VOICE CONTROLLED HOME AUTOMATION

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ABSTRACT

Voice Assistant Controlled Home Automation

This project explores the design and development of a voice-controlled home automation system. The system utilises speech recognition technology to interpret user commands and automates various household appliances accordingly. The abstract can be tailored to different approaches, such as:

Microcontroller-based System: An Arduino or similar microcontroller serves as the central hub, receiving voice commands via Bluetooth from a smartphone app. The app converts speech to text and transmits it to the microcontroller, which then controls relays to manage lights, fans, or other devices.

The project highlights the benefits of voice-controlled home automation, including convenience, accessibility, and hands-free control. It emphasises the chosen approach's strengths and potential applications within a smart home environment.

INTRODUCTION

This project dives into the creation of a user-friendly home automation system controlled entirely by your voice. We will achieve this by utilising the power of an Arduino Uno microcontroller, paired with an HC-05 Bluetooth module. This dynamic duo will act as the brains of the operation, receiving voice commands from a smartphone app and translating them into actions.

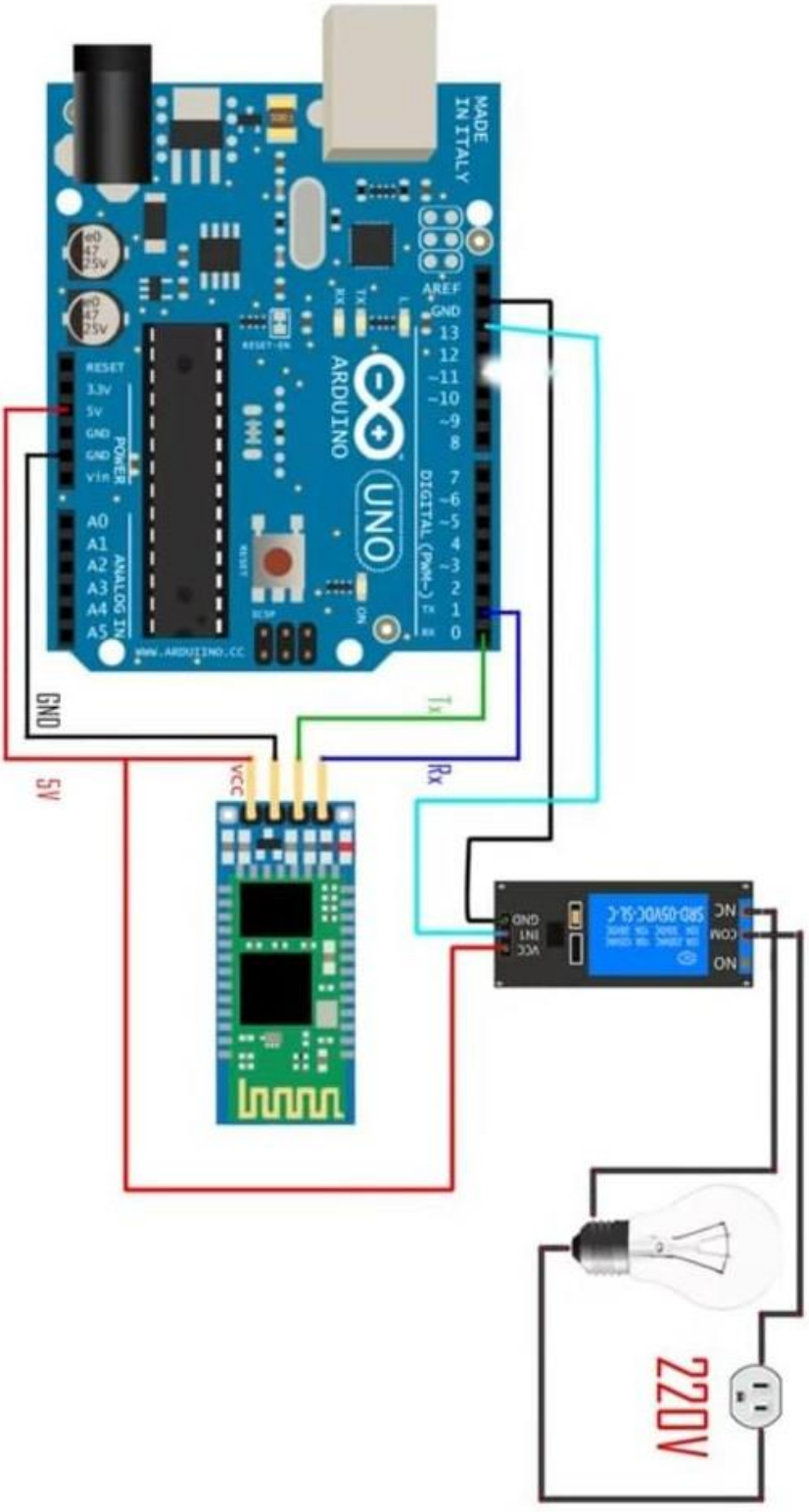
A relay module serves as the bridge between the Arduino and the physical world, allowing us to control a standard light bulb. We'll incorporate a manual switch for added convenience, providing the option for traditional control alongside voice commands.

This project offers a practical and cost-effective approach to smart home automation. By leveraging readily available components and open-source software, we'll create a voice-controlled system that enhances comfort and control within your living space.

PROJECT COMPONENTS

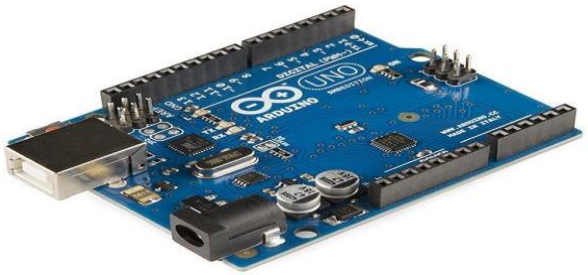
- **Arduino Uno**: Arduino Uno is a microcontroller board based on the ATmega328P. It acts as the brain of the system, receiving commands from the voice assistant module and controlling the relay module to turn the bulb on or off.
- **Arduino HC-05**: The HC-05 is a Bluetooth module that allows wireless communication between the Arduino Uno and a smartphone or other Bluetooth-enabled devices. It enables the voice assistant to send commands to the Arduino Uno wirelessly.
- **Switch**: The switch is a physical input device that allows manual control of the bulb. It can be used as a backup control method in case the voice assistant is not working or for manual operation.
- **Bulb**: The bulb is the output device that will be controlled by the system. The relay module will switch the power to the bulb on or off based on the commands received from the voice assistant.
- **Relay Module**: The relay module is used to control high-power devices like the bulb using a low-power signal from the Arduino Uno. It acts as a switch that can turn the bulb on or off based on the commands received

CIRCUIT DIAGRAM

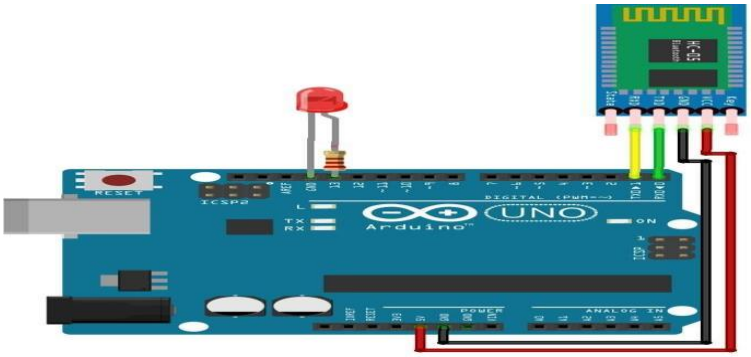


HARDWARE SET -UP

ARDUINO UNO-



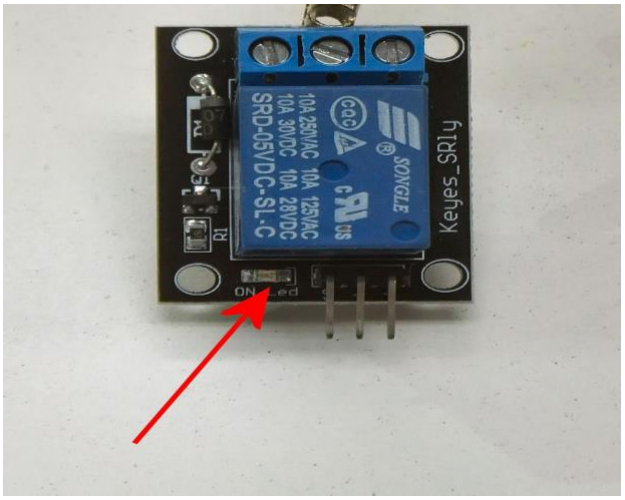
ARDUINO HC -05



SWITCH

BULB

RELAY MODULE



WORKING PRINCIPLE

Using the above components we implement our system. The core component of this system is the Arduino Uno which has a microcontroller i.e Atmega 328. Atmega 328 has a32KB flash, it is needed to burn a boot loader and download arduino sketches. The boot loader is programmed under the ISP program controller.

An adapter of 12V output power supply is used as an input to the voice controlled arduino system. Relays are connected to the output pins of Arduino Uno, these are used as switches to the loads.

Android is a mobile operating system based on the Linux kernel and currently developed by Google. We prefer android platform because of its huge market globally and it is easy to use the user interface. The voice recognizer which is an inbuilt feature of android phones is used to build an application which the user can operate to automate the appliances at his house. For wireless communication systems a Bluetooth module HC-05 is used as a remote

which is connected to the control unit for sensing thesignals sent by the android voice application.

The microcontroller device with the Bluetooth module andrelay circuit needs to be connected to the switch board.
Through the application we can instruct the microcontroller to switch ON/OFF an appliance. After getting the instructionthrough the Bluetooth module, the microcontroller gives thesignal to the relay board.

The application first searches for the Bluetooth device. If it is available then it launches the voice recognizer. It reads the voice and converts the audio signal into string. It provides a value for each appliance which will be fed to themicrocontroller device. The microcontroller uses the port inserial mode. After reading the data it decodes the input value and sends a signal to the parallel port through whichthe relay circuit will be activate

SOFTWARE IMPLEMENTATION

Arduino IDE is a free software that lets you program Arduino boards, small computers used in DIY electronics projects. It has a text editor for writing code (called sketches), a compiler to turn it into instructions the board understands, and an uploader to send those instructions to the board.

THE CODE IS AS FOLLOWS:

```
#define relay1 13    //Connect relay1 to pin 13

String voice;

void setup()
{
  Serial.begin(9600);           //Set rate for communicating with phone
  pinMode(relay1, OUTPUT);      //Set relay1 as an output

  digitalWrite(relay1, HIGH);    //Switch relay1 off

}

void loop()
{
  while (Serial.available()){ //Check if there is an available byte to
read
     delay(10); //Delay added to make thing stable
    char c = Serial.read(); //Conduct a serial read
```

```
    if (c == '#') {break;} //Exit the loop when the # is detected after the
word
    voice += c; //Shorthand for voice = voice + c
  }
  if (voice.length() > 0)
  //////////////////////////////////////////////////////////////////
  {
    if(voice == "*turn on light"){          //Voice Command to ON Relay
01
      digitalWrite(relay1, LOW);   //Relay 01 ON
      }

    //////////////////////////////////////////////////////////////////

    else if(voice == "*turn off light") {      //Voice Command to OFF
Relay 01
      digitalWrite(relay1, HIGH);   //Relay 01 OFF
    }

    //////////////////////////////////////////////////////////////////

  voice=""; //Reset the variable after initiating
  }
}
    //////////////////////////////////////////////////////////////////////

void switchalloff()              //Function for turning OFF all relays
{
  digitalWrite(relay1, HIGH);

}
void switchallon()               //Function for turning ON all relays
{
  digitalWrite(relay1, LOW);}
```

TESTING AND RESULTS

Manual Testing:

Users or testers verbally interact with the voice assistant, issuing various commands and observing the outcome on smart home devices.

Automated Testing:

Scripts are designed to simulate user commands and interactions, enabling repetitive testing and faster evaluation.

Results:

Overall, testing voice assistant home automation systems leads to a more reliable, secure, and user-friendly smart home experience.

CONCLUSION

Voice-controlled home automation projects offer a glimpse into a future of convenient and hands-free living. Here are some key takeaways to consider:

Benefits:

Convenience: Control lights, appliances, and thermostats with simple voice commands.

Accessibility: Ideal for people with limited mobility or those who find traditional controls difficult to use.

Security: Integrate voice assistants with security systems for voice-activated locks and alarms.
Challenges:

Complexity: Depending on the approach (DIY vs. pre-built system), the project can involve hardware, software, and coding knowledge.

Cost: Smart home devices and controllers can add up quickly, especially for a comprehensive system.

Privacy: Voice assistants collect user data, raising privacy concerns for some users.

Overall:

Voice-controlled home automation is a rapidly evolving field with immense potential. If you're comfortable with technology and interested in a smart home project, it can be a rewarding endeavour. However, carefully consider the complexity and cost factors before diving in.

REFERENCES

https://www.arduino.cc/en/software
(page 8-9)

Further programming references:
https://forum.arduino.cc/t/complete-reference-for- ardu ino-programming-language/1112176

(page 8-9)

Referenced YouTube Video:
https://youtu.be/hkOUWIv6v-w?si=CabUe20nIRYzisXW

(Rest of the instructions and research):

https://www.instructables.com/Voice-Control-Home-Automation/