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Language Learning Device for Blind People

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Abstract: In today's world, humans exchange information mainly through books or some digital media, which have everything written or printed on them. But to access these sources, a person mainly needs to have vision. However, for people who are deprived of vision, gathering information is mainly done by listening. To process the speech for a huge range of applications, continuous efforts have been taken. Speech recognition and its conversion to text has been extremely useful in many applications. In the field of electronics and computers, speech is not used much due to its complexity and variation in accents of the individual. However, with the help of complex algorithms and methods we can process speech signals to convert to text. This paper deals with the translation of speech from one language to another language using Raspberry Pi. This application is quite useful for Blind people. The code for the application program is written using Python programming language and embedded in Raspberry Pi. This application developed of conversion of speech from one language to another language can be the most useful and flexible approach.

Keywords: Language Learning for Blind**,** Foreign Language Learning, Speech Recognition, Speech to text display, Raspberry Pi.

I. INTRODUCTION

Today, learning different languages or being multilingual is very much necessary. There is a huge amount of resources available for learning various languages such as books, mobile-based applications, etc. which are all available either in printed or visual format. But, Visually impaired people report numerous difficulties while accessing the existing technology which is available mostly in printed form. Thus, it has become essential that technologies that interact with the users in their own language to be developed. Such a technology is called Human Computer Interaction (HCI). Thus we present a smart device that assists the visually impaired with a very effective and efficient method for learning a new language or getting their speech translated into the desired language. There are few HCI devices/techniques which have drastically changed our living habits such as computers, consumer electronics, mobile devices, etc. One of the major considerations which has become while selecting a device is the ease with which an HCI device or technique is understood and operated by users. These HCI devices are very much user-friendly as they enable the user to give the desired commands without having to learn the complex programming languages. In today's world, there aren't many opportunities for blind people in any of the fields. Learning a new language with such HCI devices will provide blind people with a lot of new job opportunities.

II. BLOCK DIAGRAM

Fig. 1 refers to the block diagram of our proposed method. Raspberry Pi is the basic framework of our proposed project. Raspberry Pi works as a single board computer which has an Ethernet port for internet connection, 4 USB ports, microSD card slot, audio jack, an HDMI Slot, and a 5V micro USB connector which is used for power supply. The 5V micro USB connector is given the power supply through the Switched Mode Power Supply (SMPS) of Raspberry Pi which converts the 230V AC supply to 5V DC. The USB port of Raspberry Pi is connected to the microphone. The basic interface between the Raspberry PI module and the developer is provided through an operating system named RASPBIAN which is loaded in Raspberry Pi.

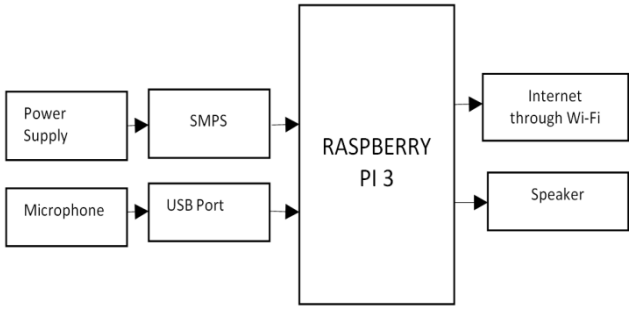

Fig 1. Block Diagram of Proposed Method

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The audio jack of the Raspberry Pi is used to give the audio output. An audio amplifier is used to amplify this converted speech output. Wi-Fi adapters in the Raspberry Pi module enables it to be connected with a Wi-Fi network.

II. FLOW OF PROCESS

The input in the source language is taken by the device in speech format through the microphone. The recognised speech is then converted into a string (text format) using the Speech Recognition module. The string is then translated to the desired language using Python multi-lingual libraries and stored as a string. The translated string is converted back to speech using the Text-To-Speech libraries and the Speech (audio) output is generated and given out through the speakers.

III. SOFTWARE SPECIFICATIONS

Operating system: Raspbian (Debian)

Platform: OpenCV (Linux-library)

Language: Python 3.6

Libraries and Modules: Speech Recognition,

Text-to-Speech Modules,

Multilingual Libraries,

PyAudio,

Mixer

The proposed project is being executed on Raspberry Pi with the help of Raspbian which is a Debian based operating system. The algorithms of the project are written in Python which is a scripting language. OpenCV library is used from where the functions used in algorithms are called. OpenCV (Open Source Computer Vision) is a library of programming functions written in languages like C and C++ and runs under various operating systems like Linux, Windows and Mac OS X mainly aimed at real-time computer vision, and it includes factory product inspection, camera calibration, medical imaging, security, stereo vision, user interface, and robotics.

V. HARDWAREIMPLEMENTATION

The hardware setup of our proposed project consists of a raspberry pi board interfaced with USB microphone and speakers. The system is connected to a Wi-Fi network which provides internet access. A power cable is used to give a 5V supply to the Raspberry pi.

Fig.2 : Hardware Setup

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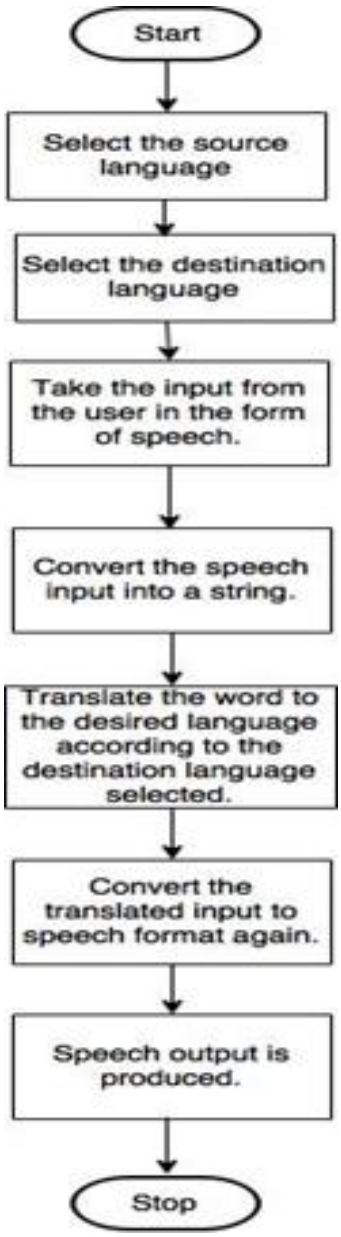
VI. FLOWCHART



VII. RESULT

The results obtained from the procedure described above by connecting Raspberry Pi with the laptop are indicated in the following figures. Figure 3 indicates the setup of Raspberry Pi connected with a laptop. Figure 4 indicates the result of the whole procedure. The performance of our system has been found to be fulfilling expectations. The input speech has been converted into another language speech and the same is displayed with great consistency. Figure 5 displays the screen consisting of the audio files generated through the whole procedure.

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Fig 3.Setup with Laptop Screen

Fig 4.Display of Speech Translation Output

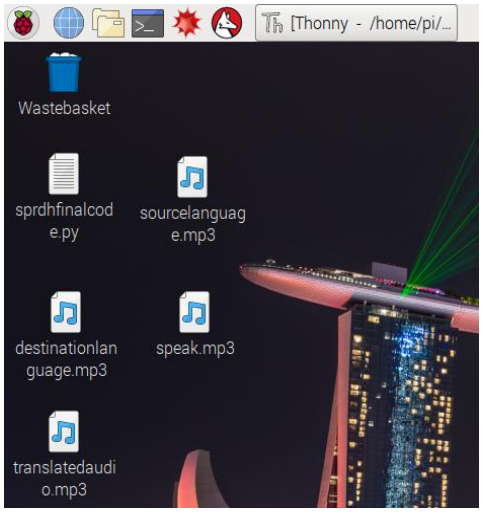

Fig 5.Generation of Audio Files

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VIII. CONCLUSION

Thus, using Raspberry Pi we have implemented a speech to speech translation technique. The simulation results have been successfully verified for various samples. Our algorithm successfully processes the speech input to the desired speech output. We have applied our algorithm on inputs in various languages and found that it successfully translates the given input to the desired language output. This is a very economical, effective as well as efficient device for those visually challenged. The device is compact and very helpful to the society.

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