

# **Voice Controlled Home Automation System**

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## **CERTIFICATE**

This is to certify that the report titled **Voice Controlled Home Automation System USING ARDUINO** submitted by **BOLLIKONDA PRANAY**, to the Electrical Engineering Department, Indian Institute of Technology, Patna, is a bona fide record of the work done by him under my supervision.

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Place: Patna

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## **Abstract:**

In this project, we present a Voice Controlled Home Automation System using Arduino and HC-05 Bluetooth module. The system aims to enhance the convenience and efficiency of home management by enabling users to control various appliances and devices through voice commands.

The hardware setup consists of an Arduino Uno microcontroller connected to an HC-05 Bluetooth module and relay modules for controlling appliances. The Arduino Uno acts as the central processing unit, receiving voice commands via Bluetooth and executing corresponding actions to control appliances.

Voice commands are processed using the Google Speech Recognition API, which converts speech to text for interpretation by the Arduino. The system supports commands for turning appliances on or off, adjusting settings, and querying status updates.

To demonstrate the system's functionality, we implement basic home automation tasks such as turning lights on and off, controlling fans, and managing other household appliances. The system provides a user-friendly interface, allowing users to interact with their home environment effortlessly using natural language commands.

Overall, the Voice Controlled Home Automation System offers an intuitive and efficient solution for home automation, enhancing convenience and accessibility for users while demonstrating the potential of voice recognition technology in IoT applications.

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# **1.Introduction**

In the realm of smart technology, home automation has become increasingly popular for its convenience and energy efficiency. Traditional systems often rely on physical interfaces or smartphone apps for control, but our project offers a hands-free alternative: a Voice Controlled Home Automation System using Arduino and the HC-05 Bluetooth module. By integrating Arduino with Bluetooth connectivity, our system enables users to control household appliances through voice commands, making home management more accessible and convenient.

This project showcases the power of voice recognition technology in IoT applications, allowing users to interact with their homes using natural language commands. With the Arduino Uno as the central processing unit and the HC-05 Bluetooth module facilitating wireless communication, users can control lights, adjust thermostat settings, and manage other appliances effortlessly. By leveraging the Google Speech Recognition API, spoken commands are converted into text for interpretation by the Arduino, demonstrating the feasibility and effectiveness of voice-controlled home automation.

## **2.Objective**

The objective of this project is to develop a Voice Controlled Home Automation System using Arduino and the HC-05 Bluetooth module. Our goal is to enable users to control household appliances through voice commands, leveraging Arduino's processing capabilities and Bluetooth communication. We aim to demonstrate the feasibility and effectiveness of voicecontrolled home automation, providing a hands-free and user-friendly solution for managing various tasks such as turning lights on and off, adjusting thermostat settings, and controlling other appliances.

## **3.Motivation**

The motivation behind this project stems from the increasing demand for smart home solutions that offer convenience and accessibility. Traditional home automation systems often require physical interaction or smartphone apps, which may not always be practical. Voice control presents an intuitive alternative, allowing users to interact with their homes naturally. By developing a Voice Controlled Home Automation System using Arduino and the HC-05 Bluetooth module, we aim to provide a hands-free solution that enhances the user experience and demonstrates the potential of voice recognition technology in simplifying everyday tasks.

## 4.Theory

The Voice Controlled Home Automation System operates on a combination of hardware and software components to enable seamless control of household appliances through voice commands. At its core, the Arduino Uno microcontroller serves as the brain of the system, orchestrating the reception and execution of commands. The HC-05 Bluetooth module facilitates wireless communication between the user's device and the Arduino, ensuring flexibility and convenience in interacting with the system from a distance.

Upon receiving voice commands, the Google Speech Recognition API comes into play. This API converts spoken words into text, providing the Arduino with a recognizable input format. The Arduino then processes this text to identify specific commands and trigger appropriate actions. For instance, a command like "turn on the study light " would be parsed by the Arduino to activate the corresponding relay module connected to the study light.

Relay modules play a crucial role in the system's functionality by acting as switches for various household appliances. These relays are controlled by the Arduino, allowing it to toggle the power supply to appliances based on the user's voice commands. This mechanism ensures that users can control multiple devices with different power requirements effectively.

The system's design prioritizes simplicity and user-friendliness, aiming to make home automation accessible to all users regardless of technical expertise. By integrating these hardware components and software functionalities, the Voice Controlled Home Automation System provides a hands-free and intuitive solution for managing home environments, enhancing convenience and efficiency in daily routines.

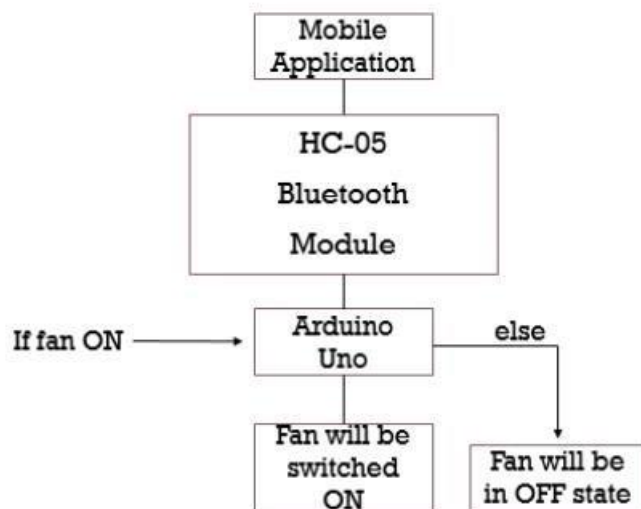
## 5.Components Required

- Arduino UNO
- HC-05 Bluetooth Module
- 2 channel 5v relay
- Electrical Bulbs
- Basic electrical components
- Power Supply

## 6. Software Used

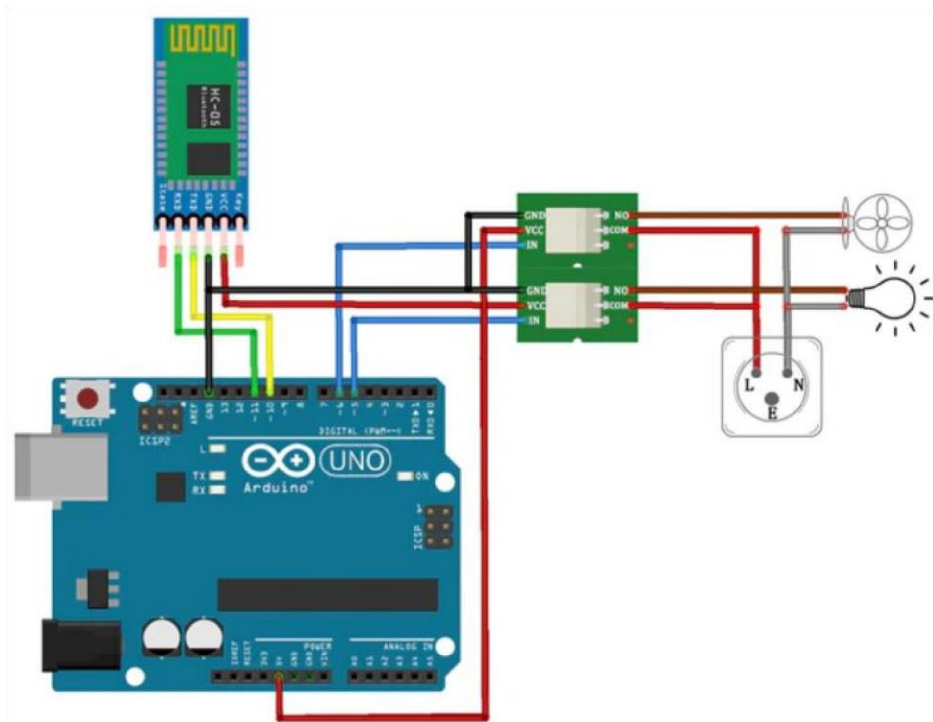
- Arduino IDE

## 7. Block Diagram:



Our system uses an Android application designed in the MIT App Inventor. voice input is given through a mobile application which transmits to arduino through bluetooth hc-05 module. Relay used here acts as a switch to control the on/off state of the appliances. Pins 4,5,6 and 7 are connected to the appliances.

## 8. Circuit Diagram



## 9. Image of Voice Controlled Home Automation System (Hardware)



Fig:- The above figure shows the hardware implementation of the circuit diagram



## 10.Code for an Arduino-based Voice Controlled Home Automation System

```
#define red_bulb 2      // Pin number for the red bulb
#define yellow_bulb 3   // Pin number for the yellow bulb

void setup() {
    Serial.begin(9600);    // Initialize serial communication at 9600 baud rate
    pinMode(red_bulb, OUTPUT);    // Set the red bulb pin as an output
    pinMode(yellow_bulb, OUTPUT); // Set the yellow bulb pin as an output
    // Turn both bulbs off initially
    digitalWrite(red_bulb, LOW);
    digitalWrite(yellow_bulb, LOW);
}
```

### 1-Explanation

1)The #define directive is used to define constants red\_bulb and blue\_bulb representing the pin numbers where the red and blue bulbs are connected respectively.

2)In the setup() function:

- i)Serial.begin(9600); initializes serial communication with a baud rate of 9600 bits per second.
- ii)pinMode(red\_bulb, OUTPUT); and pinMode(blue\_bulb, OUTPUT); configure the pin modes for the red and blue bulbs as output pins, allowing the Arduino to control their states (on or off).

```

void loop() {

    if(Serial.available() > 0) {    // Check if there's data available to
read
        String val = Serial.readString();    // Read the incoming string from
Serial
        Serial.println(val);    // Print the received
command
        // Check the received command and perform corresponding
actions
        if(val == "red bulb on") {
digitalWrite(red_bulb, HIGH);    // Turn on the red bulb
        }
        if(val == "red bulb of") {
digitalWrite(red_bulb, LOW);    // Turn off the red bulb
        }
        if(val == "yellow bulb on") {
digitalWrite(yellow_bulb, HIGH);    // Turn on the yellow bulb
        }
        if(val == "yellow bulb of") {
digitalWrite(yellow_bulb, LOW);    // Turn off the yellow bulb
        }
        if(val == "all on") {
digitalWrite(red_bulb, HIGH);    // Turn on both bulbs
digitalWrite(yellow_bulb, HIGH);
        }
        if(val == "all of") {
digitalWrite(red_bulb, LOW);    // Turn off both bulbs
digitalWrite(yellow_bulb, LOW);
        }
    }
}
}

```

## II-Explanation

1)The loop() function continuously checks for incoming data from the serial port using Serial.available() function. If there's data available, it proceeds to read the incoming string using Serial.readString() and stores it in the variable val.

2)The received command is then printed to the Serial Monitor using Serial.println(val). 3)The

code then checks the received command (val) and performs the corresponding action:

i)If val is "red bulb on", it turns on the red bulb by setting its pin (red\_bulb) to HIGH. ii)If

val is "red bulb of", it turns off the red bulb by setting its pin (red\_bulb) to LOW.

iii)Similarly, for "yellow bulb on" and "yellow bulb of", it controls the yellow bulb. iv)If

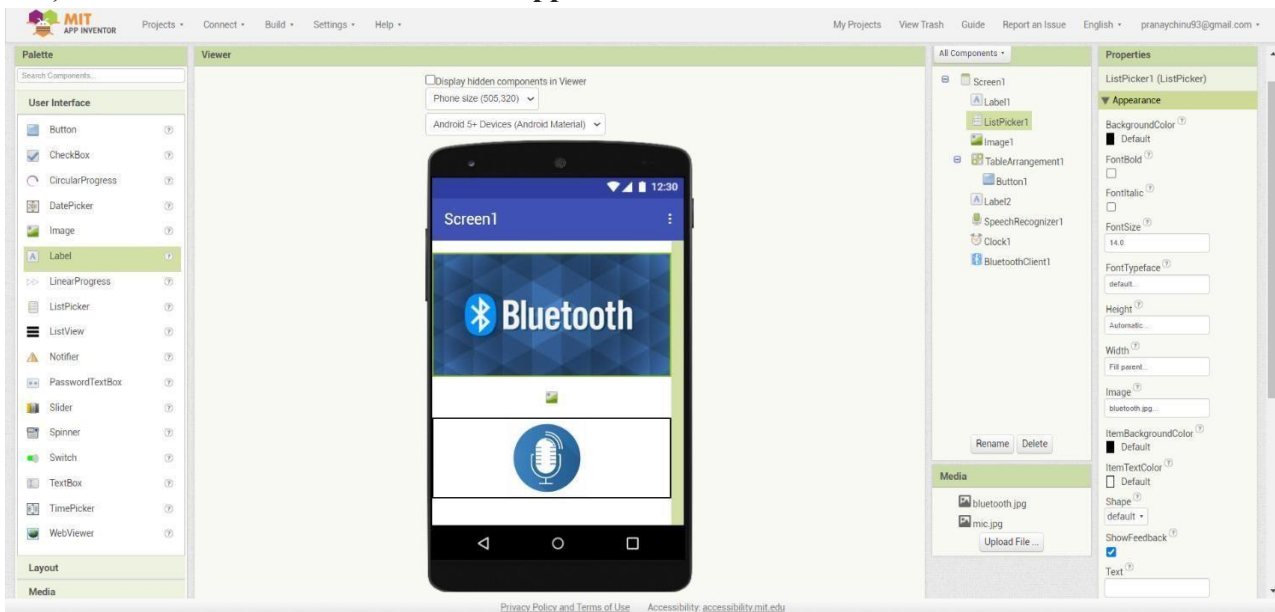
val is "all on", it turns on both bulbs by setting their respective pins to HIGH.

v)If val is "all of", it turns off both bulbs by setting their respective pins to LOW.

## 11)Interface and Building Blocks of App

The Android app is designed using the MIT App Inventor. This application controls the appliances through Voice commands. MIT App Inventor is an open source web application. It has two parts to create an android application. The first part is designing part(Fig 4) where we design the app based on graphical user interface and Second part is the blocks part(Fig 5) where we use different blocks to program the designer components of GUI based on the functionalities required for the app to run.

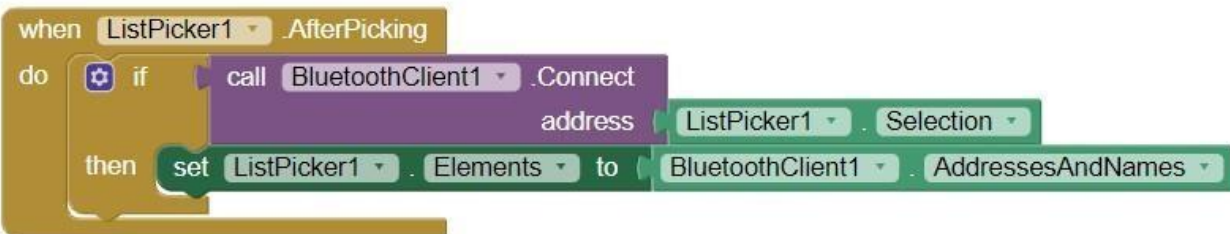
### i)Interface of the voice controlled app



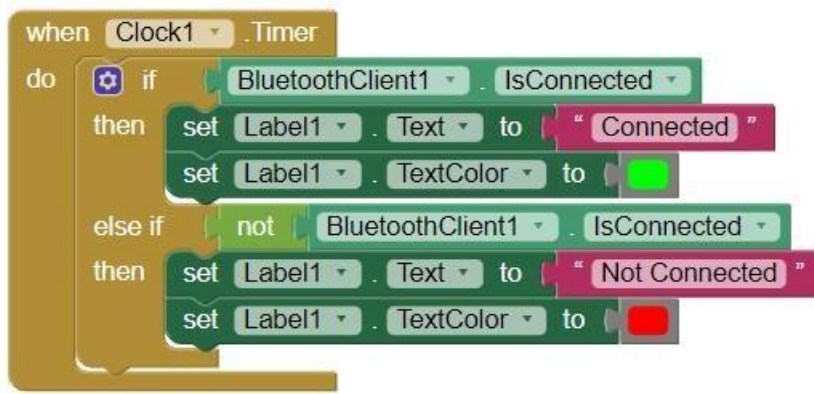
### ii)Building Blocks of the app and its functions:



1)The list picker displays every component needed to indicate a Bluetooth device that is in range.



2)Following the selection of a certain device This specific gadget, this specific block, will create a Bluetooth connection of the selected one.



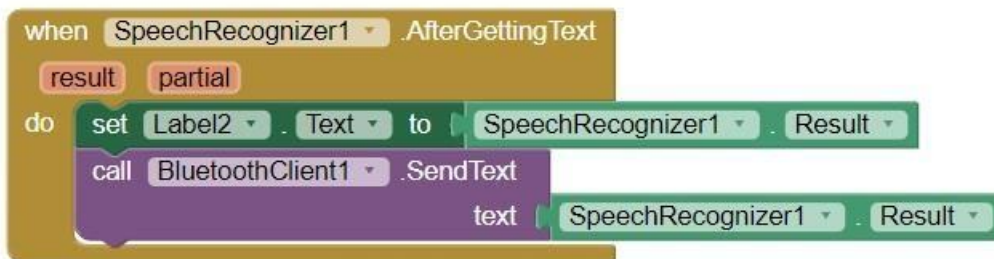
3) The “Connected” text will be shown if the connection is successful. If it's not connected it will appear “Not connected” text.



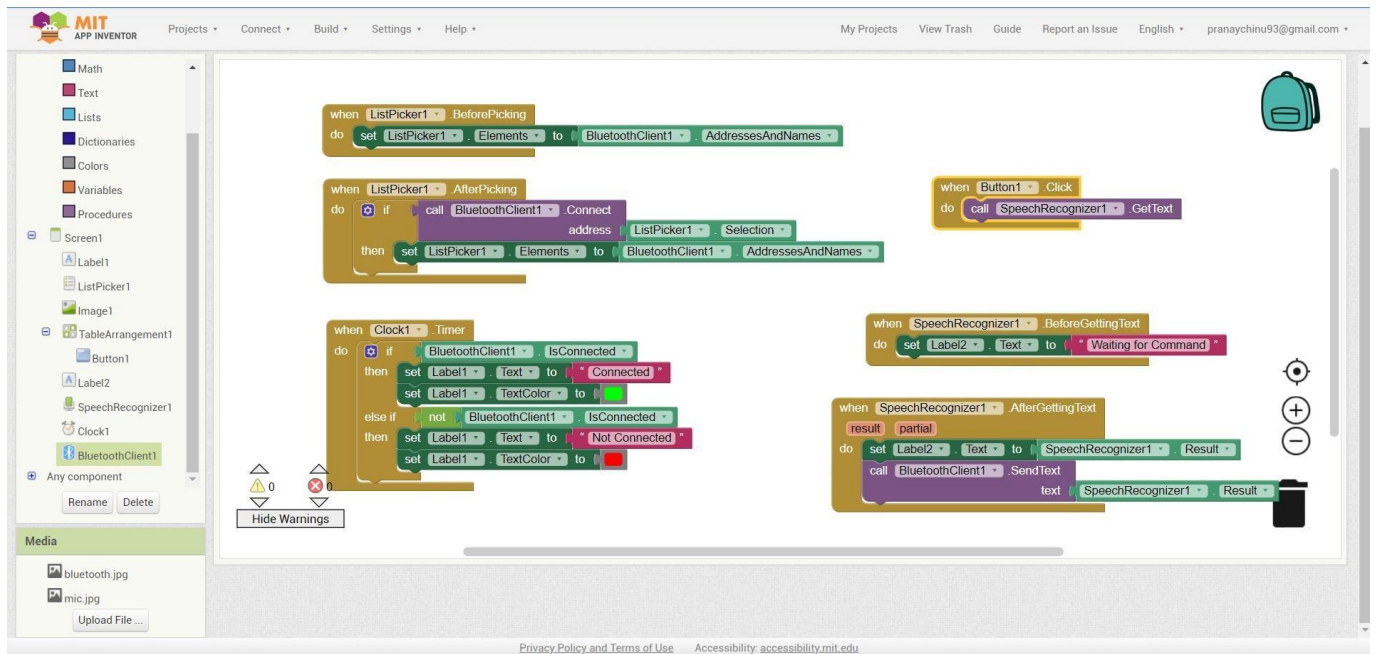
4) The do button is in charge of recording the speech



5) Following your speech, this block will be transformed into a string and saved in a variable named text.



6) This text would be transmitted to arduino over Bluetooth and sets the label2 text to respective audio text.



## 12)Results

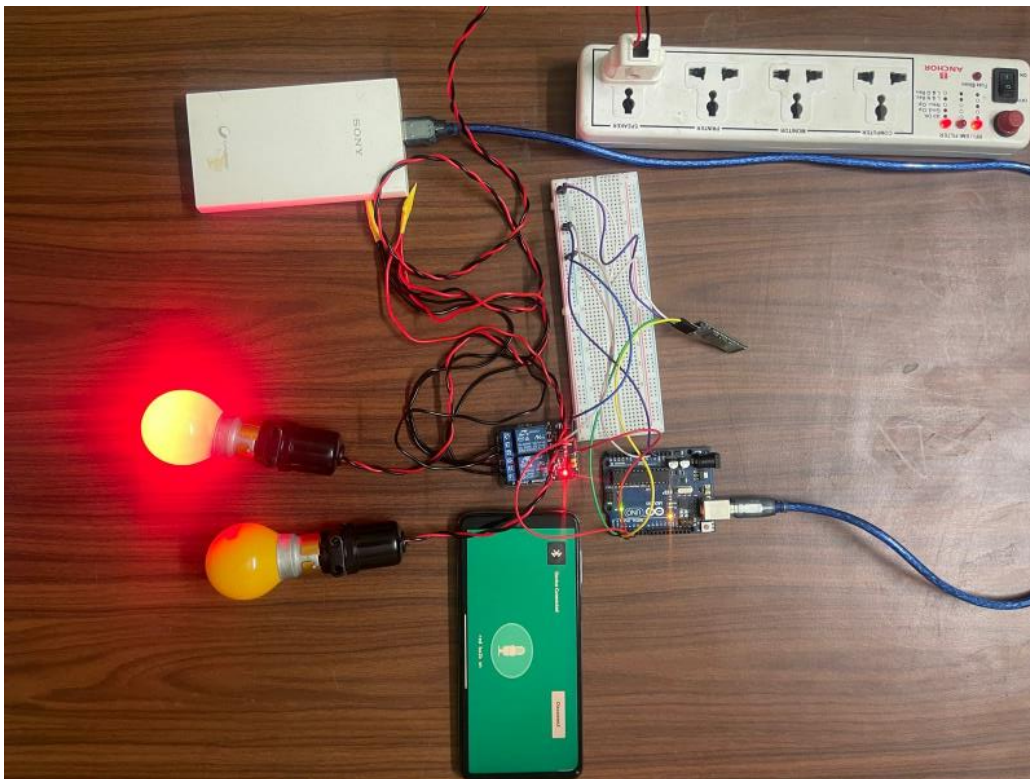


Fig-1:- Result for voice command "red bulb on".



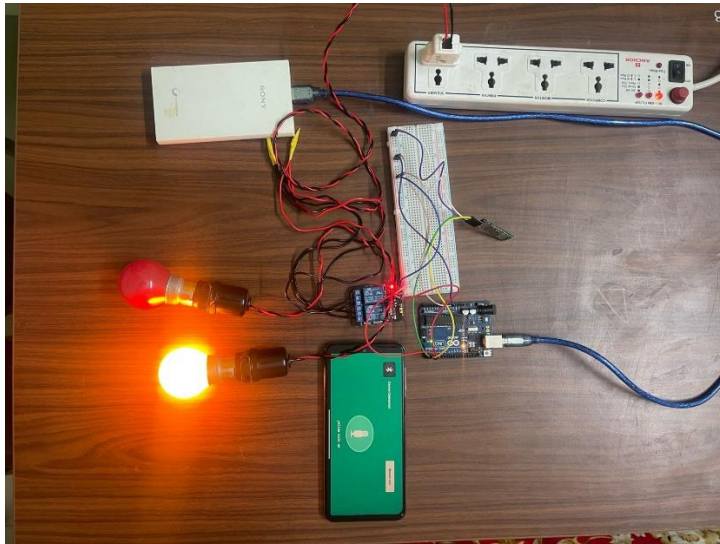


Fig-2:- Result for voice command "yellow bulb on".

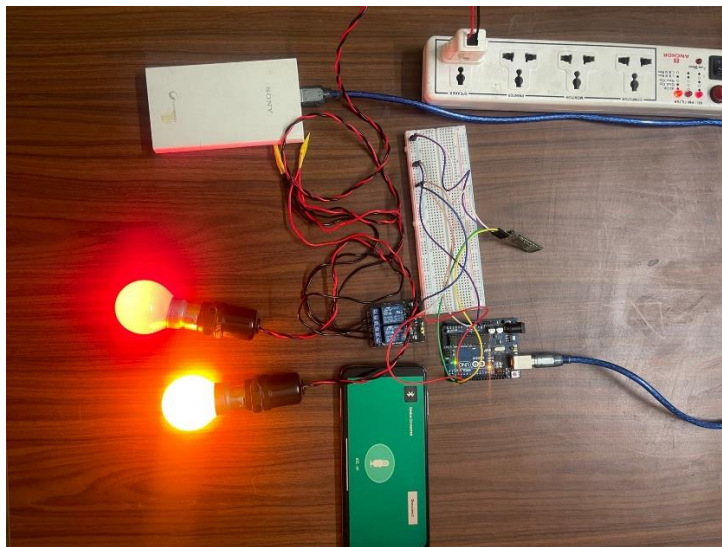


Fig-3:- Result for voice command "all on".

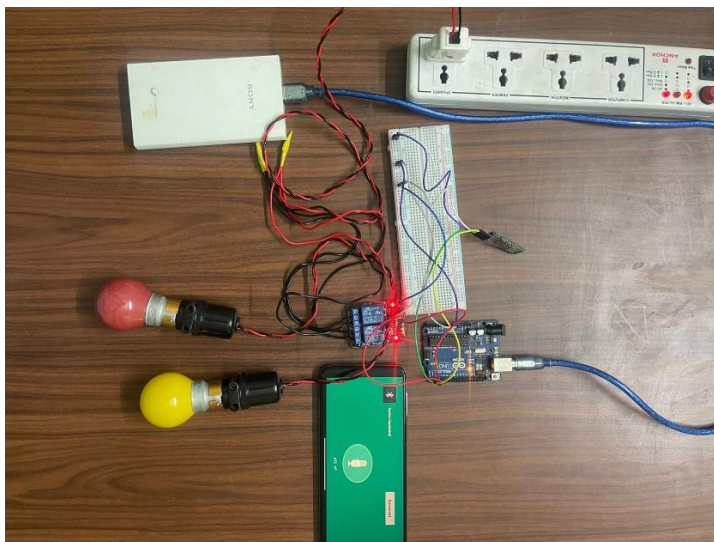


Fig-4:- Result for voice command "all of".

### **13)Conclusion**

The prototype of the Voice controlled home automation system was successfully made and The output of the project was as per the expectation. In conclusion, the Voice Controlled Home Automation System utilizing Arduino and the HC-05 Bluetooth module provides an effective and user-friendly solution for managing household tasks. Through accurate interpretation of voice commands and seamless appliance control, the system enhances convenience and accessibility in home environments. Further development could focus on integration with smart home platforms and energy optimization to enhance its capabilities. Overall, this project demonstrates the potential of voice-controlled interfaces in advancing home automation technology.

### **14)Future scope of extension**

The Voice Controlled Home Automation System offers promising avenues for further development and extension. Integration with popular smart home platforms such as Google Home or Amazon Alexa would not only broaden compatibility but also provide users with a seamless experience across different devices and services. This integration could include voice assistant functionalities, allowing users to control their smart home devices using voice commands through these platforms.

Additionally, advanced features such as support for more complex voice commands and machine learning algorithms could significantly enhance the system's capabilities. By analyzing user interactions and patterns, the system could learn to anticipate users' needs and preferences, making home automation more intuitive and personalized over time. Moreover, implementing energy optimization features would enable users to monitor and manage their energy usage more effectively. This could involve integrating energy monitoring sensors or algorithms to automatically adjust appliance settings for optimal energy efficiency.

### **15)References**

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