

# VOICE CONTROLLED HOME AUTOMATION USING RASPBERRY PI 3

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**Abstract** - The aim of this project to develop a system that will voice control the home appliances and also provide security against intrusion when the home owner is not in home. This paper mainly concerned with the automatic voice control of light or any other home appliances. It is used to save the electric power and human energy. This project is made with help of Raspberry Pi 3 and Relay driver circuit. The various appliances are connected to the relay circuit and the Alexa is connected to Raspberry Pi 3. After successful recognition of voice command, the Raspberry Pi 3 drives the corresponding appliances. Voice recognition is developed by using Google API's.

## I. INTRODUCTION

The world has become a global due to revolution in the technology in this revolution the IT (Information Technology) played an important role. Similarly, the revolution in IT makes idea come true to have an automated home. Home automation system use microprocessor-base to integrate or control electronic products and systems in the home. The incentive behind Voile controlled home automation is efficient utilization of electricity. That's why many types of researches and many solutions had proposed on home automation. These systems use PC, mobile internet [6], GSM Bluetooth [5] and ZigBee network etc. Home automation is common thing in western countries but it is not that much use in

INDIAN region, the main reason behind this is its high cost. So, we try to make this project as economical as possible to implement in local region. It is a very different concept than what is presently available in market. This would make automation easier and simpler. The people will be able to interact with the system easily. It is a very useful project for the adults and physically disabled persons, who are not able to do various activities efficiently. Human make mistakes and forgot to switch off the appliances when there is no use and, in this case, they are useful in order to utilize the power effectively and also in a secured manner.

## II. LITERATURE SURVEY

The 1<sup>st</sup> idea came in 1800s, when Nikola Tesla developed the idea of having a remote control for vessels and vehicles in 1898.[10] After development of electrical appliances the idea of home automation is developed.

A. Al-Ali and M. Al-Rousan developed a Java based Home Automation System.[7] It was developed using Wi-Fi as a medium for communication between the hardware and software component. An android based HAS was developed [8]. It would use internet as a medium for connectivity. Its disadvantage was that the unavailability of internet would fail the entire system. Inbuilt smart home management scheme was presented [9]. It was developed using Ethernet network. The system also had GSM support for the issue of unavailability of network. This system was costly and hence this was disadvantage.

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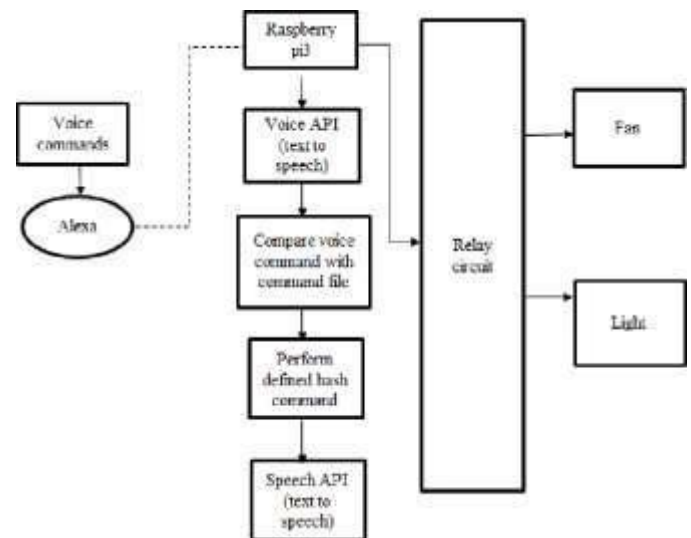
presented the idea of Bluetooth based Automation system [11]. It used arm processor (ARM9 and ARM7), and so the system has a complex architecture.

### III.NEED OF THE SYSTEM

In 21<sup>st</sup> century PC models are widely used. The problem for a middle-class human to buy the computer system should be taken into consideration. So, the need as a cheap, alternative system raised, where the costly computer system should have an alternative. Also, for security purpose of home, small offices there is requirement of the system which can provide features of voice recognition which should be available in very cheap rate and small size. The rate and size problem were covered where invented Raspberry Pi 3 model by embedded manufacturers giving extremely super quality of minicomputer. Here arises the need of system.

### IV.SYSTEM OVERVIEW

The software used Google Voice and Speech API's. The voice command from user is captured by the Alexa. This is then converted to text by using Google Voice API. The text is then compared with the defined commands inside the command configuration file. If it matches with any of them, then the bash command associate with it will be executed. This is achieved by using the Google speech API, which converts the text into speech. Below block diagram showing basic working for voice control home automation.



### V.HARDWARE IMPLEMENTATION

The hardware implementation of proposed system shown in Fig.1 is explained in this section.

#### 5.1 Alexa



Voice assistants becoming more popular as we are heading towards an era of AI and IoT based systems . You have heard about Google Assistant, Apple Siri and Amazon Alexa. These all are Voice based AI systems, what makes these different from each other is their ecosystems, and this is where Amazon Alexa stand out the most. Google, Apple and Amazon, all these companies already launched their smart speakers but Amazon was first to introduce them. Amazon echo, Echo Dot Spot, etc. are the smart speakers which are available in market. Amazon provides the API for using its much popular voice service, Alexa. It is open source and available on GitHub. Further you

can install or integrate Alexa on custom devices like Raspberry Pi and get the full Amazon Echo functionality in that device. Using Alexa voice service, we can play music, get information about weather, book tickets and many more. All you have to do is ask. In previous tutorial we have controlled Raspberry Pi GPIO using Amazon Alexa. In this tutorial, let's see how to build a voice-controlled home automation system using Amazon Alexa and Raspberry Pi. We will see how we can use Raspberry Pi to run the Alexa Voice Service and control a Light Bulb.

### 5.2 Raspberry Pi 3

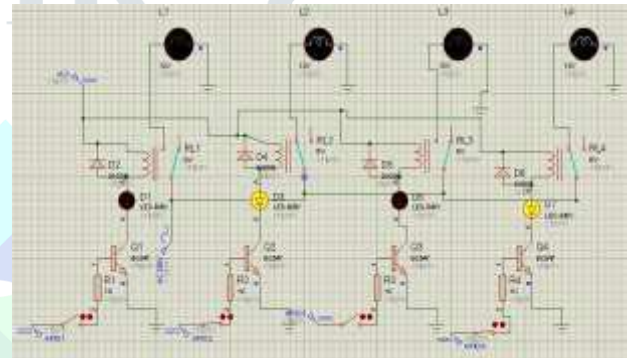
The Raspberry Pi 3 board model B has a processor of 1.2 GHz 64-bit quad-core ARMv8 CPU and 1 GB RAM which almost acts like a mini computer [1]. Raspberry pi 3 board has 802.11n wireless LAN and Bluetooth 4.1. We installed Raspbian Jessie [2] in the memory card used for the board. Raspberry Pi 3 has a LINUX based operating system call Raspbian. There are also 40 GPIO pins which can be used as both digital input, digital output and to control and interface with various other devices in the real world, 4 USB ports, 1 HDMI port, 1 Ethernet port, 1 3.5mm Audio jack, micro USB power supply. This board also has serial connections for connecting a camera (CSI) and a display (DSI).



**Fig.3 Raspberry Pi3 board**

### 5.3.Relay driver Circuit

Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal [3]. In our system the output from raspberry pi 3 is directly give to relay circuit. If GPIO pin is High then corresponding relay will turn on and makes its device working. we are using a NPN transistor in relay and it works based on concept of emf. The relay can be selected according to our application purpose as shown in Fig.4.



**Fig.4 Relay Driver Circuit**



**Fig. 5 Simulation of Relay Driver Circuit**

## VI. SOFTWARE IMPLEMENTATION

### 6.1 Voice command programming for Alexa

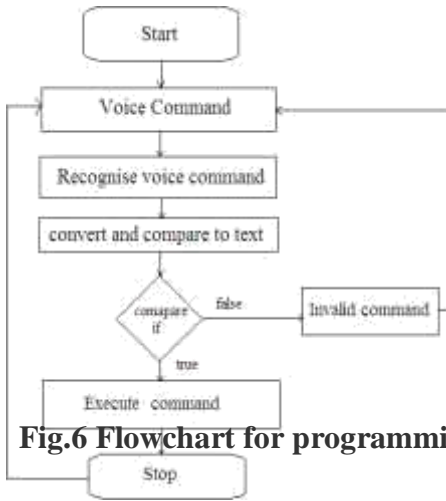


Fig.6 Flowchart for programming

### 6.2 Voice Command

After detection of the voice, voice command executes the respective python code. As shown in Fig.7

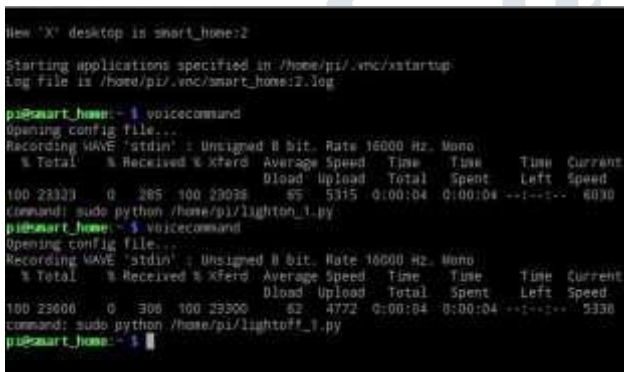


Fig 7. Voice command in terminal

### 6.3 Command table

Voice Command	Python File
Light ON	light_on.py
Light OFF	light_off.py
Fan ON	fan_on.py
Fan OFF	fan_off.py
All OFF	all_off.py

### 6.4 Proposed system



### VII. CONCLUSION

In this paper, we have shown the design and features of a Voice Control Home Automation System. It is internet based, hence wireless and can be flexible in terms of cost. This system has main feature for smart speech detection, which would decode user's sentences into appropriate commands. The system is more user friendly and increase the automation.

### VIII. REFERENCES

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