A communication aid application for the physically handicapped

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Abstract - *The project mainly deals on application which helps the physical challenged people to communicate between them and the common people. Communications between deaf-mute and a normal person have always been a challenging task. This application describes a way to reduce barrier of communication by developing an assistive application for deaf-mute persons. The advancement in modern systems, provides a space to develop a sign language translator system to assist the dumb people, there exist a number of assistant tools. Some example of screen readers are Apple VoiceOver, Google TalkBack and Microsoft Narrator. Our application is provided free of charge on all devices. Voice-to-text includes the option to provide verbal descriptions to describe what is happening on the screen. As mentioned above, screen readers may rely on the assistance of text-to-speech tools. To use the text-to-speech tools, the documents must in an electronic form, that is uploaded as the digital format.*

Key Words: Communication, Physically Handicapped, Text-to-Speech, Speech-to-Text, Speech-to-Sign Gestures.

1. INTRODUCTION

Conventional means of communication sometimes is not effective when one or more physically handicapped people are the communicators. This may lead to ineffective communication at best to misunderstandings at worst to some people. With the advancements in science and technology with time, there is ample assistive technology which helps the physical challenged people to communicate with each other and normal people. Communications between deaf-mute and a normal person have always been a challenging task. This application describes a way to reduce barrier of communication by developing an assistive application for deaf-mute persons. The advancement in modern systems, provides a space to develop a sign language translator system to assist the dumb people, there exist a number of assistant tools. The last few years have witnessed massive expansion of applications.

Everything is getting digital in this era. In this era of digitization, the area of the communication of the physical challenged people was not wholly digitalized. The general issues for communication with all people with disabilities followed by issues that may be specific to individuals with a variety of disabilities. One of the problems is for the deaf people to communicate via phone calls. Our proposed system is an application which helps in converting the voice directly to text in real time for effective communication. Sign Language is a widely used method of communication among the community of deaf-mute people. It contains some series of body gestures, which enables a person to interact without the need of spoken words. Although the use of sign language is very popular among the deaf-mute people but the other communities don't even try to learn it.

1.1 Relevance of the Paper

Communications between deaf-mute and a normal person have always been a challenging task. This application describes a way to reduce barrier of communication by developing an assistive application for deaf-mute persons. The advancement in modern systems, provides a space to develop a sign language translator system to assist the dumb people, there exist a number of assistant tools. The main objective is to develop a real time embedded application for physically challenged to aid their communication in effective means. The effectiveness of the work is verified under coding environment. A dedicated voice output will be produced corresponding to the text.

1.2 Purpose of Study

With the advancements in science and technology with time, there is ample assistive technology which helps the physical challenged people to communicate with each other and normal people.

This is achieved by making the process of communication digital. This paper aims to help in creating a software that can change the voice to text and text to voice message.

1.3 Objective of the Study

The general objective of the project is to develop a Text-to-speech, Speech-to-Text and Speech-to-Sign Gestures synthesizer for the physically impaired and the vocally disturbed individuals using English language.

The specific objectives are:
1. To enable the deaf and dumb to communicate and contribute to the growth of an organization through synthesized voice.
2. To create modern technology appreciation and awareness by computer operators.

3. To implement an isolated whole word speech synthesizer that is capable of converting text and responding with speech and the sign gestures.

4. To validate the automatic speech synthesizer capabilities during the study

1.4 General Description of the System

A communication aid application is an attempt to create an intuitive mobile application to make work easy, simple and digital. The idea is to design a system by keeping in the mind that physically challenged person have a smartphone with them so that it's easy to use the application anywhere at any time.

The User Interface of the application has to be kept simple and spontaneous with not a lot of effort required to operate it. The application will start with a start-up screen on the device that the user is using and various translation features will be displayed on the start-up screen which the user can select according to their choice.

The features are:

1. Speech-to-Text: This module converts and displays the user's speech into text.

2. Text-to-Speech: This module converts the text into speech and plays the speech.

3. Speech-to-Sign Gestures: This module converts speech into images representing sign language.

1.5 Overview of Data Requirements

Data requirements are described directives or consensual agreements that describe the details and/or structure that establish high quality data instances and values. Data requirements can be specified by several different entities or groups of entities. They may be agreed upon or contrary to each other. However, data requirements are required as a precondition to measure data superiority. Hence, they serve as a standard that defines the anticipated state of data.

The data required is the input that the user is providing, it may be in the form of text or speech. And we need to have the pictures representing the sign language so that the text or speech can be compared to the pictures and then the same will be displayed to the users.

1.6 Python

Python is a general-purpose inferred, collaborative, high-level programming language. Guido van Rossum created Python during 1985- 1990. Python source code is available under the GNU General Public License (GPL). Python is one of those rarest languages which can say that it is both simple and powerful. You will find yourself pleasantly surprised to see how easy it is to get the solution to the problem rather than the syntax and structure of the language you are programming on or in. It has efficient high-level data structures and a simple but robust approach to object-oriented programming. Python's simple syntax and dynamically typed, together with its interpretation feature makes it best language for scripting and application development in different domains on most platforms. The libraries of Python for the database are compatible with other databases as well. It is platform independent

2. Proposed System

The proposed system is an application which helps in communication aid. The features to be included are speech to text transformation, text to speech transformation and text to sign gestures transformation.

The user can choose to use one of the following depending on their needs:

1. Start-up Screen: This module displays the various translation features of the application.
2. Speech-to-Text: This module converts and displays the user's speech into text.
3. Text-to-Speech: This module converts the text into speech and plays the speech.
4. Speech-to-Sign Gestures: This module converts Speech into images representing sign language.

The proposed system will start with the main startup screen, where the user is given the available options to choose his desired conversion type. Then when the user clicks on the desired option, he/she is asked to provide the input in appropriate format. When the input is provided then it gets converted using the imported APIs and finally into the desired output.

The APIs used are Speech Recognition and Voice Synthesizer.

1. Speech Recognition API is used to convert the speech into textual format.
2. Voice Synthesizer is used to convert the passed text into an audible speech which can listened.
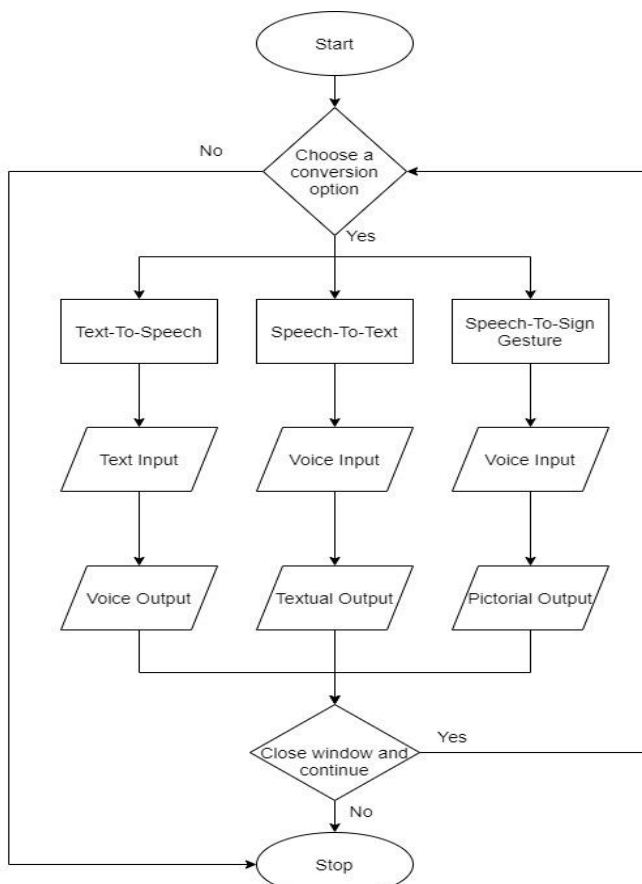
Fig–1 Flowchart of proposed system

3. Methodology

The models provide four basic types of functionalities, that is, create, read, update, and delete the resources. This is often referred to as CRUD by computer scientists. A model should have the ability to perform all these four functions in order to be complete. If an action cannot be described by one of these four operations, then it should be contained in a model of its own. We mainly make use of the model to read and display the correct data to our users.

We use python to build the functionality of the application and graphics user interface (GUI). We store the application data in the device itself which can be deleted later as required. Making use of the data stored we can show the desired output to our users. We make use of different libraries of Python, like Tkinter, PIL, PySimpleGUI and Google's api gTTS to build the application.

1. First, the layout of the system is made by using PySimpleGUI.
2. Then, the various other modules are made using PySimpleGUI and connected with each other using Tkinter.
3. User input is taken and supplied to gTTS using Python.
4. Using PIL, we make use of the Sign Gestures images to be used in the application.

5. User output is shown in windows made using PySimpleGUI and Tkinter

4. Example Case

The following diagram depicts the use case of the application. The use case diagram is for the user where he chooses a conversion option. Once the option is chosen an input is provided by the user. Conversion option uses <<include>> to add the functionality it is supposed to perform. The APIs then generates the conversion then it is provided in proper format as an outcome. Then the output acts as a source of communication to the handicapped person.
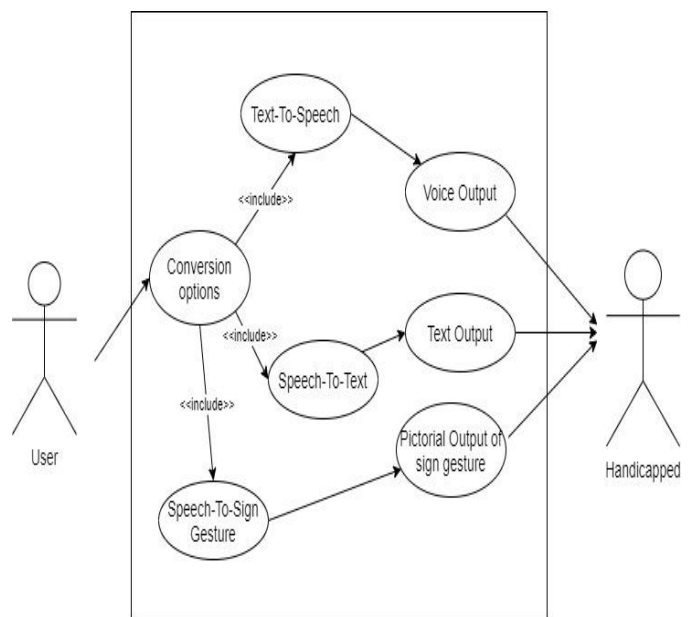

Fig-2 Example Case Diagram

Above diagram shows that how a user can interact with the GUI of the system. It also shows that how a handicapped person can participate in the interactions with the user through the application.

5. Results

In the preliminary build of the application, the main screen window opens up and displays several options. Then, the user should either choose one of the options by clicking on them or user can decide to exit the application by directly closing the window by clicking on the close window button at the top right corner. The application is made on Python using PySimpleGUI module as well as tkinter.
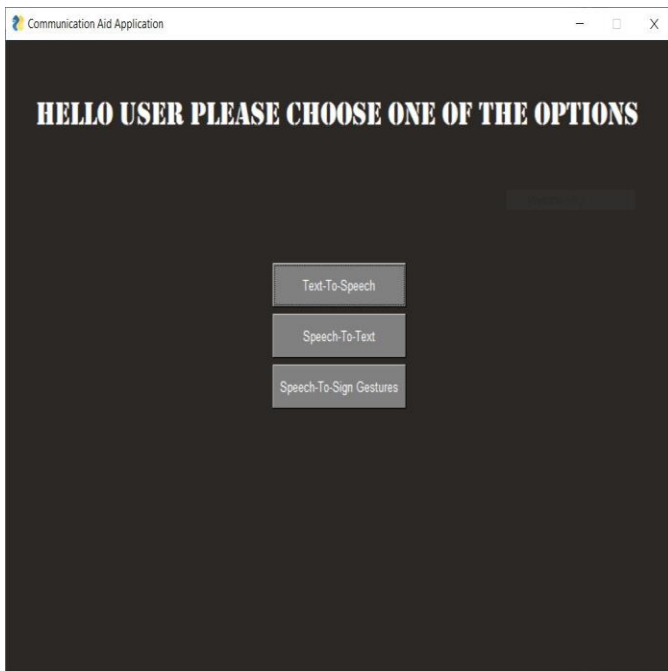
Fig-3 Home Screen

The above image shows the very first screen that will be displayed as soon as the code is executed. Here the user is given options, where he can choose one of the follow options:

1. Text-to-speech
2. Speech-To-Text
3. Speech-To-Sign Gestures

The above options can be selected by simply clicking on them as they are made as buttons.

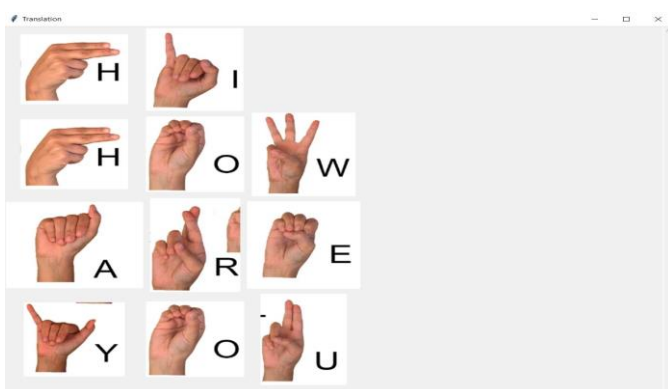An example of the Speech-To-Gesture's module is show below:

Fig-4 Speech-To-Sign Gestures Output

After the audio input is given by the user the above screen pops up and the audio which was passed is displayed in pictorial format. After the converted audio has been understood, the user can close the output window and reuse the selected conversion option or he can simply close the window to exit into startup window.

6. CONCLUSIONS

The expected output for the proposed system is the smooth transition of speech to text or text to speech or speech to sign gestures in real time enabling the smooth and easy communication between the users. The project was made to enable easy and hassle-free communication between normal users and physically handicapped users. The main focus of the application is to provide an all-in-one application which can be used by a large number of normal users in order to communicate properly with most cases of physically handicapped users.

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