

Virtual Personal Assistant for the Blind

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Abstract

There are various communication barriers for people who are blind, and they have to face various challenges. In this paper, we have discussed the implementation of a personal virtual assistant which can take the human voice commands to perform tasks which otherwise would need the dependence on others. It enables user to receive and send emails, know the weather forecast report, maintain a personal diary/Online Blog, recognize image etc, using Speech to Text Engine, Text to speech Engine, OCR (Optical character recognition) using microphone for the input and speakers for the output.

Keywords

STT, TTS, OCR, Virtual Assistant, Raspberry pi, Speech Recognition.

I. Introduction

In 2016, M. Ramlrez made an attempt to make an automatic speech recognition (ASR) system to help preschool children to learn Braille, but it is difficult to interpret and it is quite expensive [2]. In 2015, A. Mishra developed a voice-controlled personal assistant robot, in this voice commands are given to the robot remotely, using smart mobile phone but in this approach there was a power wastage as well as there was a huge requirement of hardware [3].

Now, using IOT (IOT refers to the idea of enabling everyday objects to communicate over a network without requiring person-to-person interaction) and Artificial Intelligence (AI is the art of creating machines that perform functions that requires intelligence) we can build a virtual personal assistant for blind which will not be difficult to operate. Basically, virtual assistant is the Intelligent personal mini-computer of user that are useful for helping the users to automate tasks and accomplish tasks with minimum human interaction with a machine. The interaction that takes place between a user and a virtual assistant seems natural, the user communicates using their voice, and the virtual assistant responds in the same way.

The virtual personal assistant can:

- Receive and send emails
- Access daily news
- Weather forecast
- Maintain a personal diary / Online Blog
- Text Recognition from the image.

Using the modules like Speech to Text Engine, Text to speech Engine, OCR(Optical character recognition).

II. Literature Survey

“An automatic speech recognition system for helping visually impaired children to learn Braille [2]”

- **Advantage:** By using automatic speech recognition with hardware module it detects the vowels pronounced by the user corresponding with the command and it helps preschool children to learn Braille system.

- **Disadvantage:** This system is very complex and applicable for limited number of subjects.

“A Voice controlled personal assistant robot [3]”

- **Advantage:** By using this system, the personal assistant robot performs different movements through the human voice commands given to the robot assistant by using smart phone.
- **Disadvantage:** In this system, voice commands are operated using cloud server which makes the system costly.

“Virtual personal assistance [9]”

- **Advantage:** By using this system, we can give the Artificial Intelligence more control on the hardware so that virtual personal assistant can perform lots of different operations.
- **Disadvantage:** In this system as hardware failure may happen it will not cost effective.

“VPA : Virtual Personal Assistant [4]”

- **Advantage:** This system reduces the use of input devices like keyboard and/or mouse and provides remote access to the system and also the addition of new commands to the system for performing various tasks that will facilitate the disabled people.
- **Disadvantage:** In this system the input is given through LAN or Wi-Fi for that it will require its own local Apache web server.

“Voice Recognition and Voice Navigation for Blind using GPS [6]”

- **Advantage:** In this system voice recognition module is interfaced with the Arduino and also this system is cost effective.
- **Disadvantage:** This system does not provide any internet access functionality for blinds.

Live Survey-

The various virtual assistant that are currently available-

1. **Google Now** - It is developed by Google mainly for Android and iOS mobile operating systems. It has the best voice recognition ability.
2. **Cortana** - It is developed by Microsoft and needs Windows for PC and mobile. The commands can be sent through typing so it doesn't completely rely on voice commands.
3. **Siri** - It is a popular virtual assistant developed by Apple that runs only on iOS. It has numerous features and capabilities.

III. System Architecture

The various modules of the project are-

A. Speech Recognition

This module is combination of TTS and STT modules. Basically Speech recognition system consist of TTS(Text To Speech) module ,logic processor and STT (Speech To Text) module. SpeechRecognition library supports Google Speech Recognition.

In this module, first user's voice is stored in .wav file as input which is sent to Google's SpeechRecognition engine. This processing is performed in TTS engine. Output of this will be text string which is passed as input to TTS module. TTS module converts text string into voice.

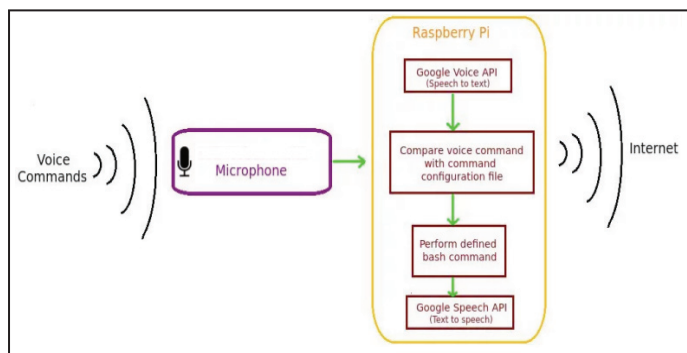


Fig. 1: Speech Recognition Module

B. Speech to Text and Text To Speech

In this module voice commands are captured with the help of voice hat and microphone. These voice commands are then send to Google voice API. Google voice API compares voice commands with stored commands in command configuration file. With the help of central processor processing is done and the result is sent to Google speech API for text to speech conversion.

C. Weather Forecast

Weather information is obtained from the weather.com web site with the help of a Python module name pywapi. It requires city name and city code for weather report generation. User can access following weather information:

- Temperature
- Wind
- Humidity
- Dew point
- Pressure
- Visibility
- UV Index

D. Email Read and Write

This framework occasionally downloads and stores the messages the client gets. The client can get to his messages utilizing voice directions. The central module at that point inputs information from the email read/compose module. This email content is at that point sent to the content to discourse module to be perused resoundingly by the framework. The client can direct an email to the framework. The information discourse is changed over to content by the discourse acknowledgment module which encourages content to the central module. The central module then advances the content to the email read/compose module which sends the email with appropriate organizing.

E. Personal Diary

For maintaining notes personal diary module is used. It uses python and SQLite3 database for storing previous notes. This module consist of note making as well as note dictating. In the note making part note keyword is searched in STT module if found it is then removed from STT for the purpose of extracting note from database. For revisiting previously stored notes note dictating part is used.

F. News Feed

This module is used for retrieving international or national news by giving voice commands. It will search for url of corresponding news. The contents of news will be divided into <header> and <p> of HTML. Then by using parser unwanted data will be removed. Then in dictionary the contents of <header> and <p> will be stored in the form of key-value pair. By using TTS engine it generates voice output.

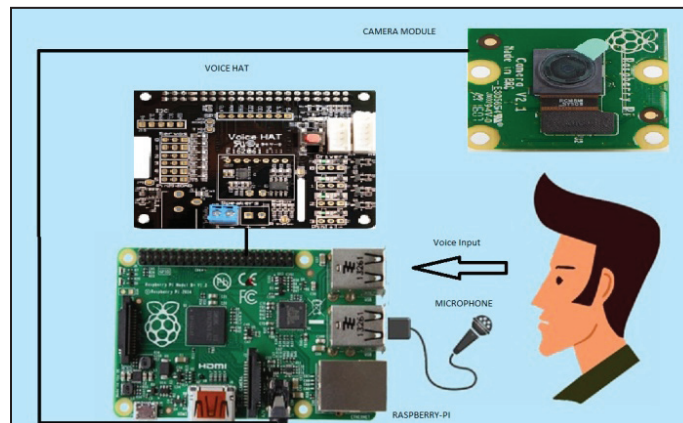


Fig. 2: Architecture Diagram

IV. Conclusion

In this paper, we have discussed about a voice guided virtual personal assistant to access the internet in order to write and read emails, get news feed, maintain a personal diary, weather forecast, get information from Wikipedia and a vision assistant to read notes from an image. The system uses a Raspberry pi with a voice hat to process the commands and talk back to the user with the speakers.

V. Future Scope

In future work, the above system can be integrated with a secure smart home automation system that works on voice commands from the user. Thus it will become easy for the disabled to control the home appliances through voice input. The assistant would require a voice password to unlock this feature. The system would inform the user about various conditions like temperature, humidity and detected motions through the sensors which would help the user to give appropriate voice commands to manipulate the home appliances like AC, lights etc.

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