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AI Based Virtual Personal Assistant- A Survey

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ABSTRACT:

In modern times, everyday life has become smarter and more sophisticated. We already know some personal assistant services like google, alexa and Siri etc. Our Virtual Personal Assistant[VPA] is considered as a platform to perform the daily task of the user by using the voice. Personal virtual personal assistant is an assistant program that works on the desktop by using concepts of Python Programming. These days we aren't even using fingers. We just speak of the task and it is done. Our Artificial Intelligence based virtual personal assistant listens to the user's voice and responds to the verbal commands. Virtual Assistants are software programs that help you ease your day to day tasks, such as showing weather report, creating reminders, playing videos on YouTube, seeking information from net etc. and many more tasks we can perform using VPA. This VPA is created by using Python programming and some concepts of Artificial Intelligence which are embedded with some libraries which we have used.

KEYWORDS: *Virtual Assistant Using Python Programming, Speech Recognition, Text to Speech, Natural Language Processing, Python Libraries.*

[1]INTRODUCTION:

The Virtual Personal Assistant **is an** Artificial Intelligence (AI) based intelligent machine which performs Various tasks based on daily activities and some automation. It is the science and engineering of making machines to demonstrate intelligence especially speech recognition, decision-making, and translation between languages like human beings. By using AI we can simulate the human intelligence processes by machines, especially computer systems. Virtual assistants help users or enterprises with a set of tasks previously only made possible by humans. The Virtual assistant uses Python Programming and some concepts of AI which is natural language processing(NLP), to assist people or automate tasks. The Virtual Personal Assistant listen to and observe behaviours, build and maintain data models, and predict and recommend actions. VPAs can be deployed in several use cases, including virtual personal assistants, intelligent personal assistants and virtual employee assistants.

AI has already become an intrinsic part of our daily life and has greatly impacted our lifestyle despite the imperative uses of digital assistants of mobile phones, driver assistance systems, the bots, texts and speech translators, and systems that assist in recommending products and services and customized learning.

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Every emerging technology is a source of enthusiasm. AI is a source of both advantages and disadvantages indifferent perspectives. However, we need to overcome certain challenges before we can realize the true potential and immense capabilities of this emerging technology.

[2]**History Of VPA:**

Radio Rex was the first voice activated toy released in 1922. It was a wooden toy in the shape of a dog that would come out of its house when its name is called.

In 1952, Bell labs presented "Audrey", the Automatic Digit Recognition machine. It occupied a six- foot-high relay rack, consumed substantial power, had streams of cables and exhibited the myriad maintenance problems associated with complex vacuum-tube circuitry. It could recognize the fundamental units of speech, phonemes. It was limited to accurate recognition of digits spoken by designated talkers. It could therefore be used for voice dialing, but in most cases push-button dialing was cheaper and faster, rather than speaking the consecutive digits.

Another early tool which was enabled to perform digital speech recognition was the IBM Shoebox voice-activated calculator, presented to the general public during the 1962 Seattle World's Fair after its initial market launch in 1961. This early computer, developed almost 20 years before the introduction of the first IBM Personal Computer in 1981, was able to recognize 16 spoken words and the digits 0 to 9

The first natural language processing computer program or the chatbot ELIZA was developed by MIT professor Joseph Weizenbaum in the 1960s. It was created to "demonstrate that the communication between man and machine was superficial". ELIZA used pattern matching and substitution methodology into scripted responses to simulate conversation, which gave an

illusion of understanding on the part of the program.

[4] **Speech Recognition:**

Speech recognition uses a broad array of research in computer science, linguistics and computer engineering. Many modern devices and text-focused programs have speech recognition functions in them to allow for easier or hands-free use of a device.

Speech recognition and voice recognition are two different technologies and should not be confused:

Speech recognition is used to identify words in spoken language.

Voice recognition is a biometric technology for identifying an individual's voice.

Working of Speech Recognition:

Speech recognition systems use computer algorithms to process and interpret spoken words and convert them into text. A software program turns the sound a microphone records into written language that computers and humans can understand, following these four steps:

1] analyze the audio

2] break it into parts

3] digitize it into a computer-readable format

4] use an algorithm to match it to the most suitable text representation.

[5] Related Work VPA

Each company developer of the intelligent assistant applies his own specific methods and approaches for development, which in turn affects the final product. One assistant can synthesize speech more qualitatively, another can more accurately and without additional explanations and corrections perform tasks, others can perform a narrower range of tasks, but most accurately and as the user wants. Obviously, there is no universal assistant who would perform all tasks equally well. The set of characteristics that an assistant has depends entirely on which area the developer has paid more attention to. Since all systems are based on machine learning methods and use for their creation huge amounts of data collected from various sources and then trained on them, an important role is played by the source of this data, be it search systems, various information sources or social networks. The amount of information from different sources determines the nature of the assistant, which can result as a result. Despite the different approaches to learning, different algorithms and techniques, the principle of building such systems remain approximately the same. Figure 1 shows the technologies that are used to create intelligent systems of interaction with a human by his natural language. The main technologies are voice activation, automatic speech recognition, Teach-To-Speech, voice biometrics,. dialogue manager, natural language understanding and named entity recognition.

[5]Proposed Plan Of Work

The work started with analyzing the audio commands given by the user through the microphone. This can be anything like getting any information, operating a computer's internal files, etc. This is an empirical qualitative study, based on reading above mentioned literature and testing their examples. Tests are made by programming according to books and online resources, with the explicit goal to find best practices and a more advanced understanding of Voice Assistant.

Speech recognition is used to convert the speech input to text. This text is then fed to the central processor which determines the nature of the command and calls the relevant script for execution. But, the complexities don't stop there. Even with hundreds of hours of input, other factors can play a huge role in whether or not the software can understand you. Background noise can easily throw a speech recognition device off track. This is because it does not inherently have the ability to distinguish the ambient sounds it "hears" of a dog barking or a helicopter flying overhead, from your voice. Engineers have to program that ability into the device; they conduct data collection of these ambient sounds and "tell" the device to filter them out. Another factor is the way humans naturally shift the pitch of their voice to accommodate for noisy environments; speech recognition systems can be sensitive to these pitch changes.

[4]Python Programming:

Python is high-level, general-purpose and a very popular programming language Python programming language (Latest Python 3) is being used in web development, Machine Learning application, along for experienced programmers with other programming languages like C++ and Java.

Below are some fact about Python Programming Language:

1.Python is currently the most widely used multi-purpose, high-level programming Language.

2.Python allows programming in Object-Oriented and Procedural paradigms.

3.Python program generally are smaller than other programming languages like Java. Programmer have to type relatively less and indentation requirement of the language, make them readable all the time.

4.Python language is being used by almost all-giant companies like-Google, Amazon, Facebook, Instagram, Dropbox, Uber…etc.

5. The biggest strength of Python is huge collection of standard library which can be used for the following:

- Machine Learning
- GUI Application (like Kivy, Tkinter, PyQt etc..)
- Data Science using Pandas and NumPy
- Web framework like Django (used by YouTube, Instagram, Dropbox)
- Scientific computing
- Multimedia
- Test processing and many more…

Language Features

1. Interpreted

There are no separate compilation and execution step like C and C++. Directly run the from the source code. Internally, python converts the source code into native language of specific computer to run it. No need to worry about linking and loading with libraries, etc

2. Platform Independent

Python program can be developed and executed on multiple operating system. Python can be used be used on Linux , Windows, Macintosh, Solaris and many more.

3. Free and Open Source

- Redistributable

4. High-level language

In python, no need to take care about low-level details such as managing the memory used by the program.

5. Simple

Closer to English language: Easy to learn more emphasis on the solution to the problem rather than the syntax.

6. Robust

Exception handling features. Memory management techniques in built

7. Rich library Support

The python Standard Library is very vast. Known as the "batteries include" philosophy of python: It can help do various things involving regular expressions, documentation generation, unit testing, database , web browser , CGI email, XML , HTML, WAV file cryptography, GUI and many more. Besides the standard library, there are various other high-quality libraries such as the Python Imaging Library which is an amazingly simple image manipulation library.

Advantages of Python Programming

1] Presence of third-party modules

2] Extensive support libraries (NumPy for numerical calculations, Pandas for data analytics etc.)

3] Open sources and community dependent

4] User-friendly data structures

5] High-level language

6] Versatile, Easy to read , learn and write

7] Dynamically typed language (No need to mention data type base on the value assigned, it takes data type)
8] Object-oriented language
9] Portable and interactive
10] Ideal for prototypes-provide more functionality with less coding
11] Highly Efficient (Python's clean object-oriented design provides enhanced processing and integration capabilities, as well as its own unit testing framework, which makes its more efficient.)
12] (IOT) Internet of Things Opportunities
13] Interpreted Language
14] Portable across Operating system

[5] Methodology Of Virtual Personal Assistant using Python Programming

1] Speech Recognition module

The system uses Google's online speech recognition system for converting speech input to text. The speech input Users can obtain texts from the special corpora organized on the computer network server at the information centre from the microphone is temporarily stored in the system which is then sent to Google cloud for speech recognition. The equivalent text is then received and fed to the central processor.

2] Python Backend:

The python backend gets the output from the speech recognition module and then identifies whether the command or the speech output is an API Call and Context Extraction. The output is then sent back to the python backend to give the required output to the user.

3] API calls

API stands for Application Programming Interface. An API is a software intermediary that allows two applications to talk to each other. In other words, an API is a messenger that delivers your request to the provider that you're requesting it from and then delivers the response back to you.

4] Content Extraction

Context extraction (CE) is the task of automatically extracting structured information from unstructured and/or semi-structured machine-readable documents. In most cases, this activity concerns processing human language texts using natural language processing (NLP). Recent activities in multimedia document processing like automatic annotation and content extraction out of images/audio/video could be seen as context extraction TEST RESULTS.

5] Text-to-speech module

Text-to-Speech (TTS) refers to the ability of computers to read text aloud. A TTS Engine converts written text to a phonemic representation, then converts the phonemic representation to waveforms that can be output as sound. TTS engines with different languages, dialects and specialized vocabularies are available through third-party publishers.

Libraries used in VPA

1] pyttsx3
2] pyAudio
3] speechRecognition
4] Wikipedia
5] smtplib
6] pywhatkit
7] pyautogui
8] pyJokes
9] keyboard

1] Pyttsx3r

For installation process for this python library we have to write **pip install pyttsx3** in a terminal of IDE and Then the respective documentation of this library

get started download,. The Purpose of this library is to convert the text into speech.

2] PyAudio

For installation process for this python library we have to write **pip install pyAudio** in a terminal of IDE and Then the respective documentation of this library get started download,. The Purpose of this library is to produce a converted text into the audio format.

3] Wikipedia

For installation process for this python library we have to write **pip install wikipedia** in a terminal of IDE and Then the respective documentation of this library get started download. The Purpose of this library is to search the respective information on Wikipedia with respect to input given by user.

4] PyAutoGUI

For installation process for this python library we have to write **pip install pyAutoGUI** in a terminal of IDE and Then the respective documentation of this library get started download,. The Purpose of this library is to take screenshorts and recording screen.

5] PyWhattkit

For installation process for this python library we have to write **pip install pyWhattkit** in a terminal of IDE and Then the respective documentation of this library get started download,. The Purpose of this library is to play the videos on youtube and the search information over the search engine google.

6] PyJokes

For installation process for this python library we have to write **pip install pyJokes** in a terminal of IDE and Then the respective documentation of this library get started download,. The Purpose of this library is to convert the text into speech.

Conclusion

In this paper "Virtual Assistant Using Python" we discussed the design and implementation of Digital Assistance. The project is built using open source software modules with VSCode backing which can accommodate any updates shortly. The modular nature of this project makes it more flexible and easy to add additional features without disturbing current system functionalities. It not only works on human commands but also give responses to the user based on the query being asked or the words spoken by the user such as opening tasks and operations. It is greeting the user the way the user feels more comfortable and feels free to interact with the voice assistant. The application should also eliminate any kind of unnecessary manual work required in the user life of performing every task. The entire system works on the verbal input rather than the next one.

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