A
Seminar Report
On

"Automation Using Alexa and Raspberry Pi"

In partial fulfillment of requirements for the degree of

Bachelor of Engineering
In
Electronics and Telecommunication Engineering

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Bharati Vidyapeeth's College of Engineering Kolhapur.

CERTIFICATE

This is to Certify that seminar work entitled "**Automation Using Alexa and Raspberry Pi**" is a bonafide work carried out in the seventh semester by "**Mr. Harshal S. Chavan**", "**Mr. Kunal R. Gaikwad**", "**Mr. Sushant A. Patil**" in partial fulfilment for the award of Bachelor of Engineering in Electronics and Telecommunication Engineering from Shivaji University Kolhapur during the academic year 2021-2022. who carried out the seminar work under the guidance and no part of this work has been submitted earlier for the award of any degree.

Dr. M. S. Sonawane	**Dr. K. R. Desai**	**Dr. V. R. Ghorpade**
(GUIDE)	**(HOD)**	**(PRINCIPAL)**

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ABSTRACT

This report discusses the implementation of a Voice User Interface (VUI) as a personal voice assistant. That can perform several assignments or tasks for the user such as knowing the weather forecast, reading the latest news feed, finding out the meaning of an unknown word, reading an article from Wikipedia, controlling electronic gadgets (such as Television, lights, etc.).

The system's hardware model is designed in such a way, Where the main component is the raspberry pi to which various other peripherals (such as a microphone, speaker, relay module, etc.) are connected. The system works on the principle of speech recognition. Speech is feeding through the microphone as an input which upon further parsing is converted to text & the system searches for desired keywords to deliver to appropriate Output, Again the textual output is converted to speech (text-to-speech) and delivered through the speakers.

The system provides a great hands-free user experience to the user.

1. INTRODUCTION

Now a days virtual assistant is very useful to human. It makes human life easier like operate PC's or laptop on only voice command. Virtual assistant is a less time consuming. By using virtual assistant, we save our time and contribute in other works. Virtual assistants are typically cloud-based program that requires internet connected devices. Virtual assistant is the flexibility to contract for just the services they need. For creating virtual assistant for your raspberry pi go from basics python.

Virtual assistants are task-oriented. Virtual assistants' ability to understand and perform requests. Virtual assistants are a software that understands verbal and written commands and completes task assigned by clients. Virtual assistants are able to interpret human speech and respond via synthesized voices. There are several voice assistants in market like Siri for apple TV remote, Google Assistant for pixel XL smartphones, Alexa as a smart speaker which is developed by using Raspberry Pi, Microsoft Cortona for windows 10. As like this all-virtual assistant we also created a virtual assistant for Linux.

Our goal for this project is to develop a Voice enabled Smart Speaker Prototype with Raspberry Pi providing services offered by Google Assistant and Amazon Alexa in same piece of hardware. It will also work for Home Automation System for controlling Smart Devices with Assistants. User can use both services alternately by invoking them with hot words (i.e., Ok google, Alexa). This model works on primary input of user's voice. Any person ranging from child to old-age person can use this Smart Speaker using Raspberry Pi to get answers for usual queries, enjoy entertainment, schedule day, manage tasks, reminders, control smart home etc. The voice sends user commands provided through raspberry-pi for home appliance control using GPIO pins to relay module. The circuit consists of relay-based circuit which acts as switches for individual ac loads. Based on commands received by the receiver, the raspberry processor processes the commands and then switches relays accordingly to switch on/off required loads on the circuit. We use a transformer to provide required supply to our board. Thus, we demonstrate a real time home automation system using raspberry pi.

We use Artificial Intelligence technology for this project. Also use python as a

programming language, because python offers a good major library. For this software uses microphone as input device to receive voice requests from user and speaker as output device to give the output voice. This process is the combination of several different technologies like voice recognition, voice analysis and language processing. Virtual assistant uses Natural Processing language to match user text or voice input to executable commands. When a user gives a command to personal virtual assistant to perform a task, the natural language is converted the audio signals into digital signals Virtual assistants can provide several services which includes,

- Showing weather condition.
- Gives latest news.
- Turn on/off light.
- Showing datetime.
- Searching on Wikipedia
- Telling jokes, etc.

2. Literature Review

In the existing system of virtual assistant there are several virtual assistants in market by using Artificial Intelligence technology. Many companies have used the dialogue systems technology to establish various kinds of Virtual Personal Assistants (VPAs) based on their applications and areas, such as Microsoft's Cortona for Windows and Espeak for Linux, Siri for Apple, Google Assistants for Android.

The first digital virtual assistant installed on a smartphone of apple was Siri, it was introduced as a feature of the iPhone in 2011. Aim of that virtual assistant was to add in tasks such as sending a text message, making phone calls, checking the weather or setting up an alarm. Over time, it has developed to provide restaurant locations, search the internet, and provide driving directions. In 2014 Cortona virtual assistant was developed by Microsoft. Cortona uses Bing search engine for performing tasks like answering questions for the users, setting remainder, etc. In 2016 Google Assistant was developed by google. It is primarily available for mobiles and smart home devices. Google Assistants via chat on google messaging app and via voice on google smart home speaker.

The home automation using the raspberry pi is the most commonly used and most affordable method in efficiency and implementation of home automation systems than any other. The raspberry pi provides more powerful platform for the processing and actioning of commands as per the user needs and that is why raspberry pi is most commonly used in the field of home automation. It can act as a powerful processing unit. With the help of various sensors and other modules such as relay module, display module etc. a better home automation system can be used with more security options to home. As the raspberry pi is a faster and efficient computing machine, the number of devices that can be connected to the raspberry pi is also a large number. The devices connections in raspberry pi are also made using the relay module. All the inputs and outputs from the devices and from the controlling device are all processed through the raspberry pi. A single server can be used to do all the large data computing and when it comes online servers, it's so costly. It is better to have a free server for the cost-effective automation system building and also the security is to be concerned for the data that passes through the servers.

The System consists of three main components; web server, which presents system core that controls, and monitors users' home and hardware interface module (raspberry-pi, microphone, speaker, and relay module), which provides appropriate interface to raspberry pi and actuator of home automation system. The System is better from the scalability and flexibility point of view than the commercially available home automation systems. The User may use the same technology to login to the server web-based application. If server is connected to the internet, so users can access server web-based application through the internet using compatible web browser. The relays are directly interfaced to the main controller. Proposed design offers are the control of energy management systems such as lightings, heating, air conditioning. Embedded system Raspberry Pi to serve as a communication gateway between mobile devices and home automation systems. It has been designed Alexa with raspberry-pi board were developed for home automation. Python program is used on the laptop to provide the user interface. The raspberry board has I/O ports and relays are used for interfacing with the devices which are to be controlled and monitor.

In this project we use Python as a programming language and Visual code studio as a platform on which we execute our code for virtual assistant. We create the personal virtual assistants web application in the form of .exe file which is easy to get in any laptop or PC's and use it, for showing datetimes, weather monitoring, Latest news, on/off light, etc. In our virtual assistant user can able to train or update it by their own needs to do some tasks.

2.1Block Diagram

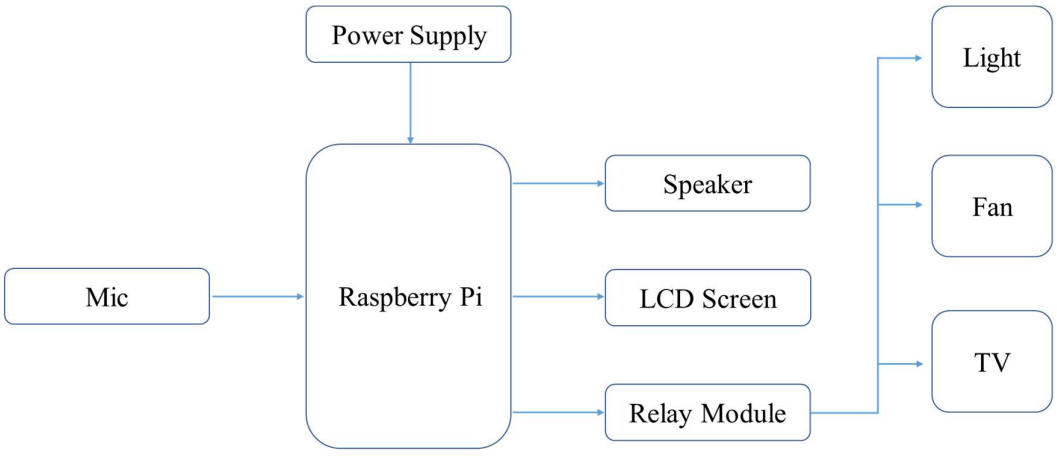

Fig 2: block Diagram of Automation Using Alexa And Raspberry Pi

2.2 Components details

Facilities Required for Proposed Work (H/W, S/W)

Hardware Requirement: -

- Microphone
- Speaker
- Raspberry-Pi 3
- Relay
- LCD Display
- Bulb, Fan

Software Requirement: -

- Visual Code Studio
- PuTTY
- VNC Viewer

1. Raspberry-pi

x

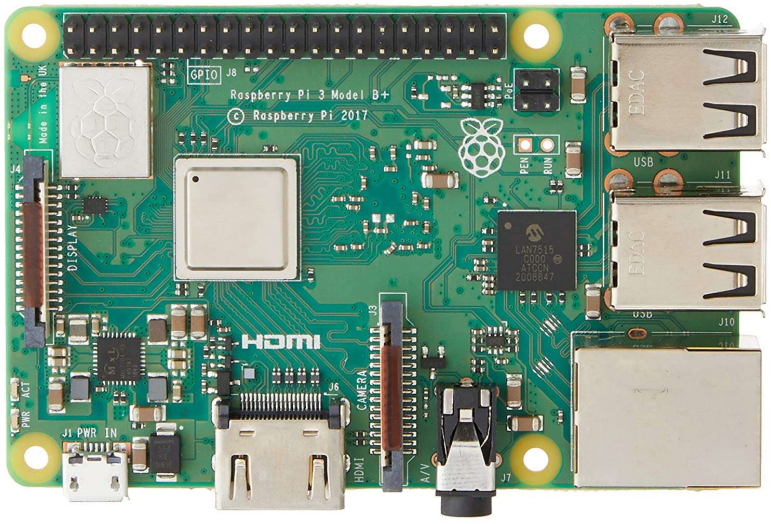

Fig 2: Raspberry-Pi 3b+ model

The Raspberry Pi Zero is the new generation, Raspberry Pi. This powerful credit card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processer, 10x faster than the first-generation Raspberry Pi. Additionally, it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs.

The Raspberry Pi 0's four built-in USB ports provide enough connectivity for a mouse, keyboard. Powering the Raspberry Pi 3 is easy, just plug any USB power supply into the micro-USB port. There's no power button so the Pi will begin to boot as soon as power is applied, to turn it off simply remove power. The four built-in USB ports can even output up to 1.2A enabling you to connect more power-hungry USB devices (This does require a 2Amp micro–USB Power Supply).

2. Microphone

Fig 3: Microphone

A microphone converts sound into a small electrical current. Sound waves hit diaphragm that vibrates, moving a magnet near a coil. The dynamic microphone (also known as the moving-coil microphone) works via electromagnetic induction. They are robust, relatively inexpensive and resistant to moisture. This, coupled with their potentially high gain before feedback, makes them ideal for on-stage use. Dynamic microphones use the same dynamic principle as in a loudspeaker, only reversed.

3. **Speaker**

Fig 4: Speaker

Speaker is defined as an electrical device used to make sound. The primary objective of speakers is to offer audio output for the listener. The electromagnetic waves are converted into sound waves through the speaker as they are transducers. The devices, like an audio receiver or computer, give audio input to speakers, which may be in the form of analog or digital. Speakers work by converting electrical energy into mechanical energy (motion). In project use electrodynamic loudspeaker

4. Relay

Fig 5: Relay

The electromagnetic relay operates on the principle of magnetism. Where base voltage (V b) appears at the relay driver section, the driver transistor will be driven into saturation allow to flow of current in the coils of the relay which treat magnetic field. Whenever the base voltage is withdrawn the transistor goes to the cut off, so current flows in the coil of the relay. Hence the magnetic field disappears so the constant point breaks automatically. The contact points are

isolated from the low voltage supply to the high voltage so the high switching is possible by the help of electromagnetic relays.

2.3 Flow Chart

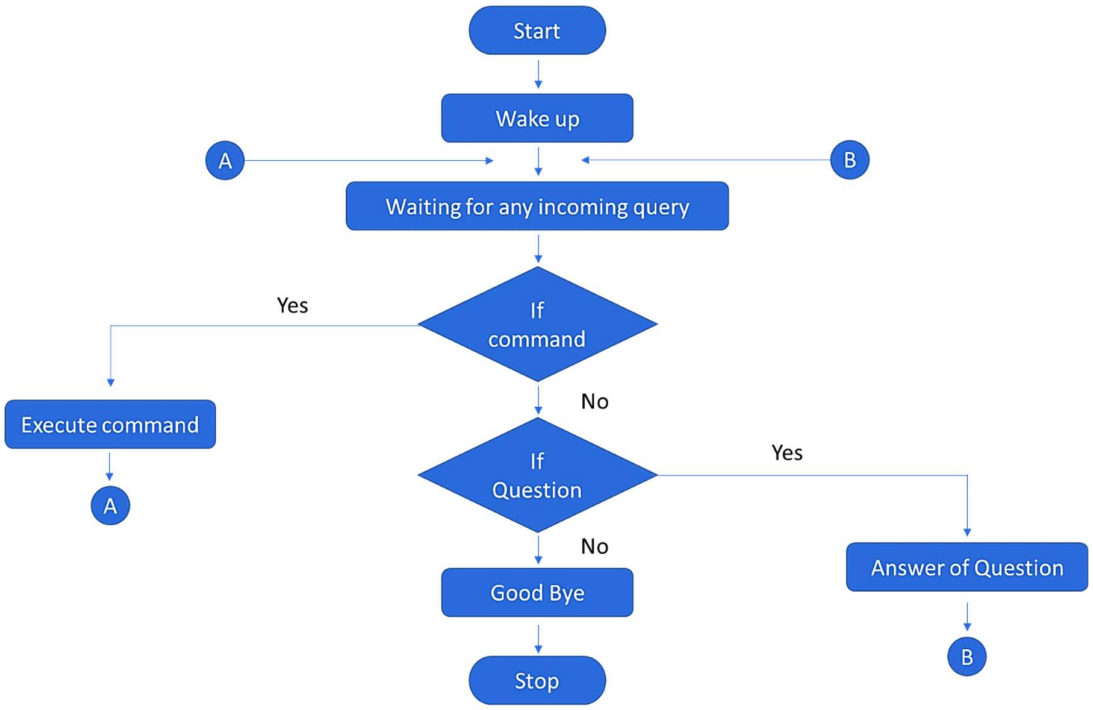

Fig 6: Flow Chart of Automation Using Alexa and Raspberry Pi

This figure represents the flow chart of this project. The flow chart gives detail idea about the working of proposed system. When the circuit get turned ON the firstly it initials with wakeup command.

3. Working Principle

Initially, we have given 5v dc power to raspberry Pi then mic takes audio from the user. With the help of sound cable, the audio signal is given to the Raspberry Pi. In raspberry Pi, the SpeechRecognition module recognize the user command. Activate virtual assistant, we use hot word that is wake up Peter or Peter. The Raspberry Pi shows the initial status on the LCD screen and the complete status as the instruction is processed or completed.

When a user says any query to virtual assistant the natural processing languages is converted the audio signal into executable commands. Then this data is compared with source code of python to find suitable answer. If query is not matching, it will try to find data on the internet after fetching the request. Generate the output in text. With the help of the Pyttx3 module of python produces text to audio format and this audio is forward to a speaker.

python as a programming language because python offers a good major library. For this software uses microphone as input device to receive voice requests from user and speaker as output device to give the output voice.

4. Project Result and Discussion

4.1 Code Stimulation

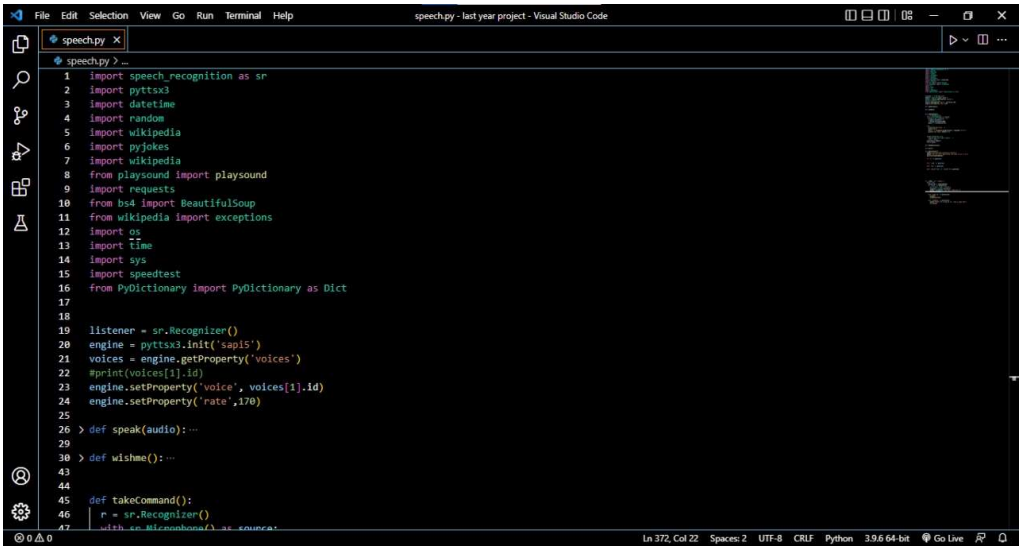

Fig 7: Stimulation of Python Code in Visual Code Studio

Fig 8: Python Code Run Successfully in Visual Code Studio

4.2Merits:

- The ease to switch on and off any device without putting in some extra effort has been the main motto of this device.
- Energy saving.
- Accessibility.
- Convenience and time saving.
- Control.
- Comfort.
- Easy communication.
- Peace of mind.
- Smart homes may be suitable for disabled persons.

4.3Demerits:

- Dependency on Internet
- Internet security
- Dependency on Professional
- Greater acceptance

4.4Applications

- Smart kitchen &connected to cooking.
- Lighting control system.
- Appliance control and integration.
- Occupancy aware control system.

5. Conclusion

The purpose of this project is to develop the voice enable smart speaker prototype that the function fully based on IOT The virtual assistant saves the time and contribute our dedicated timeline and proposed to do highlight the home automation.

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