# Voice-Assistant based Home Automation System using Raspberry Pi

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**Abstract -** *Voice-Assistant based home automation system is a very helpful project for those who are differently abled and senior citizens, who are unable to do their works accurately in home or office and need an assistant to execute all that work. This project reduced wired automation and develops a wireless voice controlled home automation. The objective of this home automation is to make life simpler and easier. Due to the compact nature of mobile phones they are very familiar to everyone. This paper presents the overall design of our development "Voice assistant based home automation system". The automation identifies the voice commands given by the user through the Android phone and transfers the data to the microcontroller to perform the tasks accordingly. Raspberry Pi 3B+ is a preferable one for home automation because of its inbuilt WI-FI and Bluetooth technology. This project is proposing to control all the electrical appliances through voice commands and to respond accordingly to user's queries.*

*Key Words***: Raspberry Pi, Android, Wireless, Low cost, Python.**

## 1. INTRODUCTION

There is a rapid growth in world's population of old-age people. Home automation plays a crucial role in our lives. The main advantage of automated system is it saves time and energy of the people. These home automation system aims those seeking comfort and others seeking for appropriate needs like differently abled and senior citizens. The aim of the project "Voice Assistant based Home Automation" is to prepare a system that is able to respond to voice commands and control the switching ON/OFF of electrical appliances such as lights, fan, television, etc at home or office. The system is economically low and easy to build. The system is intended to control all the home appliances from any point in their home, as a wireless controller is provided. This project exhibits a system that can be combined as a single compact unit and allows the user to wirelessly control all the appliances.

This project using Raspberry Pi is both hardware and software in which user controls appliances through his voice commands. The overall system is controlled from Android phone application. User can launch the application in android phone and connect it to the Raspberry Pi. Later the user can give his voice commands for controlling devices like light, fan, etc. The Android application sends the voice commands in binary sequence to the microcontroller. The microcontroller undergoes the word matching; if the words match the raspberry pi performs the activities else the raspberry pi doesn't work. In this way the user can work easily and effectively.

## 2. Literature Survey

As per our survey, there exist systems that can control home appliances using different techniques. Each system has its unique features. Followed models describe the work performed by others:

The authors [1] Rozita Teymouzadeh and Salah Addin Ahmed built "GSM based Home Automation System". This automation uses Global System for Mobile Communication (GSM) to control all the home appliances such as light, and security system via SMS. The concepts of Serial communication and AT-commands have been used to develop this system. The authors [2] Y.Swetha and M.Saritha developed a system called "Home Automation through E-Mail". Whenever a person wants to control the devices the user need to send an e-mail to mail-id i.e., assigned to home system. The PC receives the mail and forward to microcontroller by using visual basic software, and acts accordingly. The author [3] Emand.S.Othman built "Voice Controlled Personal Assistant" which performs tasks based on user's commands. This system uses Raspberry Pi as its main hardware and responds to user in informing about weather, traffic conditions, news and notify from social applications, etc. The authors [4] Ritvik Iyer and Antara Sharma made "Home Automation system with Pattern Recognition". In this system arduino is interfaced with

multiple sensors that is used to measure temperature, humidity, light, etc. The data is stored and pattern analysis is done which tells the user which time appliances are usually ON/OFF via internet and automatically controlled.

Our designed system is application layer prototype. The application is able synthesize the speech data with the help of an MIT App that recognizes the voice. This design provides features of controlling home appliances such as light, fan, and television, etc, using voice commands and it has its own software level.

## 3. Proposed System

The Fig-1 Shows the block diagram of voice assistant based home automation system using Raspberry Pi. The system allows users to control home appliances through voice commands. The hardware part consists of a Raspberry Pi 3 B+ board whose GPIO pins will be used to transfer signals to controller based on voice commands filtered by Pi. The commands will be transmitted through Wi-Fi network. The Android application controls the Raspberry Pi wirelessly to perform required tasks. The main objective is to implement cheap and best home automation system. Python is used as a main programming language that supports Raspberry pi.
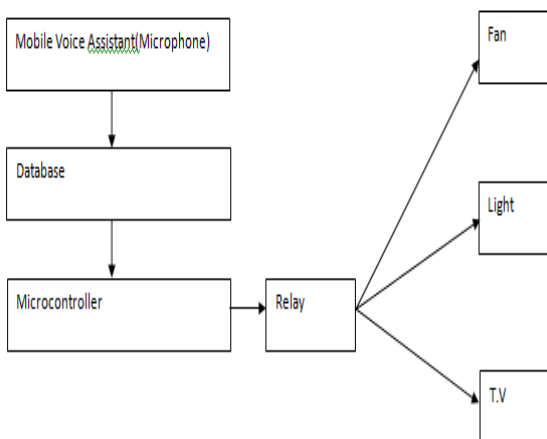


**Fig-1**: Proposed Flow Chart

## 3.1 Hardware Requirements
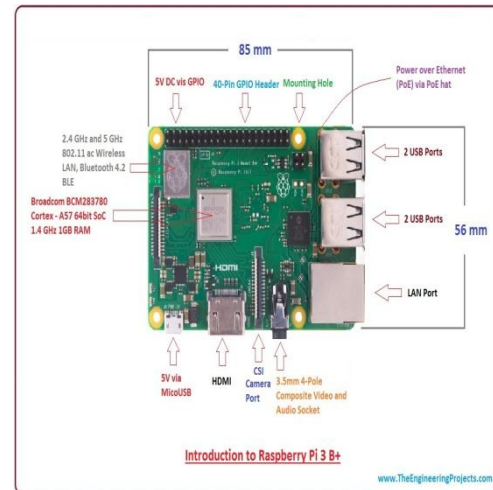
### Raspberry Pi 3B+:



**Fig-2:** Raspberry Pi 3B+

Raspberry Pi works as a credit card sized computer. This version is third generation of Raspberry Pi. Raspberry has the following features:

- 4 USB ports
- 40 GPIO pins
- Micro SD card slot
- Bluetooth 4.1
- A 1.2GHZ 64-bit quad-core ARMv8 CPU
- 802.11n Wireless LAN
- 1GB RAM
- Ethernet port
- Full HDMI port
- Android Mobile App

The android application named MIT AI 2 app is downloaded and created a home automation system on the android device. This provides the user an interface to interact with Raspberry Pi. This application allows the users to control all the home appliances and know the status of them through this app.

### Relay:

Relay is used for switching applications. The signal supplied from microcontroller may be high/low. Whenever a low voltage signal is given to the relay, the appliance connected to it is turned OFF and whenever a high voltage is given it turns ON.
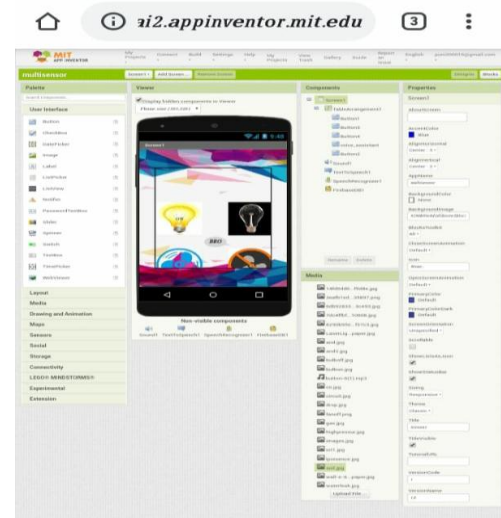
**Fig-3:** 4 Channel 5V relay

## 3.2. Software Requirements

### 3.2.1 Programming Language

Python is the main programming language. Python is a high level language used by Raspberry Pi for execution of GPIO commands. This is used to develop the code for voice controlled home automation.

### 3.2.2 Installation

Download Raspbian stretch zip file from the raspberry and extract the zip file. This would be the operating system of Raspberry Pi. After obtaining the IP address of raspberry pi , putty can be downloaded and the IP address can be given. VNC viewer is useful to operate through laptop.

## 4. METHODOLOGY

Voice commands are given through MIT app, voice app that is developed which connects through Wi-Fi and sends the data to Raspberry Pi. The command that is given is first proceeded and then it is converted to text, then from that text keywords are extracted and then check with the ones that are already stored in the hardware. If the command matches with modules that are already stored, then the microcontroller sends data to relay to turn ON/OFF the light, fan accordingly. This system can be used to control the appliances both at home and office.

## 5. RESULTS AND ANALYSIS

This part of the paper shows the result that are obtained when voice command is given.

When a user gives voice command to "turn ON/OFF the light" in particular place through the MIT application the light gets Turned ON/OFF accordingly.



**Fig-4**: Image of fan and light module.

The status of lights and fans can be known easily. The user can also known about the current weather, traffic condition or set an alarm and a remainder.

## 6. APPLICATIONS

- This system is designed to assist and provide support, in order to fulfill the needs of senior citizens and physically disabled people in home, so that they can have access to the basic needs.
- Home appliances like light, fan, and other devices can be easily controlled. Status of lights, fans and other electrical appliances can be easily known.
- The voice assistant device can be used to set an alarm, a remainder and play music, etc.
  This can is used for dual works for controlling home appliances i.e., fan, light, etc. and acts as an assistant that responds to users commands and does their tasks.

## 7. CONCLUSION

The main objective of our project is to use Android phone to control the home appliances effectively and an assistant that responds to users commands. User can easily interact via phone. The Raspberry Pi acts as a server, and according to data received it activates the GPIO pins. The GPIO pins which are connected to relay activates home appliances accordingly. The system is easier to interact and voice controlled home automation makes lives of people easier. This system is easy to use as it is wireless, easy to implement and saves power.

## 8. FUTURE SCOPE

This voice assistant based home automation can be further increased for face recognition. We propose to use voice recognition for security measures, so as to provide limited access to particular people. We would increase the scale of control of appliances such as controlling the temperature of A.C, changing particular channels in television, etc. We are trying to build an automatic interface for the user so as to simplify the process of controlling and make it much more interesting.

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