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Real Time Speech To Braille Converter

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Abstract— People who are blind or have low vision have trouble reading and writing. A Braille translation is a piece of software that can turn a text document into Braille and send it to a Braille embosser, which will make a hard copy of the original text document. You can speak English into this program, and it will turn it into written English. This means that speech will be turned into writing. After that, the English text will be turned into Braille by getting the right Braille code for each letter. A special Braille printer can then be used to make the final Braille output, which will help blind people read it. Another useful feature is that it can turn the Braille text into spoken English. The Braille text can be read by anyone by listening to it through the Braille Translator. This includes people who are blind. People who are blind or partially blind will be able to use our project to make Braille papers quickly and easily. Even though Braille signs can be made in many languages, such as Spanish, French, music, math, computers, and more. A computer program will be used to turn the English text into Braille. A special Braille printer can then be used to print out the final Braille result, which will help blind people read it.

***Keywords*— Text to speech, Braille code, and a Braille printer**

INTRODUCTION

The Braille translation program is mainly made for people who are blind. It's hard for blind people to type in English. A braille translation can turn a text into braille that the user can read. This program can also take sound. Using Braille, it has been seen that blind people have trouble typing the text. The Braille Translator program can take spoken English and turn it into written English. This means that words will be turned into text and text into speech. The main reason why bridges fail and fall down. Many of these bridges could fall apart because of things inside and outside the bridge.

At the moment, there isn't a stand-alone app that can make it easier to make Braille papers quickly. People who are blind or partially blind will be able to use our project to make Braille papers quickly and easily. Even though Braille signs can be made in many languages, such as Spanish, French, music, math, computers, and more.

Speaking English will be used to make Braille code for our project. In other words, the goal of the project is to help blind people make Braille signs that can be used for communication. In this app, we'll also add the ability to go from Braille code to English text and back again, from English text to speech. This app is helpful because it lets blind people hear their documents and tell if they are right or not.

A computer program will be used to turn the English text into Braille. A special Braille printer can then be used to print out the final Braille result, which will help blind people read it.

LITERATURE REVIEW

People who are blind or visually impaired have trouble writing and reading. So it is very important to turn spoken language into writing. Basically, there are two ways to do this: One is the Hidden Markov Model (HMM), and the other is the Fast Fourier Transform Algorithm (FTT) [1]. The HMM is a finite state machine with n states. Aside from the first and last states, each state has a different chance of producing a result, and each arc between states has its own transition probability. The Fast Fourier Transform Algorithm builds on the Finite DFT, which can only work with a certain number of values [1]. This FFT method is used because it is accurate, even when dealing with an endless, or unorganized, wave format. This gets rid of the noise that isn't needed.

Each character in the Braille system is made up of a Braille cell, which is made up of six raised or stamped dots grouped in the way shown in the figure. What the raised dots mean is different for each cell, which can be a letter, a number, or a simple stop mark. Using the Braille Alphabet, Braille codes are beautiful, clear, and very human ways to transcribe written material. Braille is a writing system used by people who can't see.

a person who is blind or has low vision read and write. A "dot-id" term is used to describe a braille cell [2]. There are six dots in a Braille cell, split into two groups of three dots each. As a sign, each Braille cell can stand for a letter, a word, or a group of letters, symbols, numbers, or punctuation marks [2].

The field of digital signal processing has many real-world uses, and speech recognition is one of them. A test was set up in this study to use the CMUSphinx framework to train and test a speech recognition system [3]. This approach is flexible and works with languages besides English. Because of this, the writers were able to train the system to understand Kannada. The system that was just talked about had a Language Model, an Acoustic Model, and a Dictionary. The Language model has a lot of words and how likely it is that they will be used. Phonemes are the smallest sound units in a language that can send a message. They are part of the Phoneme set. Dictionary is a tool that helps you organize your words [3].

Computers that can recognize speech In speech recognition, the goal is to learn the computer's words so that it can do what it's supposed to do. When we talk to each other in everyday English, we often use words from our own languages. The author of this work has come up with a method for Multilingual Speech-To-Text translation to solve this problem. There are two parts to how the method works: teaching and testing. During the teaching process, each word is said out loud and taped. The MFCC method is used to pull out audio features for each word. This way, the features of each word are saved in the feature vector so that they can be used later. Any system that can turn words into text needs to have a database. A self-generated library is used in the suggested method. [4]

The work by Ahmad M. Abushariah talks about a method that uses Mel Frequency Cepstral Coefficients (MFCC) to turn speech waves into a set of feature vectors [11]. MATLAB (GUI) is used to run the system. The paper is mostly about the numbers 0–9, which have their own word structure [11]. Isolated word speech recognition and continuous speech recognition are the two modules that were made. The MFCC method is used to pull out the features from the waves that are fed into it, and then all of those features are saved in the

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feature vector. After that, the HMM method sorts the feature vectors into groups based on phonetics at each frame. Then, because HMM can't record the sequence of states, the best sequence is found, and that sequence is used to look at the results [1, 11].

For a long time, scientists and engineers have been trying to figure out how to turn voice data into text format. The main problem is that the person in question has a bad language or accent. Because it's hard to make a system that can spot all accents, this study only talks about recognizing British English [8]. To change words to text and then text to braille, the stated method uses a table-referencing system. The Braille codes are broken down into Grade 1 and Grade 2 codes in the table for converting text to braille. Not the phonemes, but the words are used to make the items in the table [8]. A state matching system is used by the system. This system works with a limited number of states that can hold the current context in the text page.

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.

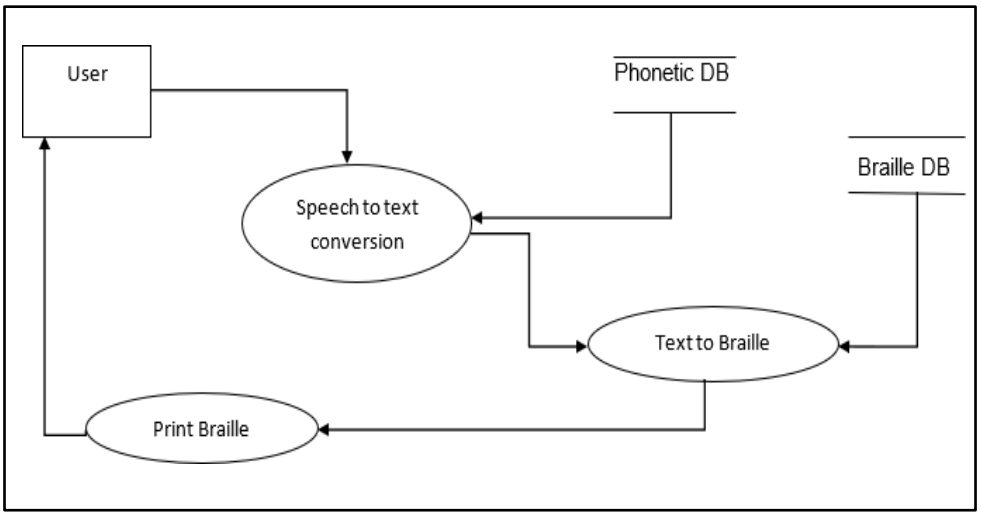

Fig. 1 System Architecture of proposed system.

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.

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.

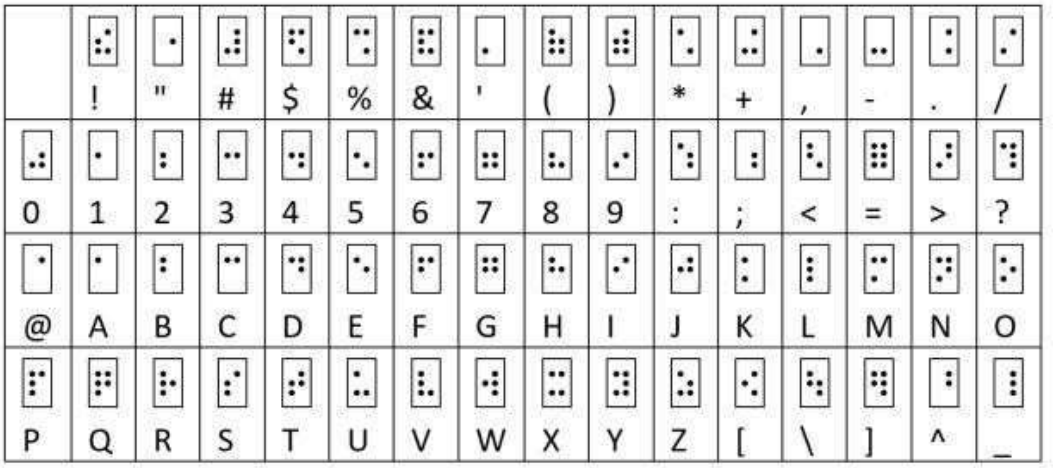

Fig. 2 Six dot Braille codes.

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 International Conference 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",*

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.