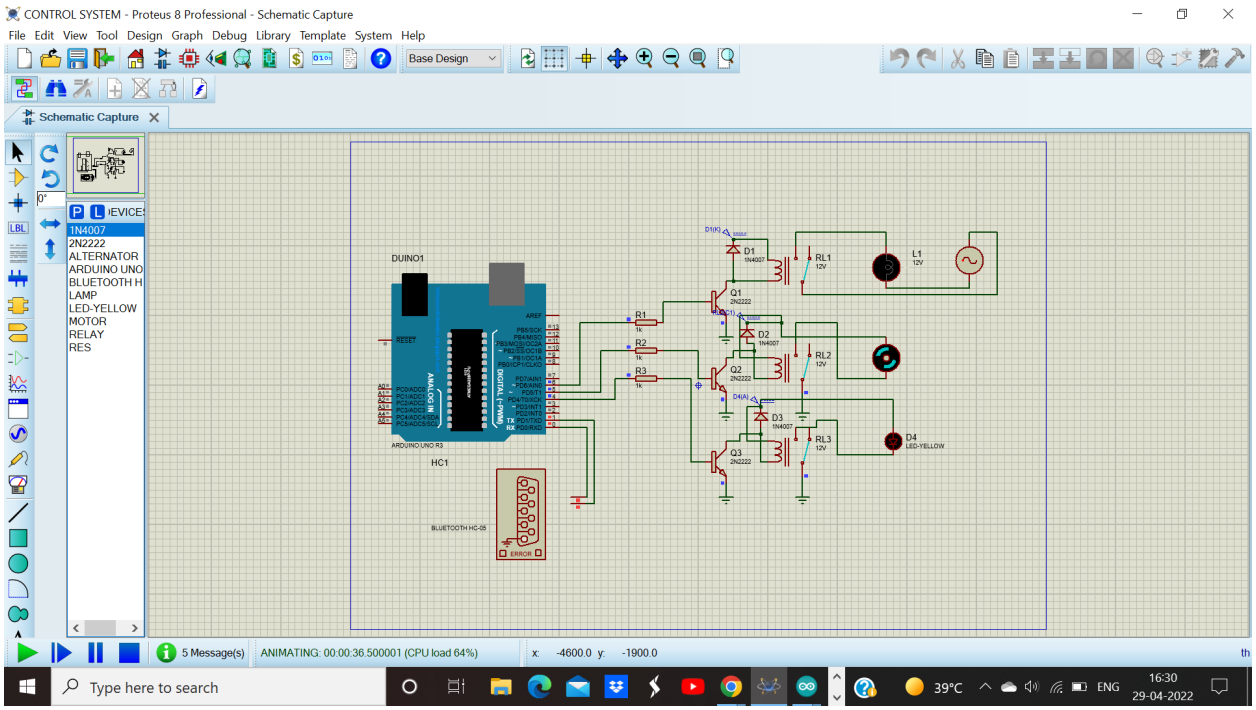

## When the voice command light off is given: -



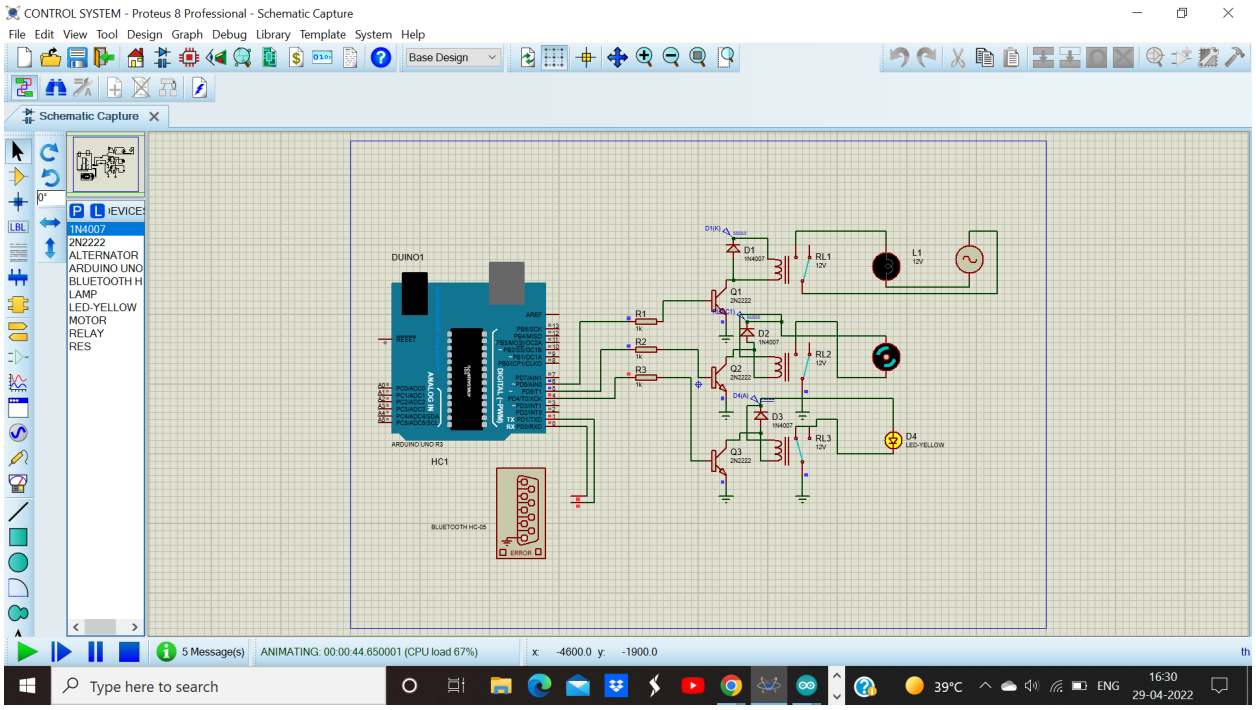
## Result 4: -When the  voice command fan on is given: -



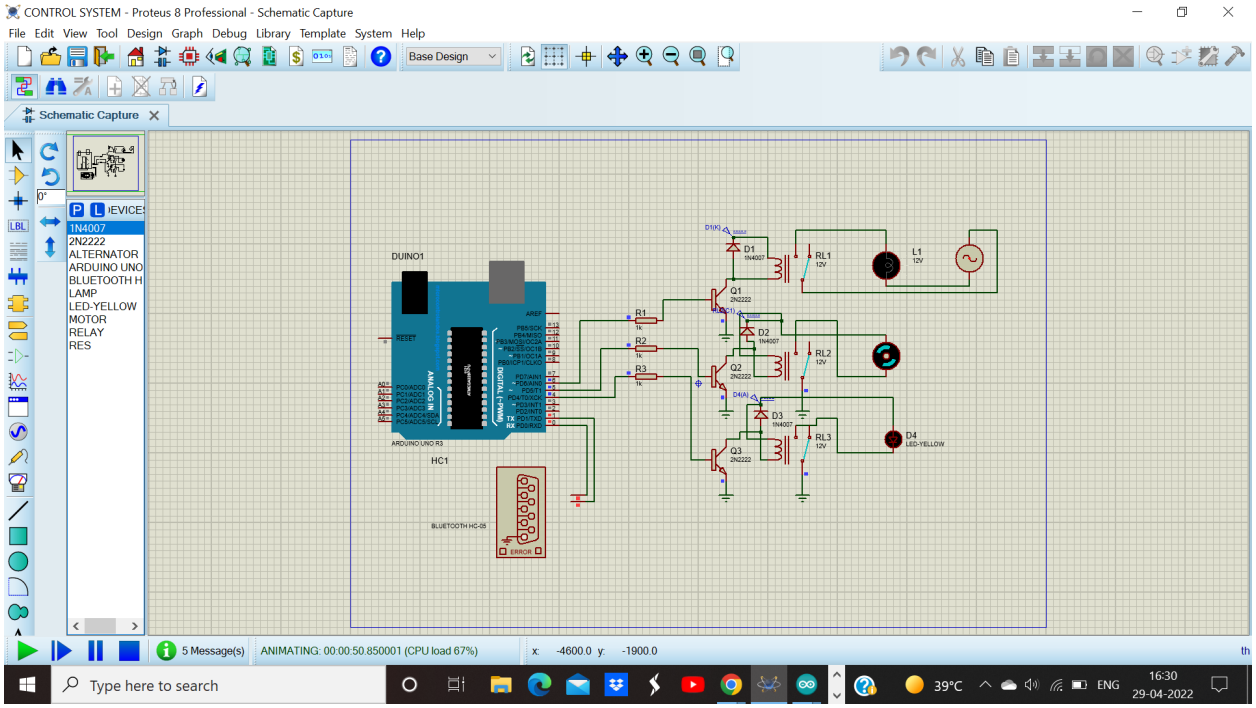

## When the voice command fan off is given: -



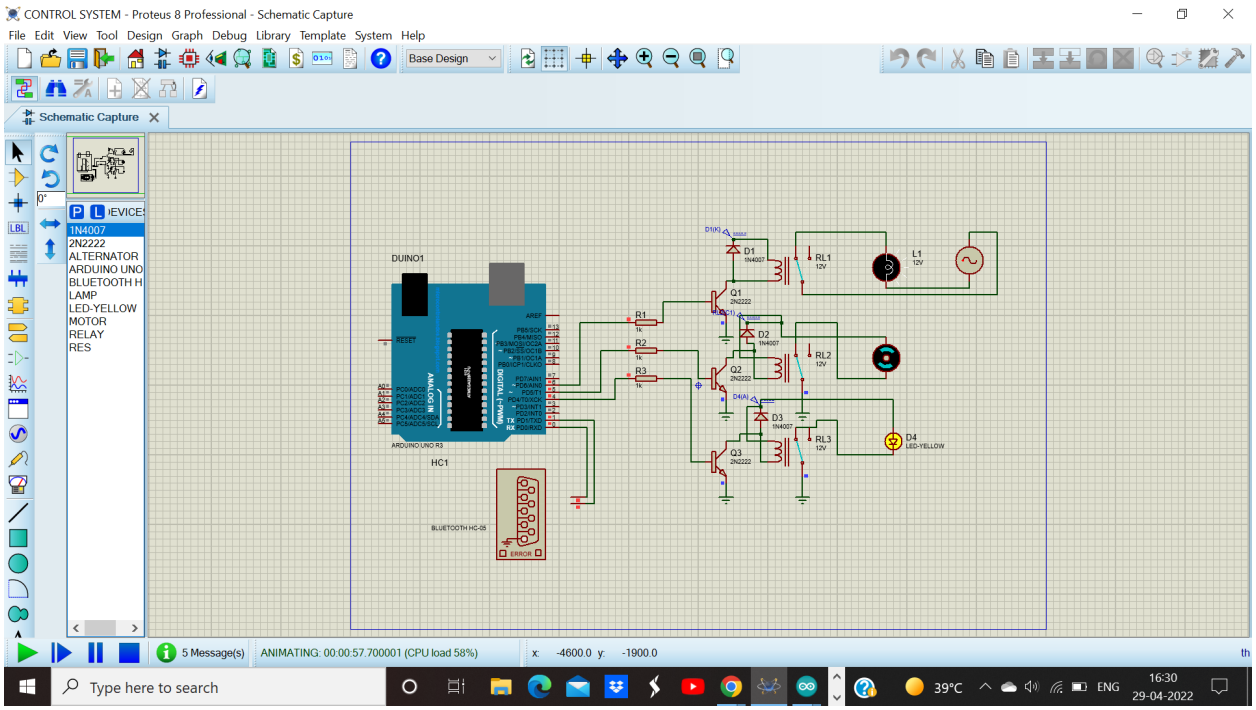
## Result 5:-When the voice command night lamp on is given:-



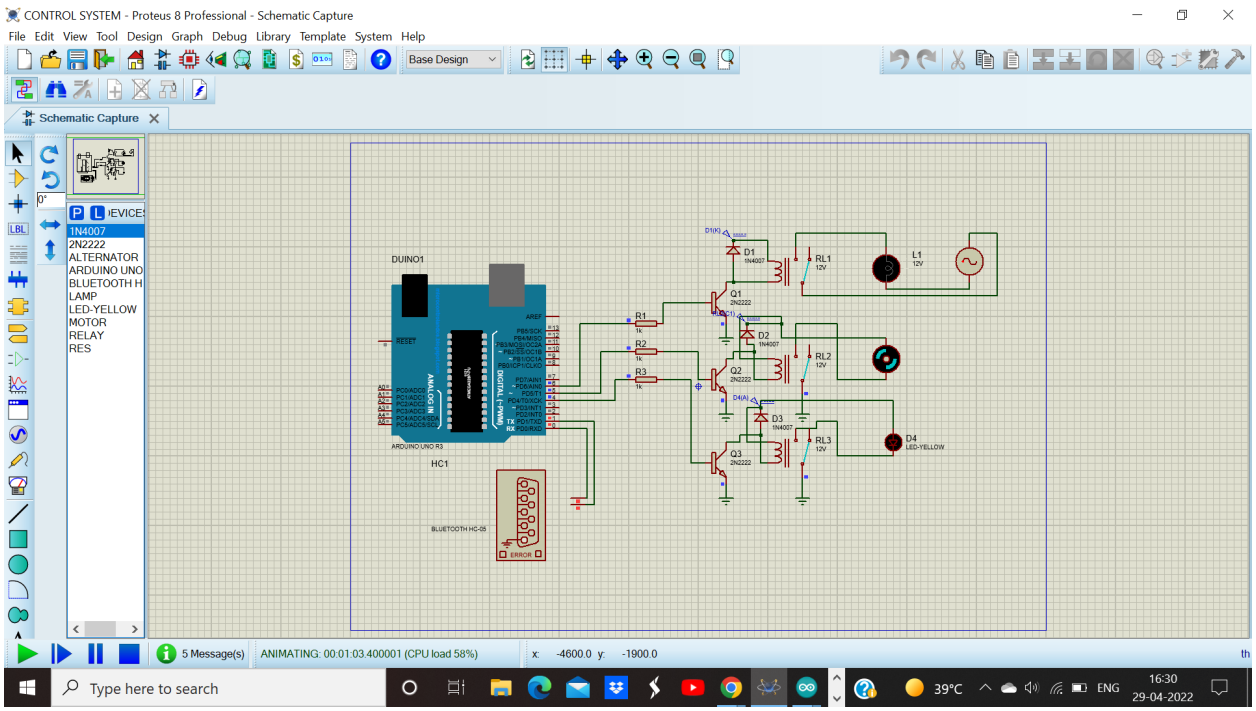

## When the voice command night is off is given: -



## Result 6 : - When the voice command all on is given : -




## When the voice command all off is given : -



## Conclusion and future work

In this project we successfully implemented a voice controlled home automation system controlling relays using arduino with Bluetooth module HC-05. This project can be used for controlling ‘n’ number of input controls i.e by extending the number of relays.This system will prove to be highly useful for people who are old or disabled. With voice-activated home automation systems, we can make our space more energy efficient and can improve our home management.Further, the project can be expanded by adding different sensors (light, smoke, etc.) to make it more feasible in our daily lives.

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[1] Voice recognition based home automation system for paralyzed people
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