

# SWITCH ON/OFF HOME APPLIANCES USING ARDUINO THROUGH VOICE COMMANDS

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**Abstract—** So far we are controlling many electrical devices at homes, industries, offices, institutions manually. To control all electrical devices we need a lot of “MAN POWER”. If manpower increases maintenance cost also rises. This doesn't cause any benefit to the industry. So to avoid these kind of drawbacks we need some wireless controlling systems. One such wireless communication system to be used is Bluetooth communication system. This communication system can be used in all fields like industry, domestic purposes like home appliances controlling using Bluetooth as a remote. This system can be used by elder or disable persons who are unable to go to the switch board to control the devices. Remote operation is using smart phones or devices with Android operating system, upon a GUI (Graphical User Interface) based voice command. This arduino based voice controlled home appliances using Bluetooth uses the android application that sends voice command to the devices through the Bluetooth. This system reduces human labour, effort, time and errors due to human negligence. We can control all loads at a time from one place without connecting any physical wire between loads and control room.

**Keywords—** Arduino, Voice Reorganization, Bluetooth module, Android application

## I. INTRODUCTION

This project is mainly designed for elderly and disabled people. Home Automation is popular as it helps in reducing efforts and errors because of human and it further increases the efficiency. Different applications like lights, fans, TV, AC etc. can be controlled by use this project through Bluetooth wirelessly. Other types of Automation Systems include Internet Controlled, RF Controlled or IR based Remote Controlled. Based on the application requirement we can prefer the type as each has its own advantages and disadvantages. In this project , by sending a Voice Command we can control where different appliances. The main controlling component in the system is Arduino UNO, whose working is explained in later section. The proposed system has mainly two parts, they are (a) Voice recognition system, and (b) wireless data transfer system. In this project controlling of home appliances are done by using a voice controlled android application. It is easy for users to make use of remote access to control various applications.

In general, home automation research targeted many needs like applications that provide the luxury and smart requirements while some threw light on the special needs for elderly and disabled etc. Our system is a Arduino based system that can accepts voice commands and process them. That means one can switch the device either ON or OFF.

The aim of the report “ Voice controlled home appliances using Arduino Bluetooth” is to furnish a system that can respond to voice commands and control the ON/OFF status of electrical devices either ac or dc. The system should be reasonably cheap, easy to configure and easy to use. The user should be able to control all the appliances from any point in their home, so a wireless controller should be provided. This report demonstrates a system that can be integrated as a single portable unit and allows one to wirelessly control lights, fans, air conditioners, television, etc. This integrated platform for home security, monitoring and automation by using microcontroller. A Bluetooth model is interfaced with the control unit for sensing the signals transmitted by android application. The commands given through voice are conveyed to the control unit with switches on loads ON/OFF as desired. These voice commands sent are converted to binary sequence in microcontroller. The microcontroller unit takes decision and performs the required decision.

## II. HARDWARE DESCRIPTION

### 1. ANDROID BASED PHONE

First Download the app available in play store called “*Arduino Bluetooth Voice Controller*”. One can directly download the arduino software that recognizes the voice commands and sends the information to the device through Bluetooth module connected to the board. If you are connecting the module for the first time, it will ask for password ie., 1234 or 0000. Open the app and follow the following images given below, like first click on “*connect to Bluetooth device*” and select your Bluetooth module hc-06 and check whether it is connected or not. Then to speak make a click on the mic icon and send the voice command to the HC-06 module.

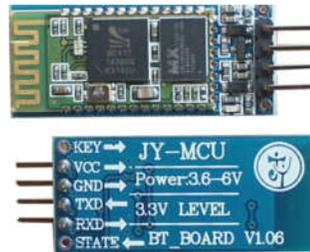


Fig: Sending Voice commands to Bluetooth module through Android App  
 After this, the HC-06 will serially communicate with the Arduino UNO and then the task is performed as per the pre defined commands. The below shows the command and the action to be performed by the command:

S. No.	Command
1.	LED on
2.	LED off
3.	MOTOR ON
4.	MOTOR OFF

2. BLUETOOTH MODULE

Serial wireless data transmission can be achieved by using this module. Its operating frequency is 2.4GHz. It follows Bluetooth 2.0+EDR standard. In this 2.0, 0.5 seconds is the signal transmit time for different devices. For other applications like industrial, medical and scientific it ranges from 2.402 to 2.480 GHZ. The data transmission rate is given by 25 Mb/s. It follows full duplex mode of data transmission. It uses frequency hopping spread spectrum technique to avoid interference with other devices.



Bluetooth can operate in the following two modes either Command Mode or Operating Mode.

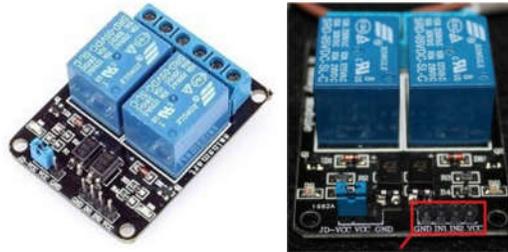
In **Command Mode** we will configure the Bluetooth properties like the signal name, set a password or operating baud rate etc. where as in **Operating Mode** data transmission and reception between Arduino board and Bluetooth module takes place. It requires 5V supply and the signal pins operate on 3.3V.

3. ARDUINO UNO

It is an open-source microcontroller. The Arduino/Genuino Uno can communicate with computer, or other Arduino boards. It provides UART serial mode of communication, through digital pins 0 (RX) and 1 (TX). Simple Textual data can be sent or receive to or from board through serial monitor. This data transmission between USB port and computer can be indicated by two leds one for transmission and other for reception. The Receiver and Transmitter LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). In Uno board a Software Serial library allows serial communication on digital pins. The Uno board supports a set of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. It consists of 14 Digital pins, 6 Analog pins, and they are programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. A USB cable or by an adapter of 9 volt or a battery is used to power up the board and is capable to accept voltages between 7 and 20 volts.

#### 4. RELAY

A electromagnetic relay is made of a coil of wire wrapped around a soft iron core (a solenoid), an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two contacts in the relay pictured). The armature is linked to the yoke and mechanically connected to one or more sets of moving contacts. The armature is connected to a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. In this condition, either of the contacts (NO- Normally open or NC- Normally closed) in the relay pictured is closed (NC), and the other set is open (NO).



(a) Single Channel (b) Dual Channel

IN1: This input controls the first relay (it will be connected to an Arduino digital pin)

IN2: This input controls the second relay (it should be connected to an Arduino digital pin if you are using this second relay. Otherwise, you don't need to connect it)

### III. SOFTWARE DESCRIPTION

Download the app called “*Arduino Bluetooth Voice Controller*” which is free on play store. Open the app and follow the image below, like first click on “*connect to Bluetooth device*” and select your Bluetooth module and check if it is connected or not. Then click on the mic icon to speak and send the voice command to the HC-06 module. When you are connecting your Bluetooth module for the first time with your smart phone it will ask for the pass code, use 0000 or 1234. After setting up all the things, you just have to send the voice command by using the app which is further sent to Bluetooth module HC-06 and the HC-06 serially communicate with the Arduino UNO and then the task is performed as per the command.

### IV. WORKING ARCHITECTURE

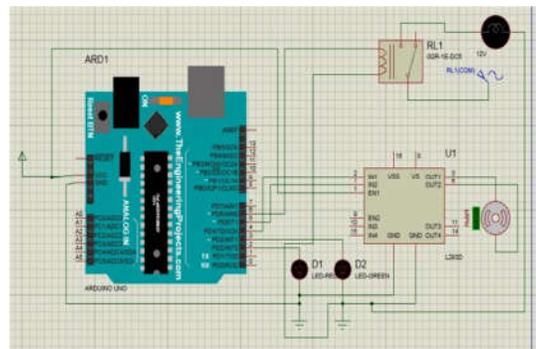


Fig. Architecture of Voice controlled home appliances

### V. HARDWARE IMPLEMENTATION AND WORKING PRINCIPLE

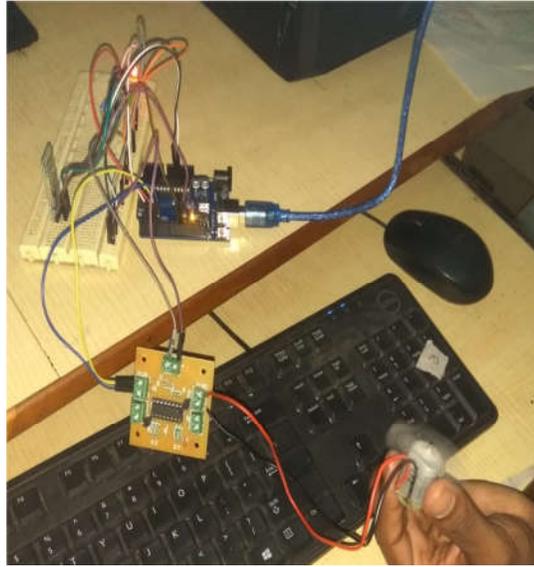
The circuit can be designed by using those components. The heart of the system is Arduino Uno which has a microcontroller i.e Atmega 328. It has a 32KB flash, it is needed to burn a boot loader. ISP program controller is used to program boot loader.

This voice controlled Arduino system is powered by using a 12V adapter. To control heavy AC loads relays are connected at the output pins of Arduino Uno, this relay act as switch to the loads. Android is developed by Google and it runs on Linux Kernel operating system. Android is preferred because of its easy interface and its huge global market. Here our main goal is to control our devices through voice commands, for that we are using the inbuilt feature available in all android phone. So user can easily access home appliances at his house.

A Bluetooth module HC-06 for wireless communication system is used as a remote which is connected to the control unit for sensing the signals sent by the android voice application. The Arduino device along with the Bluetooth module and relay circuit needs to be connected to the switch board. Then we need to install the Arduino app “*Arduino Bluetooth Voice Controller*”. This application receives the voice commands from the user and sends that information to Bluetooth module wirelessly.

Microcontroller by receiving instructions from the Bluetooth module it gives a signal to the relay to control the device (either Switch ON/OFF). Simple LEDS and DC motors can be controlled directly. A simple ROBO can be designed without the use of Relays to design hobby projects.

### V. RESULT



**FIG: MOTOR turned ON through Voice command**

### VI. CONCLUSIONS

In conclusion, generally speech or voice recognition interface can be implemented in many applications. Home automation based on voice recognition has been built and successfully developed in this project. The voice recognition system in this project is identified until 20 m of range to transmit the signal from the smart phone to the home appliances via Bluetooth. This system was targeted for elderly and disabled people. Voice system is a sensitive system, so other disruption such as weather, buildings and noise must be avoided to get a better performance. The range can be extended by using Raspberry Pi which can be connected to internet.

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