SPEECH RECOGNITION USING PYTHON

A PROJECT REPORT

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BONAFIDE CERTIFICATE

Certified that this project report titled "**SPEECH RECOGNITION USING PYTHON"** is the bonafide work of "**ANUSHKA KHARE-19BCE10273, ADITI NIGAM-19BCE10300, LAVEENA DUDANI-19BCE10378, DIVYA MATHEW -19BCE10456"** who carried out the project work under my supervision. Certified further that to the best of my knowledge the work reported here does not form part Of any other project / research work on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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The Project Exhibition I Examination is held on

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I would like to thank my internal guide Dr. Chandan Kumar Behera, for continually guiding and actively participating in my project, giving valuable suggestions to complete the project work.

I would like to thank all the technical and teaching staff of the School of Computer Science, who extended directly or indirectly all support.

Last, but not the least, I am deeply indebted to my parents who have been the greatest support while I worked day and night for the project to make it a success.

LIST OF ABBREVIATIONS

S.NO	ABBREVIATIONS	FULL FORM
1	VIT	Vellore Institute Of Technology
2	SCSE	School Of Computer Science Engineering
3	GUI	Graphical User Interface
4	HMM	Hidden Markov Model
5	STT	Speech To Text
6	TTS	Text To Speech
7	GTTS	Google Text To Speech
8	PIP	Preferred Installer Program
9	OS	Operating System

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ABSTRACT

Speech recognition is the process by which a computer (or other type of machine) identifies spoken words. Basically, it means talking to your computer, AND having it correctly recognizes what you are saying. Incorporating python with speech recognition is highly synergetic and offers immense approachability. The project uses the speech recognition technology by taking the input in speech format and giving the output in text format. VIT Directory contains the phone number and e-mail id of each faculty and staff working in VIT Bhopal.

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INTRODUCTION

1.1 INTRODUCTION

Speech recognition is the ability of a machine or program to identify words and phrases in spoken language and convert them to a machine-readable format.

1.2 MOTIVATION FOR THE WORK

To further pursue our interest in the field of python and its application, and helping our fellow colleagues regarding the problem they face while searching a teacher for assistance. We decided to prepare a VIT Directory which aims to ease their trouble while looking for a teacher.

1.3 OBJECTIVE OF THE WORK

This project focuses on the following points:

- To understand the speech recognition and its fundamentals
- Its working and applications in different areas
- Implementation of VIT directory through speech recognition

LITERATURE REVIEW

2.1 INTRODUCTION

Speech recognition started somewhere in 1940s.

Practically the first speech recognition program was appeared in 1952 at the bell labs, that was about recognition of a digit in a noise free environment.

1940s and 1950s consider as the foundational period of the speech recognition technology, where work was done on the foundational paradigms of the speech recognition that is automation and information theoretic models.

In the 1960's we were able to recognize small vocabularies (order of 10-100 words) of isolated words, based on simple acoustic-phonetic properties of speech sounds.

In 1970s the medium vocabularies (order of 100-1000 words) using simple pattern recognition methods were recognized.

In 1980s large vocabularies (1000-unlimited) were used and speech recognition problems based on statistical and handling language structures.

The key invention of this era was hidden markov model (HMM) and the stochastic language model, which together continuous speech recognition enabled powerful new methods for handling problem efficiently and with high performance.

In 1990s the key technologies developed were the methods for statistical learning of acoustic and language models, and the methods for implementation of large vocabulary speech understanding systems.

It was only in 1997 that the world's first "continuous speech recognizer" (ie. one no longer had to pause between each word) was released, in the form of Dragon's NaturallySpeaking software.

After the five decades of research, the speech recognition technology has finally entered marketplace, benefiting the users in variety of ways.

2.2 RESEARCH WORK DONE BY PEOPLE

- Thiang, et al. (2011) presented speech recognition using for controlling movement of mobile robot. Input signals were sampled directly from the microphone.

- Ms. Vimala. C and Dr. V. Radha (2012) proposed speaker independent isolated speech recognition system for Tamil language.

- Cini Kurian and Kannan Balakrishnan (2012) found development and evaluation of different acoustic models for Malayalam continuous speech recognition.

- Annu Choudhary et al. (2013) proposed an automatic speech recognition system for isolated and connected words of Hindi language.

- Md. Akkas Ali et al. (2013) presented automatic speech recognition technique for Bangla words.

- Jitendra Singh Pokhariya and Dr. Sanjay Mathur (2014) introduced Sanskrit speech Recognition.

PROJECT PROCEDURE

3.1 VIT DIRECTORY

This program uses the speech recognition technology for taking the input in speech format (faculty name) and giving the output in text format which contains the phone number, e-mail Id and cabin number of each faculty and staff working in VIT Bhopal.

3.2 A BRIEF OF PROPOSED APPROACH

- **Text to Speech** - A Program that takes in put in text form and converts it into speech form.
- **Speech to Text (Audio File)** - A Program that takes input in speech form and converts it into text from using audio file.
- **Speech to Text (Microphone)** - A Program that takes input in speech form and converts it into text from using microphone.
- **Virtual Assistance** - This program is capable of performing all operations (STT, TTS) in a single program.

3.3 METHODOGY

- **Acoustic Front-**

  With the help of microphone audio is input the system. The pc sound card produces the equivalent digital representation of received audio. Acoustic model is responsible for signal process and feature extraction.

- **Acoustic Model-**

  An acoustic model is created by taking audio recordings of speech, and their text transcriptions, and using software to create statistical representation of the sound that make up each word.

- **Language Model-**

  Language model in speech recognition tries to capture the properties of a Language.

- **Lexicon -**

  Lexicon is responsible for the pronunciation of the words.

- **Decoder-**

  Decoder predicts the next word in speech sequence. At the end, sentence is\ given as output.

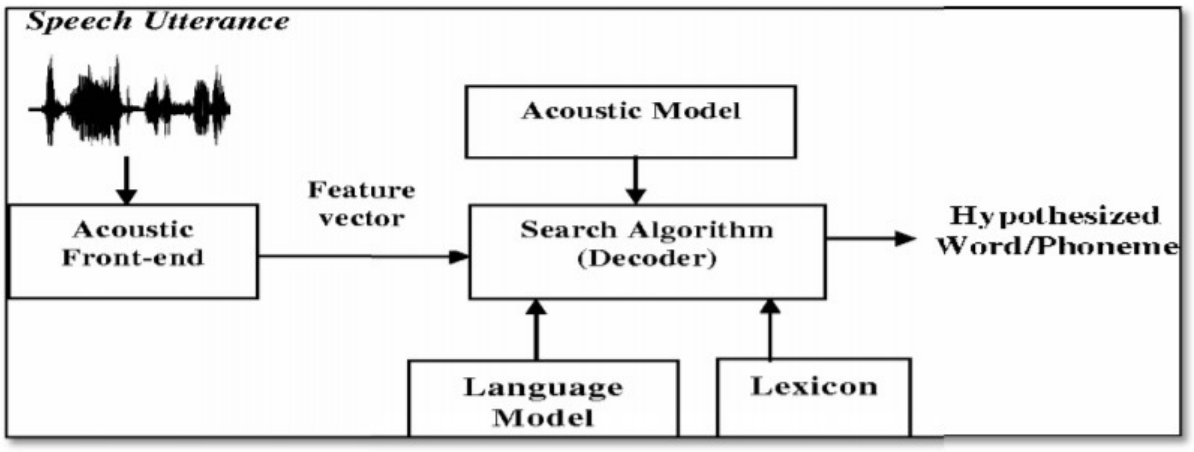

Figure 1: Methodology of speech recognition

3.4 HARDWARE REQUIREMENTS

- **SOUND CARDS**
  - I. High quality 16 bit sound card (min.)
  - II. Proper driver installed
  - III. Clear signals

- **MICROPHONES** (desktop microphones shouldn't be used)
  - I. Headsets – with or without earphones (mono or stereo).

- **COMPUTER / PROCESSORS**
  - I. Dependent on processing speed (large amount of digital filtering and signal processing takes place).

3.5 SOFTWARE REQUIREMENTS

This is a Python based program therefore; we need to have PYTHON APPLICATION installed in our system.

Included libraries are: -

- **Speech Recognition:**
  - I. This library converts spoken words into text.
  - II. Installation command – pip install SpeechRecognition

- **gtts (Google text to speech)**
  - I. This library converts the entered text into audio form.
  - II. Installation command – pip install gtts

- **Pyaudio**

  I. This library is used to recognize & record the speech uttered by the user

  II. Installation command – pip install pyaudio

- **Port Audio**

  I. This library is used to implement the recorded speech from the user.

  II. Installation command – pip install port audio

- **Wikipedia**

  I. This library is used to give information to the user as asked.

  II. Installation command – pip install Wikipedia

3.6 ADVANTAGES OF SPEECH RECOGNITION

1. Dictation Ability

- Now-a-days, we can easily create documents by speaking.
- Speech recognition enables us to create documents much faster, because as soon as we utter word, the software produces the word quickly.

2. Invaluable Contributions To Organizations

- Use of speech recognition technology, enriches customer experience and reduces organizational costs.
- Customers can input information such as name, account no. , the reason for their call, etc. without interacting with a live agent.

3. Speech recognition also encourages a human-like conversation that creates bloated amounts of interactions with customers.

4. Also, through speech recognition we can save agents for more critically important tasks.

WORK DONE, OBSERVARTION AND RESULT

4.1 TEXT TO SPEECH

```
from gtts import gTTS
import os

fh = open("test.txt", "r")
myText = fh.read().replace("\n"," ")

language = 'en'

output = gTTS(text=myText, lang=language, slow=False)

output.save("output.mp3")
fh.close()
os.system("start output.mp3")
```

4.2 SPEECH TO TEXT (AUDIO FILE)

```
import speech_recognition as sr
AUDIO_FILE=("hello.wav") #name of audio file=hello
r=sr.Recognizer()
with sr.AudioFile(AUDIO_FILE) as source:
    audio=r.record(source)
    try:
    print("audio file contains \n"+r.recognize_google(audio))
except sr.UnknownValueError:
    print("Google Speech Recognition could not understand audio")
except sr.RequestError:
    print("couldn't get the result from google speech recognition")
```

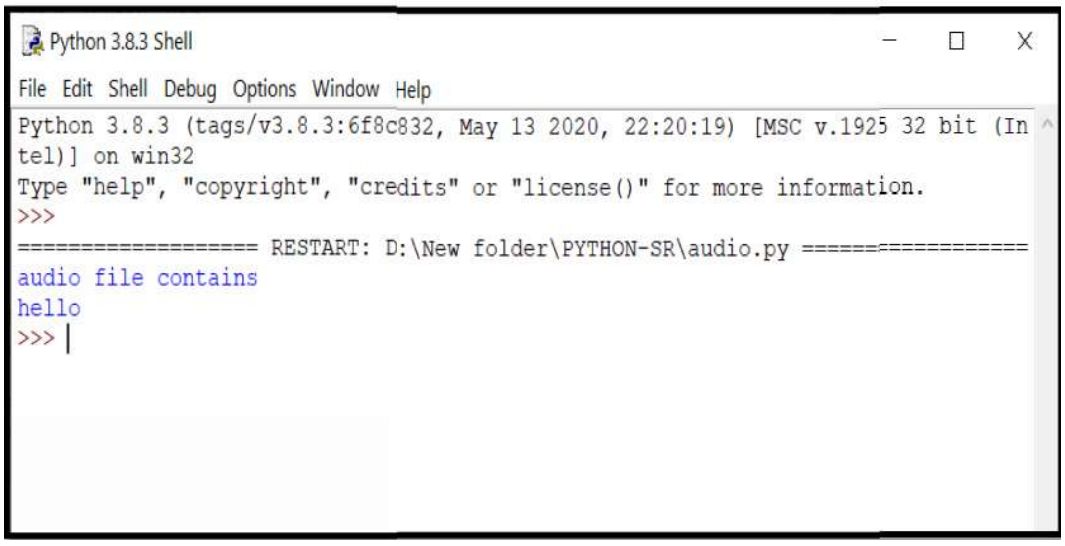

Figure 2: Output Window of Speech to Text (Audio File)

4.3 SPEECH TO TEXT (MICROPHONE)

```
import speech_recognition as sr

r = sr.Recognizer()

with sr.Microphone() as source:

    print('speak something : ')
     audio = r.listen(source)

  try:

        text = r.recognize_google(audio)

       print('you said : {}'.format(text))

    except:

       print('sorry could not recognize your voice')
```

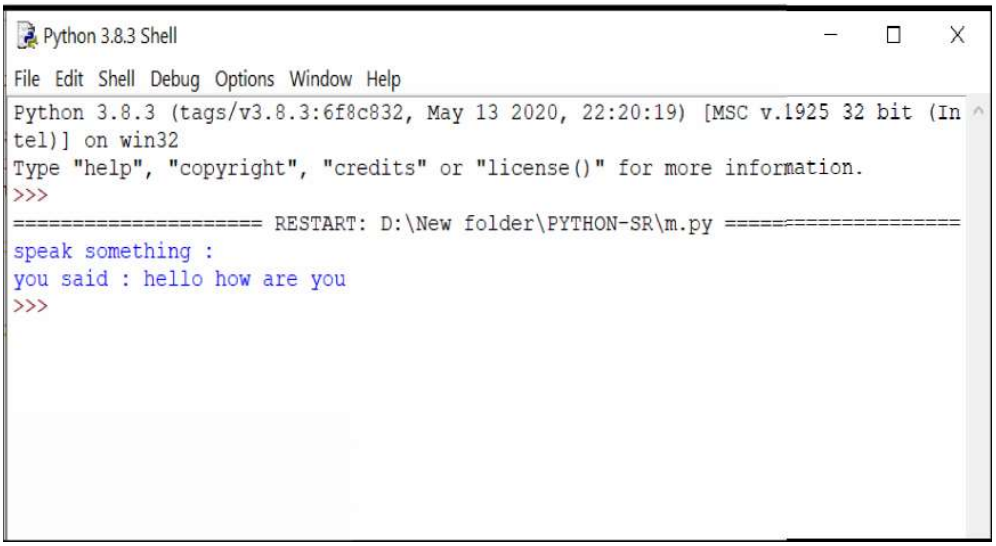

Figure 3: Output Window of Speech to Text (Microphone)

4.4 VIT Directory

4.4.1 VIT Directory GUI

```
import tkinter as tk
window=tk.Tk()
window.geometry("300x400")
window.configure(bg="#98AFC7")
window.title("Welcome to VIT Directory")
canvas =tk.Canvas(window, width=1000, height = 150)
canvas.pack()
img = tk.PhotoImage(file="C:/Users/hp/Desktop/images (1).png")
canvas.create_image(150,80,image=img)
greeting = tk.Label(text="VIT DIRECTORY", bg = "blue", fg = "white", width = 18,  font =("Arial bold", 20))
greeting.pack()
speak = tk.Label(text="YOU SPOKE :", bg = "black", fg = "white", width = 18,  font =("Arial bold", 15))
speak.pack()
msg=tk.Message(window,text="  ", font =("Arial", 10))
msg.pack()
details = tk.Label(text="DETAILS :", bg = "black", fg = "white", width = 18,  font =("Arial bold", 15))
details.pack()
msg1=tk.Message(window,text="  ", font =("Arial", 10))
msg1.pack()
window.mainloop()
```

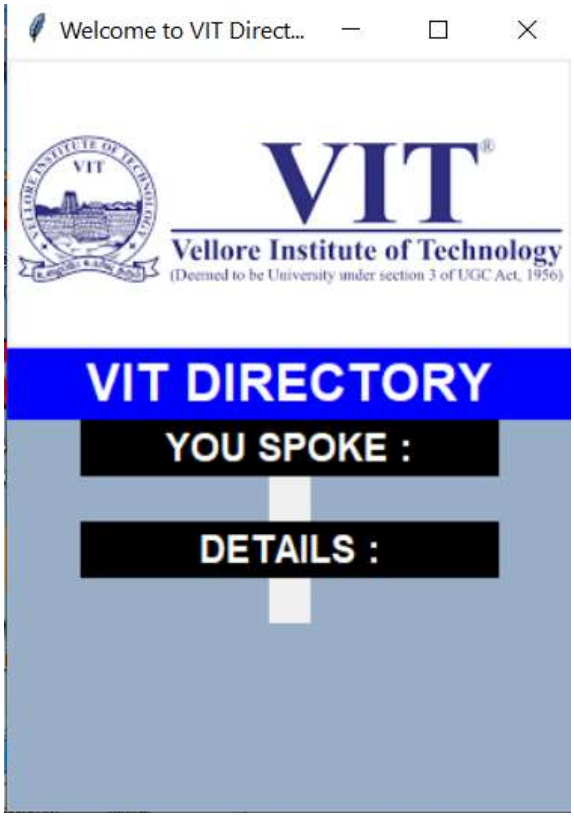

Figure 4: GUI of VIT Directory

4.4.2 VIT DIRECTORY

```
import tkinter as tk
window=tk.Tk()
window.geometry("300x400")
window.configure(bg="#98AFC7")
window.title("Welcome to VIT Directory")
canvas =tk.Canvas(window, width=1000, height = 150)
canvas.pack()
img = tk.PhotoImage(file="C:/Users/hp/Desktop/images (1).png")
canvas.create_image(150,80,image=img)
greeting = tk.Label(text="VIT DIRECTORY", bg = "blue", fg = "white", width = 18,  font =("Arial bold", 20))
greeting.pack()
people = ['A. Sampath Kumar', 'Abhay Vidyarthi', 'Abhishek Verma', 'Amita Mahor', 'Amrut Shrikant Mulay', 'Anand Motwani', 'Anant Kant Shukla', 'Anirban Bhowmick', 'Anita Yadav', 'Ankur
```

Beohar', 'Ashish Kumar Sahu', 'Ashish Tripathi', 'Baseera A.', 'Bhakti Parashar', 'Bhumika Girishkumar Choksi', 'Chandan Kumar Behera', 'Charles Richard', 'Deepika Masand', 'Divya Haridas', 'Druv Sharma','Duggineni Karthik' , 'g l Balaji', 'H. Azath', 'Harihara Padhy', 'J. Amuthavel', 'Jitendra Kumar Tandelkar', 'K. Venkatachalam ', 'Kanchanlata Kashyap', 'Krishna Kumar', 'L. Shakkeera' , 'M. Dinesh Babu', 'Maheswar R', 'Mamta Agrawal', 'Manas Kumar Mishra', 'Manikandan Kalimuthu', 'Manoj Acharya', 'Mayank Gupta', 'Muneeswaran V.', 'Nageswara Guptha M.', 'Neha Choubey', 'Nella Anveshkumar', 'Nilamadhab Mishra', 'Pallabi Sarkar', 'Paras Jain', 'Pon Harshavardhanan', 'Pradeep Kumar Kayshap', 'Praveen Lalwani', 'Pritesh Vishwasrao Bansod', 'Priyanka Singh', 'Pushpdant Jain', 'Pushpindra Singh', 'Rahul Kottath', 'Reena Jain', 'Ribu Mathew', 'Roja Rani Ilka', 'Sandip Mal ', 'Saravanan J.', 'Sathish Kumar R', 'Sharad Chandra Tripathi', 'Shince V Joseph', 'Shishir K Shandilya', 'Shriram R.', 'Shubhash Chandra Patel', 'Sounthar Rajan', 'Suganya E.', 'Sumit Mittal', 'Suresh Dara', 'Tushar Choudhary', 'V. Pandimurugan', 'Venkat Prasad Padhya', 'Venkatesh T.', 'Vinod Bhatt', 'Virendra Kushwah', 'Y. Sharmasth Vali', 'Yogesh Shukla']
phoneNumbers = ['9894721222', '8765773284', '7586852491', '9425019572', '8830091723', '9894512300', '9345522103', '9547155428', '9977588551', '9893383443', '9506347438', '7579287442', '9698960667', '9826722177', '7016527953', '8847872575', '7708342512', '9425602587', '9930594727', '8535034245', '8124709555', '7974537024', '8120008102', '9668780860', '9597788658', '9406784831', '8610569054', '9826733258', '7584826299', '9701336323', '6380043405', '9655212300', '9425027637', '9956250356', '9952387877', '9131096990', '7722993939', '9842541667', '9843255706', '9713606045', '9503132874', '9437169510', '6294524861', '9963023330', '9937704985', '9389634514', '8087181373', '9933979757', '8765330670', '6301800673', '9893273243', '8591515682', '8989982847', '9003397713', '7987253273', '9583085832', '9047240141', '7667281338', '7697867027', '9938165145', '9009972032', '7358194673', '7905407827', '9786066776', '9884970535', '9318325748', '9007400537', '9752005705', '8249897681', '8310597038', '7747973581', '9826143220', '7415869616', '9557404420', '9479877102']

email = ['sampath.kumar@vitbhopal.ac.in', 'abhay.vidyarthi@vitbhopal.ac.in', 'abhishek.verma@vitbhopal.ac.in', 'amita.mahor@vitbhopal.ac.in', 'amrut.shrikant@vitbhopal.ac.in', 'anand.motwani@vitbhopal.ac.in ', 'anantkant.shukla@vitbhopal.ac.in', 'anirban.bhowmick@vitbhopal.ac.in', 'anita.yadav@vitbhopal.ac.in', 'ankur.beohae@vitbhopal.ac.in', 'ashish.kumar@vitbhopal.ac.in', 'ashish.tripathi@vitbhopal.ac.in', 'baseera.a@vitbhopal.ac.in', 'bhakti.parashar@vitbhopal.ac.in', 'bhumika.choksi@vitbhopal.ac.in', 'chandank.behera@vitbhopal.ac.in', 'charles.richard@vitbhopal.ac.in',

```
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'suresh.dara@vitbhopal.ac.in', 'tushar.choudhary@vitbhopal.ac.in', 'pandi.murugan@vitbhopal.ac.in',
'venkat.prasad@vitbhopal.ac.in', 'venkatesh.t@vitbhopal.ac.in', 'vinod.bhatt@vitbhopal.ac.in',
'virendra.kushwah@vitbhopal.ac.in', 'sharmasth.vali@ithopalac.in ',
'yogesh.shukla@vitbhopal.ac.in']

def record():
  import speech_recognition as sr
  r = sr.Recognizer()
  with sr.Microphone() as source:
    print('SPEAK THE NAME OF THE FACULTY TO GET THE DETAILS: ')
    audio = r.listen(source)
    try:
        text = r.recognize_google(audio)
        print('you said : {}'.format(text))
        a = format(text)
```

```
        return(a)
    except:
        a='sorry could not recognize your voice'
        return(a)
a=record()
speak = tk.Label(text="YOU SPOKE :", bg = "black", fg = "white", width = 18,  font =("Arial bold",
15))
speak.pack()
msg=tk.Message(window,text=a, font =("Arial", 10))
msg.pack()
found = False
index = 0
while found == False and index < len(people):
        if people[index] == a:
          found = True
        else:
            index = index + 1
if found:
        print ('PHONE NUMBER : ',phoneNumbers[index],'\nE-mail : ' ,email[index])
else:
        print ('that name was not found')
b=a+"\n"+phoneNumbers[index]+"\n"+email[index]
details = tk.Label(text="DETAILS :", bg = "black", fg = "white", width = 18,  font =("Arial bold",
15))
details.pack()
msg1=tk.Message(window,text=b, font =("Arial", 10))
msg1.pack()
from gtts import gTTS
import os
language = 'en'
output = gTTS(text=b, lang=language, slow=False)
output.save("sound.mp3")
os.system("start sound.mp3")
window.mainloop()
```

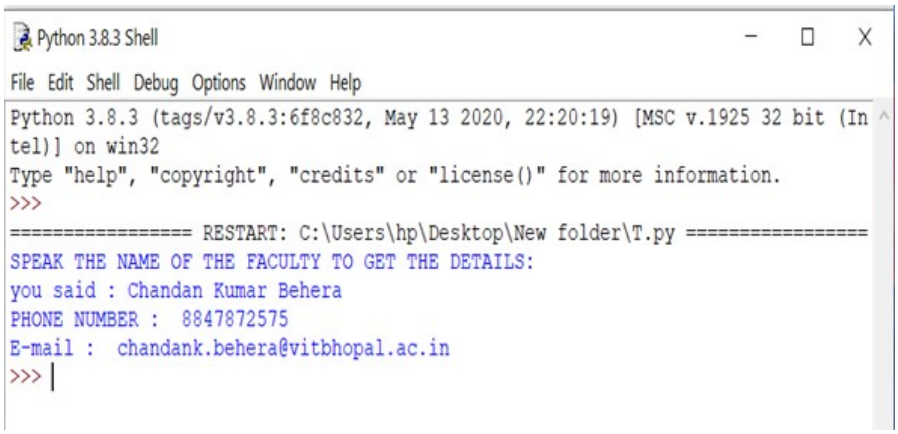

Figure 5: Output Window of VIT Directory

Figure 5: VIT DIRECTORY

4.4.3 VIT DIRECTORY UML DIAGRAM

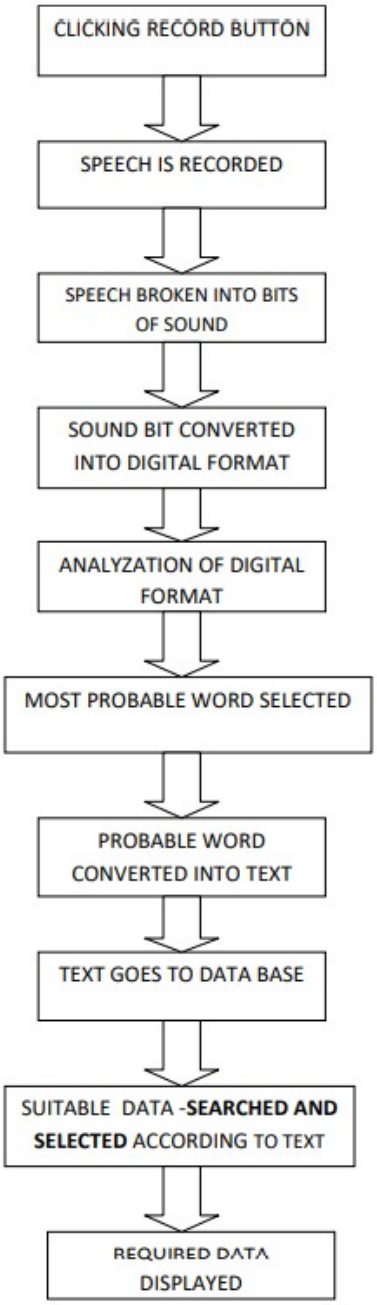

Figure 6: UML Diagram of VIT Directory

4.4.4 VIT DIRECTORY ADVANTAGES

- **Fast Consultancy**
  Through this program students can

- **Personal Support**
  Students can get personnel assistance with their concerned teacher

- **Better Understanding**
  Doubt clearance and submission of various assignments will become much easier.

- **Saves Time**
  This program will save the time of a student to search for a student.

FUTURE ENHANCEMENT AND CONCLUSION

5.1 LIMITATIONS OF EXISTING WORK

- **Lack of Accuracy & Misinterpretation:**
  - I. Speech Recognition programs cannot understand the context of language which often leads to misinterpretations.
  - II. Speech recognition program decodes the speech and give it a meaning which may not be always accurate. For example, it cannot always differentiate between homonyms, such as "their" and "there".
  - III. It may also have problems with slang, accents, technical words, acronyms. Style of speaking, voice change (due to cough, cold or throat problem) and language constraints.

- **Time Costs & Productivity:**
  - I. Speech recognition programs may not always speed up our work and we may have to invest more time than expected in any process.
  - II. Some programs adapt to our voice and speech patterns over time; this may slow down our workflow until the program is up to speed.
  - III. Getting used to using a system's commands and speaking punctuation out loud is not always easy. This can affect the flow and speed of our speech.

- **Background Noise Interference:**

  I. To get the best out of speech recognition program, we need to have a quiet environment such as an isolated room.

  II. The program may not be able to differentiate between your speech and other ambient noise, leading to transcription mix-ups and errors.

- **Physical Side Effects:**

  I. If we use voice recognition technology frequently, you may experience some physical discomfort and vocal problems.

  II. Talking for extended periods can cause hoarseness, dry mouth, muscle fatigue, temporary loss of voice and vocal strain.

5.2 FUTURE SCOPE OF SPEECH RECOGNITION -

There are yet miles to achieve the true potential of speech recognition technology. This implies to both i.e. increment in refinement of the technology and decrement in its naivety.

As we look into the near future, we can contemplate and visualise how interaction all around the globe will change. Also,Amazon's of concept of "ambient computing" seems quite apt.

Voice is becoming an interface of its own, moving beyond the smartphone to the home and soon, to many other quotidian contexts.The time is not far away when Apple and

Google will assimilate their AR and VR applications with the required level of consumer appetite.

Speech recognition technology provides the platform for us to communicate credibly, but it is up to marketers to make the relationship with their audience mutually beneficial.

5.3 CONCLUSION

- This report started with a brief introduction of speech recognition including the objectives and brief of existing work.
- Later we discussed about our proposed work which consisted of our proposed approach on VIT DIRECTORY and the methodology used.
- We also discussed the software hardware used for bringing the idea into practical work and its advantages.
- A detailed explanation of how speech recognition works on VIT DIRECTORY was given through python codes, a UML diagram and GUI of our program.
- At last, we have concluded with the limitations of our work and scope of speech recognition in future.

Speech recognition if implemented properly can ease human lifestyle. For some disabled people who might struggle, or find it impossible, to work with the mouse or keyboard, speech recognition enables a world of productive possibilities. It can free people from typing and keyboard use, helping those with physical impairments and reducing the risk of repetitive strain injury from excessive typing or mouse use.

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