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Converting Spoken Words into Braille in Real Time

Sourabh Supnekar1, Mohit Narkhede2, and Sagar Pawar3
Computer Engineering Professor Sinu Nambiar and Graduate Students from the Indira College of Engineering in Pune, Maharashtra, India

Abstract— People with visual impairments often struggle with reading and writing. Using a Braille translator, which is a piece of software, a document may be converted into Braille and then sent to a Braille embosser, which will print out a Braille version of the document. This piece of software can take an audio or video recording of spoken English and convert it into written English. So, eventually, we'll be able to type what we say. Then, the Braille code for each letter in the English text will be extracted and used to create the Braille version. The final Braille output may be processed by a dedicated Braille printer, facilitating readability for the visually impaired. As an added bonus, it also works to translate Braille text into spoken English. In order for the Braille document to be understood by anybody (both the visually impaired and the sighted) by listening to it using Braille Translator. People who are blind or have low vision will benefit from our initiative since it will facilitate the creation of high-quality Braille materials for them. There are many other languages that may be used to create Braille codes, including Spanish, French, music, mathematics, computers, and more. The English text will be translated into Braille using an automated procedure. Printing the final Braille output on a dedicated Braille printer makes it accessible to visually impaired readers.

Keywords— **Braille, Braille code, Braille printer, and Speech Translator**

INTRODUCTION

The primary target audience for Braille translation software is the visually impaired. When a document is typed in English, it must be converted to Braille before a blind person may read it. Audio may also be fed into this program. It has been noted that blind persons have trouble using Braille to type documents. The English language may be fed into Braille Translator software and converted into text. This will allow for the translation of spoken words into written ones. The leading reason for bridges to collapse. External and internal causes also contribute to the deterioration of many of these bridges.

There isn't a stand-alone program that can help you make Braille documents quickly and easily. People who are blind or have low vision will benefit from our initiative since it will facilitate the creation of high-quality Braille materials for them. There are many other languages that may be used to create Braille codes, including Spanish, French, music, mathematics, computers, and more.

In this effort, we'll convert spoken English into Braille. Therefore, the goal of the project is to facilitate the creation of Braille codes for use by the visually impaired. The program will also provide translation from English text to Braille code, and then from English text to voice. The application's value lies in the fact that the visually impaired may verify the accuracy of their own documents by listening to them.

The English text will be translated into Braille using an automated procedure. Printing the final Braille output on a dedicated Braille printer makes it accessible to visually impaired readers.

LITERATURE REVIEW

Those who are visually handicapped sometimes struggle with reading and writing. Therefore, it is crucial to be able to transform spoken language into written language. There are two basic methods for doing this: [1] a Hidden Markov Model (HMM) and b a Fast Fourier Transform (FTT) algorithm. The hidden Markov model (HMM) is a finite state machine with n states, where each state (other than the initial and final stages) has unique output probabilities and each arc (the connection between two states) has a unique transition probability. The Fast Fourier Transform Algorithm [1] is a generalization of the Finite Discrete Fourier Transform. The FFT technique is used to filter out extra noise because of its precision even when dealing with an endless, unstructured wave pattern.

Each Braille letter is represented by a Braille cell, which consists of six embossed or raised dots grouped in the pattern indicated in the picture. Each cell represents a single letter, number, or punctuation mark according on how the dots are arranged. Braille is a method for transcribing written text using a Braille alphabet that is both humane and aesthetically pleasing. Braille is a kind of writing for the visually impaired.

disabled reader or writer; a braille cell is defined by the "dot-id" parameter [2]. Six dots, in two columns of three, make up a Braille cell. One letter, one word, or any combination of letters, symbols, numbers, and punctuation marks may be represented by a single Braille cell as a symbol [2].

The field of Digital Signal Processing has numerous practical uses in areas such as speech recognition. In order to test and train a Speech Recognition System [3], an experiment was put up in this study using the CMUSphinx framework. Since this architecture is adaptable and can handle languages outside English, the authors were able to teach it to understand the Kannada language. A Language Model, Acoustic Model, and Dictionary made up the aforementioned system. The Language model includes several terms and their frequencies. Phonemes, the smallest unit of sound in a language that may yet carry meaning, are included in the Phoneme set. A dictionary is a tool for making word maps [3].

Using a Computer to Recognize Speech The goal of any speech recognition job is to get familiar with a computer-generated voice in order to carry it out. Words from our mother tongues sneak into our everyday English conversations. This work offers a solution to this issue by proposing a method for multilingual speech-to-text conversion. The system may be thought of as having two distinct modes of operation: training and testing. Each word's utterances are recorded throughout the training phase. The MFCC technique is used to extract acoustic properties of each word. This manner, we can keep track of the unique characteristics of each word inside a unified "feature vector." Any system that converts voice to text must have a database. The suggested method relies on a database that is created automatically. [4]

Mel Frequency Cepstral Coefficients (MFCC) [11] are used to convert speech waveforms into a collection of feature vectors in the approach described in the work by Ahmad M. Abushariah. The system is built on MATLAB's graphical user interface. Word-isolated digits (from 0 to 9) are the primary focus of this work [11].

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Isolated word recognition and continuous voice recognition are the two modules that were built. When a waveform is used as an input, the MFCC algorithm is used to extract features, which are then recorded in a feature vector. The HMM technique is then used to categorize the feature vectors at each frame based on the phonetic categories. Since HMM is incapable of capturing the sequence of states, an optimum sequence of states is generated and then utilized to observe the outputs[1][11].

Scientists and technologists have been working on the problem of turning audio into text for quite some time. The major barrier to this is the person's own diction or accent. It's challenging to create a system that can identify a wide variety of accents, which is why this research focuses only on identifying British English [8]. The disclosed method employs a table-referencing technique to translate spoken words into written text, and then from written text into braille. The Braille codes are organized into Grade 1 and Grade 2 categories in the reference table used to make the conversion from text to braille. Not phonemes, but syllables are used to organize the items in the table [8]. The system employs a state matching mechanism that works with a fixed set of states that may each represent a different point in time inside the text content.

PROPOSED SYSTEM

The proposed system is the development of Real time speech to braille converter. The system takes speech input from user. Converts the speech input to corresponding text and the converted text is further converted into corresponding braille language. For text to braille conversion the system make use of the Braille database to find the equivalent braille code for each alphabet as well as numbers. The system saves the converted braille code in a separate file .The system also provides braille to text verification. The saved Braille coded file can again be opened and the contents of the file are read to the user through speaker or any headset.

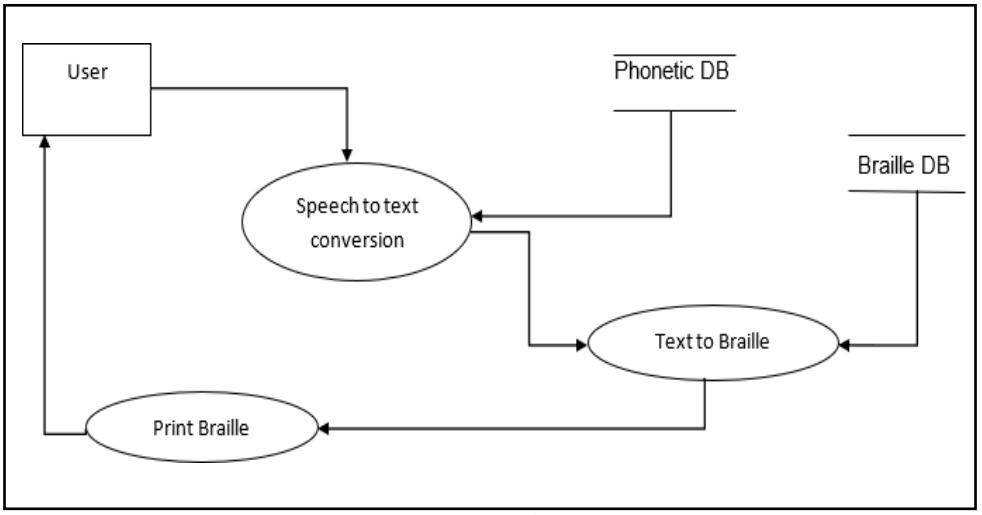

Fig. 1 System Architecture of proposed system.

Components of the system:

User:
User gives the speech input to the system for processing. The speech input is given to the system using a microphone. The speech input maybe in different languages like Spanish, English, German, et cetera, but this system gives focus to the conversion of English speech into the text format which will later be converted in Braille.

Speech to Text conversion:
The speech input taken from the user is converted into equivalent text using the Fast Fourier Transform Algorithm. The FFT algorithm is used to classify the sound waves according to their frequency levels. It does captures wavelengths from an infinite frequency range. It then removes the unnecessary noise from the given input. The processed soundwaves are used to convert the speech input into a text format. This is done with the help of a phonetic database.

Text to Braille conversion:
The main purpose of this system is to provide an easier way for blind people to communicate with able people and vice versa. In this module the text file that has been converted from the speech input that is taken from the user as input will be converted into a braille format. This is done using a braille database which contains the braille codes for each corresponding alphabet and number.

Phonetic Database:
Phonetic database contains list of words coded phonetically which helps in speech to text conversion. Phoneme of a letter is a basic unit of pronunciation used for that letter. A combination of these phonemes is used to pronounce a word. This database will hold the phonemes of all the letters and according to the phonemes the speech input will be converted into the text format.

Braille Database:
Braille database contains the corresponding braille code for each alphabet and numbers. Braille language has two dub types namely 6 dot code and 8 dot code. This database will contain the 6 dot code for each and every alphabet and basic number which will be used in the conversion process of the text file to a braille format.

Print Braille:
After the successful conversion of text to braille the final result is displayed to the user. This file can be saved in the local storage. To print this image we may use a braille embosser, but using a braille embosser is out of the scope of this project.

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Braille Codes:

6 dots Braille can only produce 63 different Braille cells. In 6 dots Braille an unused Braille cell or a blank Braille cell is used as a space. Some 6 dot Braille cells have numerous meanings. Numbers, capital letters, and many symbols require more than one cell to produce 6 dots Braille data. 8 dots Braille can produce 255 different Braille cells.

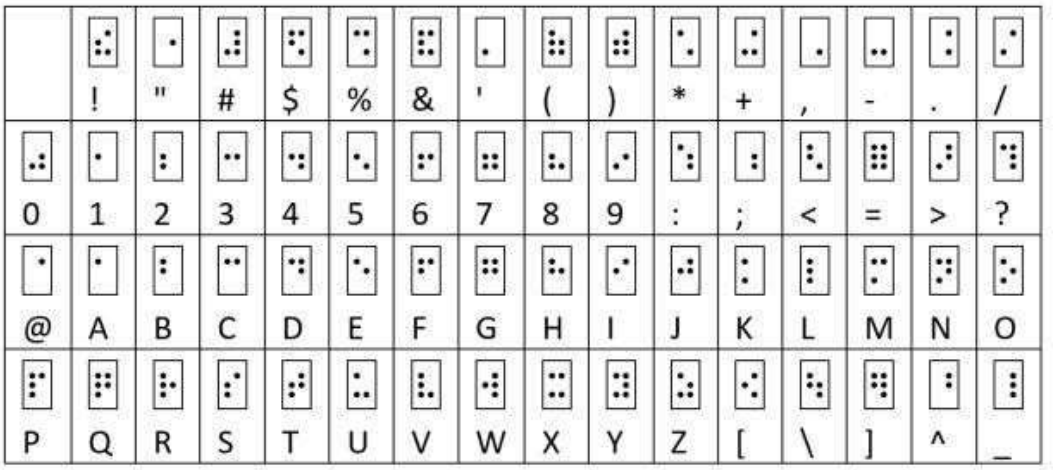

Fig. 2 Six dot Braille codes.

Speech to text conversion:

Hidden Markov Model is a statistical model. It is used to identify the hidden states in the frequency waves. The sequence of the emission can be observed in the HMM model but the sequence of the states is not known. The speech is first taken as input from the user. Then all the excess noise is removed from the given waves. The filtered waves are then compared with the speech database (HMM), according to which the output is derived.

Hidden Markov model has a very specific drawback. It cannot capture the sequence of the states in the given speech input. This is overcome in the Fast Fourier Transform algorithm which is used in this system. FFT is the extension of Finite Discrete Fourier Transform algorithm. Finite DFT constrains itself to a limited value. It entails that Finite DFT only captures wavelengths of a specific frequency. FFT is used in spite it captures infinite frequency wavelengths. As the wavelengths may have infinite frequency the wave format is unstructured. The unnecessary noise is later removed. Then the processed waves are converted to text.

CONCLUSIONS

This system helps to the blind peoples to interact with the other normal peoples very efficiently. As well as normal peoples who want to interact with blind peoples this software helps them also. Peoples interacting with this system can create the Braille documents who ever not having knowledge about the Braille code.

Keeping in mind requirement of the system the project has completed on time with following advantages: a) Easy to use interface. b) Better load handling capacity.

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REFERENCES

[1] *E. Saranya1, B. Baron Sam2 and R. Sethuraman3 "Speech to Text User Assistive Agent System for Impaired Person", 2017 IEEE International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy and Materials (ICSTM), Veltech Dr.RR & Dr.SR University, Chennai, T.N., India. 2 - 4 August 2017. pp.221-226.*

[2] *Dr.V. Ajantha Devi., M.Sc., PhD "Conversion of Speech to Braille: Interaction device for Visual and Hearing Impaired", 2017 4th International Conference on Signal Processing, Communications and Networking (ICSCN - 2017), March 16 – 18, 2017, Chennai, INDIA.*

[3] *Shivakumar K M, Varsha V Jain and Krishna Priya P "A study on impact of Language Model in improving the accuracy of Speech to Text Conversion System" , International Conference on Communication and Signal Processing, April 6-8, 2017, India*

[4] *Yogita H. Ghadage, Sushama D. Shelke "Speech to Text Conversion for Multilingual Languages", International Conference on Communication and Signal Processing, April 6-8, 2016, India.*

[5] *Cater, John P., Electronically Hearing: Computer Voice and speech Recognition,Howard W Sams& Co.,*

[6] *Wu Xiaosong, Zhu Haihong, Kim Seong-Hyok, Allen Mark G., "A Portable Pneumatically-Actuated Refreshable Braille Cell", The 14th InternationalConference on Solid-State Sensors, Actuators and Microsystems, Lyon, France, June 10-14, 2007.*

[7] *J.Bhattacharya, S.Majumder, G.Sanyal, "Automatic inspection of Braille Character: A vision based approach." International Journal of computer & Organization trends – Volume 1 Issue 3 – 2011.*

[8] *Blenkhorn, Paul; "System for Converting Print into Braille",*

ISSN: 1832-5505
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IEEE Transactions on Rehabilitation Engineering, Volume.5, No. 2, 1997, pg. 121-129.

[9] *Mathias De Wachter, Mike Matton, Kris Demuynck, Patrick Wambacq, "Template Based Continuous Speech Recognition," IEEE Transs. On Audio, Speech & Language Processing, vol.15, issue 4,pp 1377-1390, May 2007.*

[10] *Rozeha A. Rashid, Nur HijaMahalin, MohdAdibSarijari and Ahmad Aizuddin Abdul Aziz, "Security System Using Biometric System: Design and Implementation of Voice Recognition System (VRS)", Proceedings of the International Conference on Computer and Communication Engineering, pp 898-902, ISBN :978-1-4244-1692-9, May 2008.*

[11] *M. A. M. Abushariah, T.S.Gunawan, and O.O.Khalifa, "English Digits Speech Recognition System Based on Hidden Markov Models," Proceedings of International Conference Computer and Communication Engineering (ICCCE), 2010, pg. 1-5..*

[12] *Ertmer, P.A., Newby, T.J., Liu, W. et al. (2011). Students' confidence and perceived value for participating in cross-cultural wiki-based collaborations. Educational Technology Research and Development, 59, 213-228 doi: 10.1007/s11423-011-9187-4.*

[13] *Reynolds, B.L. (2015). Helping Taiwanese graduate students help themselves: Applying corpora to industrial management English as a foreign language academic reading and writing. Computers in the Schools, 32(3-4), 300-317.*