Braille-Vox Pro
Empowering Inclusive Communication

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Abstract **- Braille-Vox Pro is an innovative project with the objective of creating a voice-to-Braille conversion system for individuals with vision impairments. The project intends to overcome the reading and writing difficulties encountered by visually impaired individuals, which can have a substantial impact on their ability to access information and communicate effectively. By turning spoken words into Braille text in real-time, the technology will give a practical answer to these issues, allowing visually impaired people to be more autonomous and productive.**

The research employs advanced natural language processing algorithms capable of effectively recognizing and interpreting spoken words and translating them to Braille text. Also, the system will include a Braille display device that will allow visually impaired individuals to read the transformed text. The development of this technology will give visually impaired individuals with a new degree of accessibility and inclusion, providing them more effective communication and information access.
The Braille-Vox Pro project is a huge advancement in assistive technology, providing visually impaired folks with a much-needed answer to their difficulties. By allowing individuals to read and write Braille with their voice, the technology will enhance their capacity to communicate, gain access to information, and participate more fully in society. This project has the potential to aid millions of visually impaired individuals worldwide, which is a tremendous impact. The Braille-Vox Pro project is an innovative and vital Endeavor that will have a significant influence on the lives of individuals with vision impairments.

[1] ***Keywords— Sub-images, Fuzzy logic, Image enhancement, Histogram, HSV, Image processing.***

I. INTRODUCTION

In today's era, everyone is moving ahead in the matter of technology. And we are surrounded by people who are either physically/mentally abled or physically/mentally disabled. Reading is one way to obtain knowledge, but it would be difficult for persons who are blind to read conventional letters. As a result, letters known as Braille letters are particularly made for them. A Braille letter is tended to by six touches coordinated in a square shape illustration of three lines and two fragments.

The Braille system was created in ancient times to help visually impaired individuals obtain knowledge and engage with the rest of the world. Learning Braille script entails detecting Braille dots. The dots are too tiny in size. As a result, detecting the dots and identifying the letters is a challenging process. To read and write successfully, visually impaired pupils must memorize/remember numerous patterns of keys of the Braille matrix allocated to different letters/symbols in Braille script. There are several varieties of Braille devices on the market, including refreshable Braille displays, rotating Braille displays, and panda Braille displays. They are very costly. People in underdeveloped countries, such as India, cannot afford it.

As per the writing, PCs presently can't seem to arrive at even the most essential study halls in India's country and distant areas. As a result, offering computers for visually impaired youngsters to learn and operate appears implausible. As a result, we came up with the notion of designing and developing user-friendly, cost-effective learning aids for visually impaired youngsters. The project's goal is to create a visual learning aid in English that incorporates a feeling of play into the learning process. The suggested methodology successively develops a character followed by a number on a Braille cell, assisting the visually challenged in learning the language.

Rest assured, it addresses the reading challenges experienced by blind people; but, to read braille, one must first learn it. The dots and combinations that make up a letter must be understood and memorized. As a result, it

becomes a time-consuming procedure since one must train the sensitivity of one's hand to discern patterns by touch. Furthermore, the quantity of Braille books accessible for use is quite restricted. The printing of Braille books is a time-consuming procedure.

The need for specialized printers and software adds to their scarcity. Life is easier for physically abled persons than for physically disabled ones, especially for those who are suffering from blindness, dumbness, and deafness. Talking about blind people, they are not even able to study or read. For them, there is Braille language, a language which was a great initiative taken by Louis Braille, inventor of a reading and writing system for used by people who are blind. As you know Louis Braille wounded his right eye while playing with his father's cobbler tool and his left eye became inflamed due to subsequent sympathetic ophthalmia, and he eventually lost sight in that eye. At five years old, he totally lost his sight and presently, he is viewed as the creator of the Braille framework. In 1950, UNESCO successfully announced the Braille letters in order, and in 2005, it perceived the Braille system as a "crucial language of correspondence, as genuine as any remaining dialects in legitimate as all other languages in the world".

II. LITERATURE REVIEW

The visually impaired community faces various challenges in their day-to-day lives, including navigating unfamiliar environments, accessing information, and communicating with others. Although there are some systems available to aid the visually impaired, these systems are limited and not always comprehensive. In this article, we will discuss the challenges that the visually impaired community faces and the limitations of the current assistive technology available.

John Wiley, et.al (2011) [4], One of the most significant challenges that the visually impaired community faces is accessing information. Most of the information we receive is in a visual format, such as text, graphics, or videos. This makes it difficult for the visually impaired to access the same information that sighted people can. The current systems available to aid the visually impaired in accessing information are limited to either Braille keyboards or text-to-speech services. However, different problems require different services, and no all-in-one companion is available for the visually impaired.

Ghimire, et,al (2011) [5], Moreover, the number of reading materials available in Braille format is limited due to the fewer populations of the visually impaired as compared to the total population. As a result, visually impaired people may not have access to the same information as sighted people. Additionally, there is no mechanism to integrate text, voice, and printing in Braille format. This limits the accessibility of information for visually impaired people and creates additional barriers for them to overcome. Furthermore, most of the text-to-speech services are limited to a single language only. This creates a significant barrier for visually impaired people who may need to access information in a different language. For example, if a visually impaired person speaks English as a second language, they may have difficulty understanding text-to- speech services in English. This can limit their access to important information and create additional barriers to their ability to communicate with others.[6]

Verma, el.al (2012) [7], To address these challenges, researchers and developers have been working on new assistive technology that can aid visually impaired people in their day-to-day lives. For example, there are now smart glasses that can help visually impaired people navigate unfamiliar environments. These glasses use a combination of cameras, sensors, and machine learning algorithms to help the wearer understand their surroundings. They can identify objects, read signs, and even describe the facial expressions of people around them.

Moreover, there are also new technologies that can help visually impaired people access information. For example, there are now apps that can convert text to Braille format, allowing visually impaired people to read text in a tactile format. These apps use a combination of machine learning algorithms and haptic feedback to create a Braille-like reading experience on a touchscreen device.

Mc Owan, et.al (2012) [8], Furthermore, there are also new technologies that can help visually impaired people communicate with others. For example, there are now apps that can translate speech into text and vice versa. These apps can help visually impaired people communicate with others who do not understand sign language or Braille.

Despite these advancements in assistive technology, there is still a long way to go in creating comprehensive and accessible systems for the visually impaired community. As the population of visually impaired people continues to grow, it is essential that we continue to invest in research and development to create new and innovative solutions to the challenges that they face. [9]

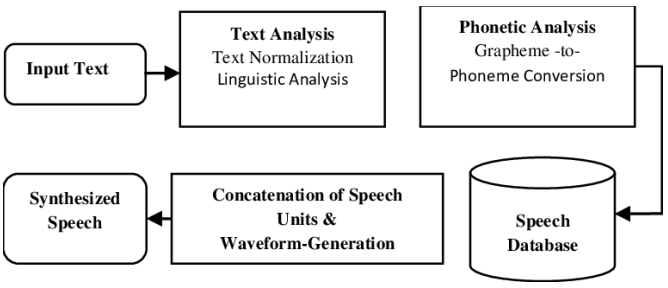

Fig (1)

III. PROPOSED METHODOLOGY

This research paper explains a helping software for visual-impaired people that will help the social and psychological problems of a blind person. The program carries out the Speech-to-Braille conversion that will help students to communicate easily, they can tell their feelings by speaking and our software will convert it automatically to Braille. Our software can be a need of many people around the world who are suffering from a lack of Speech to Braille software. It will be easier for a normal human being to communicate with blind persons.

My team and I randomly searched about more than 35 everyday problems recently which comprised life skills development, unemployment, home automation problems, health crisis, and a lot more. My Team and I measured all the possibilities and probabilities and concluded to help the blind people because most of our youth is attracted by AI and IoT projects solving everyday problems but we decided to do this project to solve the problems of disabled persons so that they can feel free to communicate. We have studied more than 20 research about this.

These outcomes drove my examination group and me to infer that people who are outwardly weakened need this sort of programming at a very low cost and is also, really helpful to those individuals who want disabled persons to participate in their events or want to communicate with them. Anyone can easily convert Speech to Braille.

Our main aim is "to carry out and show the utilization of the product for and by the visual-impaired individuals convert speech to braille printed scripts".

Using our modern and futuristic method, we can solve problems like cost, real-time problems, and unemployment for blind people. Children must be literate to read, write, and count. Learning braille helps youngsters enhance their grammar, spelling, and punctuation skills. When kids grow up, these talents will provide them with intellectual freedom, personal security, independence, and equitable opportunity. Literacy is required for children to read, write, and count.
Learning braille helps children improve their grammar, spelling, and punctuation. When children reach adulthood, these abilities will offer them intellectual freedom, personal security, independence, and equal opportunity. And the cost of many assistive technology gadgets continues to fall, making them more affordable to individuals of all economic backgrounds. They are listening rather than reading while using a voice synthesizer. Listening limits, the benefits of literacy by omitting critical components such as spelling, grammar, formatting, and emphasis. It is one of the best implementations of a system for the visually handicapped.

Our system is primarily focused on providing multi- linguistic support to the visually impaired to make them more self-dependent. It can be used to convert the text in any language to speak in any language.

It is capable of printing text in Braille format through integration with braille printers. It is capable of printing in Braille format directly from real-time voice or pre- recorded voice recordings through integration with braille printers. Instantaneous text-to-braille conversion from text file or direct text input. Complete voice-controlled user interface with braille keyboard support. Conversion logging mechanism for last conversions.

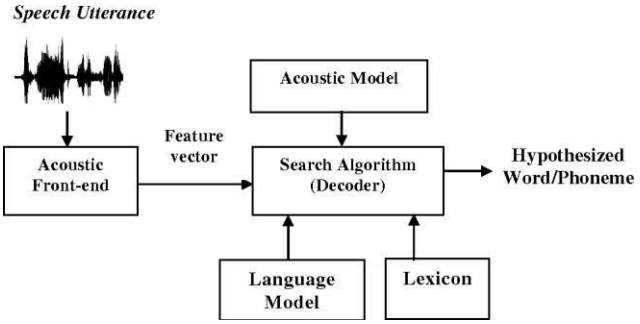

Fig (ii)

Using Google Text to Speech API, and integrating them with the current voice-controlled interface with narration accessibility, we can give integrated real-time Speech to Braille conversion and also, fast text to Braille conversion.

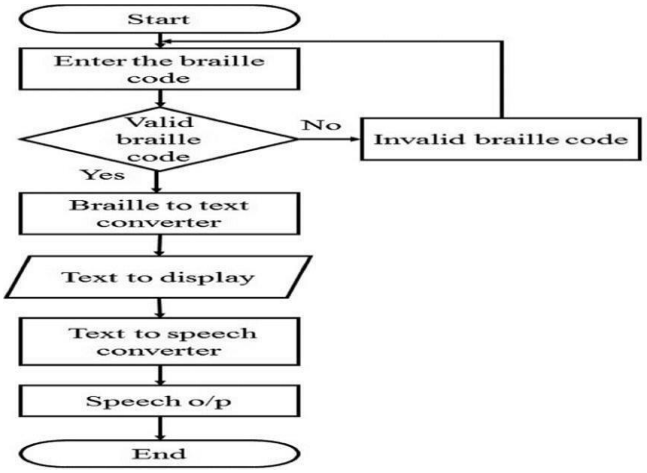

Fig (iii)

With our code, we add an extra layer of security, by which all the files that will be stored would be encrypted log files. The files will be printed in braille format but the end store will be encrypted.

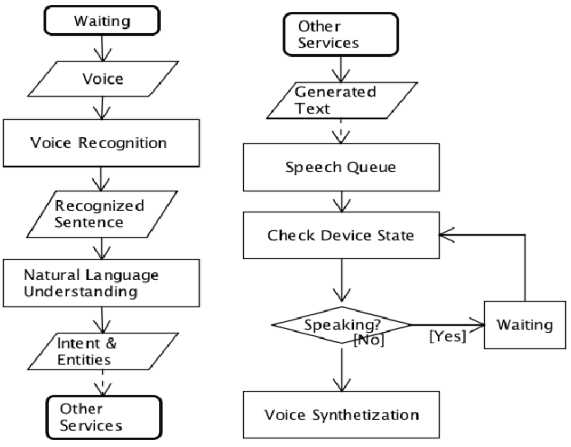

Fig (iv)

IV. PROBLEM FORMULATION

A sub-flow chart of the main flowchart that explains how our Python implementation will convert text to Braille. It will first get text input through a Braille keyboard or will get a text file through the prompt to open the file and then read the text from the file and then convert that text to Braille character by character and print out in Braille format. at last, all the Braille conversions will be saved in the text file.

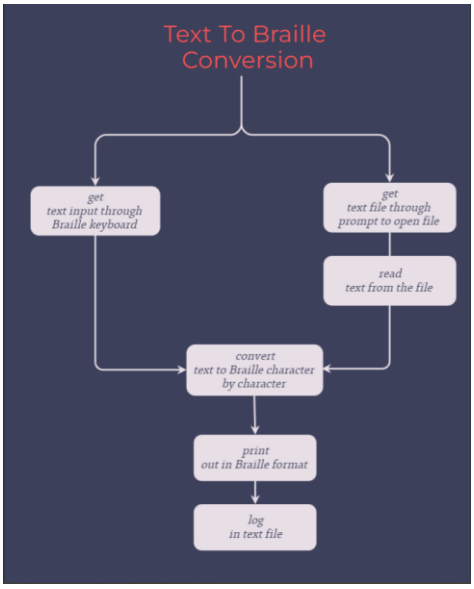

Fig (v)

A sub-flow chart of the main flowchart that explains how our Python implementation will convert Audio to Braille. In the first case, it will first get audio input through a microphone and then convert voice to text using Google's text to speech API. In the second case, it will get the audio file through a prompt to open the file and then convert audio to text using Google's text to speech API. Whenever one of these two cases would be executed, our code will convert text to Braille character by character and print them in Braille format as log in text file.

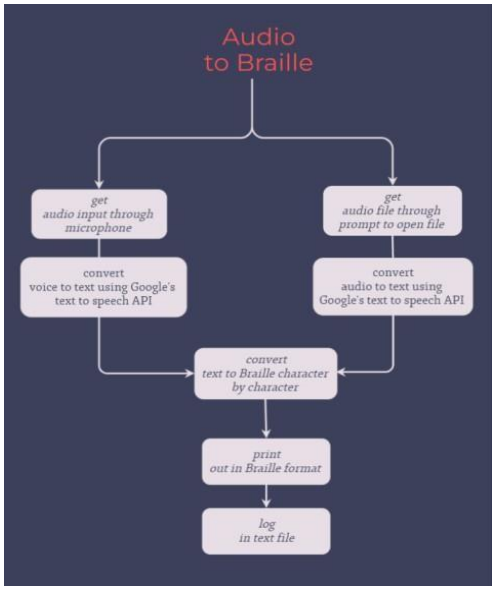

Fig (vi)

If either of (1) or (2) is performed, then if we will instruct the GUI to "Show Log", it will open the log files and read the data from the file.

Its next step will be to decrypt the data and show the decrypted text because as we mentioned earlier that the converted Braille files are encrypted in private keys through encryption.

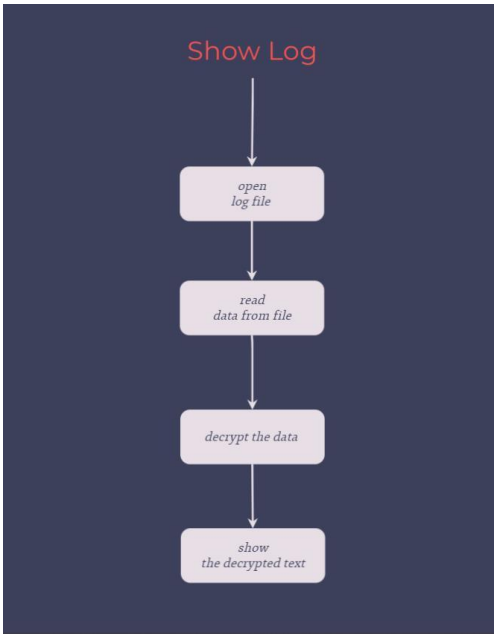

Fig (vii)

Firstly, when the app starts up, it greets the user and asks if the user wants to hear the available options. If the user says “yes” then the app will speak out all the available options, otherwise it will let the user know that it will be listening for the user’s commands. Our app has five options in the main menu, namely audio based services, text-based services, show log files, delete old records, and lastly exit. In the text-based services, there are three options, i.e., user can convert text to braille by typing in through either a regular keyboard or a Braille keyboard, or the user can browse and open an existing text file, or the user can go back to the main menu. If the user choses to convert text to braille by typing in through either a regular keyboard or a Braille keyboard, then the user will be prompted to enter the text in an input box, and then the app converts the text typed by the user to Braille and prints the same through our self-created methods. If the user choses to browse and open an existing text file, then the user will be prompted to browse for the file and then open it. Once the file is selected, our app will read the contents of the file and convert the text that is extracted from the file to Braille and print the same using our self-created methods. Otherwise, if the user choses to go back to main menu, the app will let the user know that he/she is back in the main menu and the app is ready to act upon the command that the user gives them.

In the audio-based services, there are three options. If the user choses to convert speech to braille by speaking in real-time, the speech of the user to text at first

Using Google's Speech to Text API and then the converted text to Braille and prints the same through our self-created methods. If the user choses to browse and open an existing audio file, then the user will be prompted to browse for the file and then open it. Once the file is selected, our app will convert the speech from the file to text at first using Google's Speech to Text API and then the converted text to Braille and print the same using our self-created methods. Otherwise, if the user choses to go back to main menu, the app will let the user know that he/she is back in the main menu and the app is ready to act upon the command that the user gives them.

Also, if the user decides to see the log file, our app lets the user know that the log file is loaded successfully and displays the log file in the output area. This loading of log is done in a secure way as we always keep the log file encrypted. Once the encrypted contents of the log file are loaded in the app, we decrypt the contents and display the decrypted contents in the output window without modifying the contents of the log file itself.

As for the fourth option, if the user decides to delete all the old records, then the app will ask for confirmation. If the user confirms that he/she wants to delete the old records, then all the data from the log file will be erased and the user will be acknowledged for the same.

Lastly if the user decides to exit from the application, the app says goodbye and quits.

V. CONCLUSION

Finally, the Braille-Vox Pro project is a ground-breaking initiative that aims to provide a much-needed solution to the reading and writing challenges faced by visually impaired people. The project's goal is to improve the independence, productivity, and quality of life of visually impaired people by developing a voice-to-Braille conversion system that allows them to communicate more effectively and access information more easily.

The advancement of this technology is significant because it has the potential to significantly improve the lives of millions of visually impaired people worldwide. The project represents a new level of accessibility and inclusivity, providing those with visual impairments with a more effective means of communication and access to information.

In addition, the Braille-Vox Pro project demonstrates the power of assistive technology to improve the lives of people with disabilities. As technology advances, we can anticipate more creative solutions to the challenges that people with disabilities face, allowing them to participate more fully in society.

Overall, the Braille-Vox Pro project is an inspiring and forward-thinking initiative that gives visually impaired people hope and empowerment. It serves as a reminder of technology's ability to affect positive change in the world, as well as its potential to improve the lives of people with disabilities.

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