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Speech to Braille Conversion Using Python

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ABSTRACT—This project, titled "Speech to Braille Conversion for Visually Impaired," aims to enable visually impaired individuals to convert speech into braille script effortlessly. By utilizing Python packages and libraries, the system converts spoken words into text and further transforms the extracted text into braille script. This innovative approach is intended to assist blind individuals in accessing and comprehending various forms of data that are not available in braille. Braille, a tactile reading and writing system, relies on raised dots to represent letters of the alphabet. The proposed system seeks to enhance communication and understanding for the visually disabled, making their interaction with the community less complex and more effective. By implementing speech to braille conversion, this project has the potential to benefit approximately 39 million blind people and 15 million visually and hearing-impaired individuals.

I. INTRODUCTION

In our rapidly advancing society, where technology has made lives easier, it is crucial not to leave behind individuals with disabilities. This project specifically focuses on visually impaired individuals and aims to improve their quality of life. Due to the scarcity of braille-printed reading materials, visually impaired individuals face significant challenges in accessing facilities and opportunities available to others. As a result, they often struggle to reach their full potential and contribute their skills to the world. To address this issue, we propose a system that converts speech to braille, providing a solution for visually impaired individuals. This system utilizes the Python speech recognition package to convert spoken words into text, which is then transformed into braille script.

Braille, primarily used by blind or deafblind individuals for reading and writing, employs a system of raised dots that represent letters of the alphabet. It serves as a widespread means of communication for the visually disabled, enabling them to lead independent lives without unnecessary obstacles. The knowledge of braille empowers individuals and opens up equal opportunities and intellectual freedom.

1.1 PROBLEM STATEMENT

The objective of this project is to implement a system capable of converting speech to braille. To accomplish this, we employ the Python speech recognition package to convert speech into text, which is subsequently converted into braille script. The scarcity of braille-printed reading materials poses a significant challenge for blind individuals in India, hindering their formal education and employment prospects.

1.2 EXISTING SYSTEM

Previous systems aimed to enhance interaction with computers for visually impaired individuals include E-touch and speech recognition interaction systems. These systems utilize speech recognizers, which are standard computer applications designed to run alongside other programs. They enable blind individuals to enter text by speaking, as they cannot see the screen. A screen reader with a built-in speech synthesizer conveys information to the user through the computer's speakers. Some companies currently offer computer programs known as "Speech Recognizers," allowing blind individuals to use standard computers. However, these systems can be complex to operate, requiring precise language input and often relying on speech instead of manual keyboard input.

1.3 PROPOSED SYSTEM

The proposed Speech to Braille system serves as a valuable tool for learning, particularly for children with disabilities or blind individuals, facilitating efficient understanding of given data. This system converts input voice from a PC or any device application into braille script, displaying it on a liquid crystal display (LCD). While blind individuals can read, speak, and listen, writing poses a challenge. Thus, this system enables them

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to write easily by simply speaking the words into a PC or device application.

Overall, this project aims to bridge the communication gap for visually impaired individuals by providing a user-friendly and efficient method of converting speech into braille, enhancing their independence and engagement with written information.

II. LITERATURE SURVEY

The paragraphs provided discuss various research and development efforts aimed at improving communication and accessibility for visually and hearing-impaired individuals through the use of braille and related technologies.

One project described in [1] focuses on the implementation of a prototype device that utilizes a hardware-based braille pad on a mobile phone. This device aims to facilitate braille output generation from speech input, catering to the needs of both visually and hearing-impaired individuals

In [2], an end-to-end braille translation approach from Japanese speech for the deaf-blind is discussed. The researchers explore the use of neural networks to directly translate Japanese braille from speech, comparing their proposed method with an existing approach that combines automatic speech recognition (ASR) and braille translation.

Another project, presented in [3], addresses the design and implementation of a messaging system using braille code for visually impaired persons. The goal is to provide an economical and efficient braille device that converts voice signals into braille text format, enabling visually impaired individuals to engage more fully in society.

The importance of braille language and its impact on visually impaired people is highlighted in [4]. The authors emphasize the challenges faced by visually impaired individuals in accessing digital content and electronic documents, stressing the need for braille language converters to enhance their reading experience.

In [5], the focus is on developing a low-cost, portable, and fast braille system for visually impaired people. The aim is to provide affordable access to the latest information and technologies, which are often inaccessible due to their high cost and limited portability.

[6] introduces a hardware implementation of a text-to-braille translator using field-programmable gate arrays (FPGAs). Unlike software-based translators, this circuit enables text-to-braille translation directly in hardware, offering improved throughput compared to commercial software-based translators.

Lastly, [7] discusses a device for text-to-speech production and braille script. The authors highlight the importance of braille as a unique script for communication among the visually impaired and emphasize the limited options currently available for communication in this community.

Overall, these projects and studies demonstrate the ongoing efforts to develop innovative solutions, technologies, and devices that facilitate communication, enhance accessibility, and improve the quality of life for visually and hearing-impaired individuals through braille and related systems.

III. DESIGN METHODOLOGY

Importing Libraries

Matplotlib is a Python library that enables the creation of 2D plots. It allows users to plot images in multiple small images and ensures compatibility with various platforms, generating high-quality figures suitable for publication in both hard copy formats and interactive environments.

Numpy, on the other hand, is a fundamental package for scientific computing in Python. It plays a crucial role in dividing images from construction sites into n-dimensional objects. This division facilitates easy comparison with datasets, aiding in tasks such as object recognition and analysis.

PyAudio is a third-party library that is not included in Python's standard library. It serves as a valuable tool for numerical computing in Python, offering users a versatile N-dimensional array object for storing data. Additionally, PyAudio provides powerful mathematical functions for efficient operations on arrays of numbers.

PyTorch is an open-source machine learning library based on Torch. Developed primarily by Facebook's AI Research lab (FAIR), it focuses on applications such as computer vision and natural language processing. PyTorch is released under the Modified BSD license and offers both Python and C++ interfaces, although the Python interface is more extensively developed and polished.

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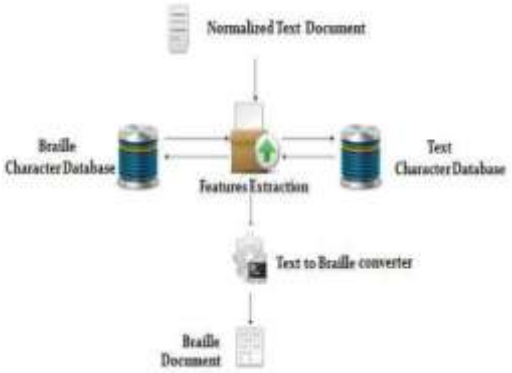

Figure 3.1: Block diagram of python to Braille Conversion.

Figure 3.1 explains how the speech is converted to braille. The procedure for speech to braille is initially, the speech is received as an input with the help of microphone and if the voice contains any interrupt microphone detects the noise and try to recover it.

Figure 3.2: Input speech to Microphone

Secondly,after the speech is detected, and try to process it Finally, after processing the speech it converts the given speech into braille text with the given representations of letters that are indicated in braille script.

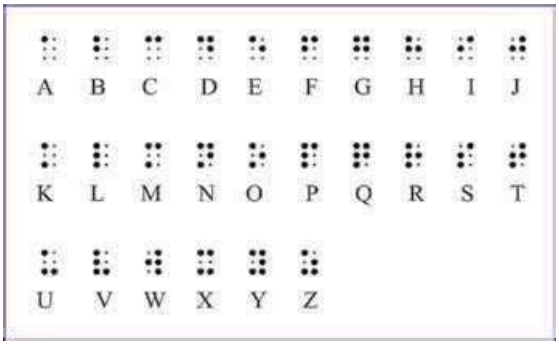

Figure 3.3: braille alphabets

The acquired braille result to check whether it processed perfectly or not so for verification try to scan the braille script which acquired to convert that braille data into speech. By this finally we can convert speech into the braille script

Figure 3.4: Braille Neue conversion

IV. IMPLIMENTATION

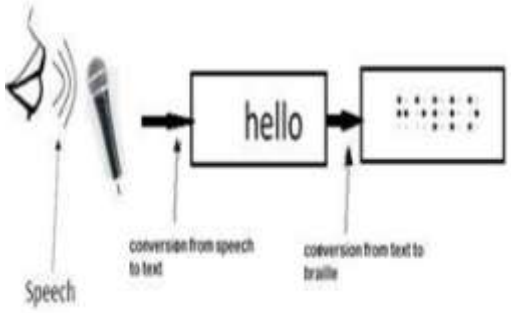

Figure 4.1: flow chart

The implementation of the Speech to Braille system using Python involves running the code in visual studio code or Google Collaboratory. The main focus of this project is to address the challenges faced by the blind community, particularly in the area of writing. The code includes speech recognition functionality, which can be installed using the command "pip install SpeechRecognition".

Additionally, braille representations of alphabets in the form of ".png" files need to be uploaded. The next step involves developing code for speech recognition to obtain the corresponding braille script.

Braille is a unique writing system consisting of raised dots that can be read by touch,

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enabling blind and partially sighted individuals to access written information. By understanding braille, people with visual impairments have equal access to written content and can enjoy reading throughout their lives.

In the implementation, a text file provided by the user serves as the input. The text analysis module compares the input text with its corresponding English alphabet and numbers. Python's built-in libraries and file handling functions are utilized to convert the text into a braille pattern.

V. RESULTS

The input speech provided for the conversion is "Welcome to Braille interpreter." The image below illustrates the output obtained after converting the speech into text. Please note that the content of the figure cannot be described as it is not provided.

Figure 5.1: Output after conversation of speech totest

The text converted through the system is compared with a braille database, and the resulting output is depicted in the accompanying figure.

Figure 5.2: Conversation of speech to Braille

Figure 5.3: Verification of braille script through media.

VI. CONCLUSIONS

The objective of the Speech to Braille conversion project was to implement and demonstrate software that enables visually and hearing-impaired individuals to convert speech into braille printed scripts. This system offers the advantage of allowing visually impaired users to independently engage in the typing process, without requiring assistance from others.

To enhance the proposed project, it is suggested to incorporate a feature that converts braille to speech with minimal errors. Additionally, enabling the conversion of different languages into braille scripts would be beneficial, as it would allow users to read data in their preferred braille language.

The primary functions targeted by this system include the Braille Converter, Language Translator, Text reading, saving audio files in mp3 format, and printing documents. This system is highly recommended for visually impaired individuals, as it provides an automated solution that simplifies their challenges and significantly increases user satisfaction.

Future scope:

A visually impaired can be easily understand through braille script with which the speech that is not audible mainly for deaf and blind. We intend to make this model more robust and accurate by improvising the speech without any interruptions

In the future, the speech with the number of words obtained will not be problematic. So, easily the speech with greater number of words is processed and converted into braille. In this project we are identifying that as there is improvement in speech recognition without the interruption of noise or any other disturbances and the efficiency analysis is approximately 97%..

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