

Portable Device Converting Braille of English and Kannada Language to Speech Output

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Abstract—“Braille is an image of 6 celled dots”.

This paper presents a novel method of converting Braille of English and Kannada Language to a speech output and also having a text to speech and a communication to model having speech to text output in English language to have a more economical and a handheld device for a visually impaired people.

The Project deals with Image Processing algorithm to be followed along with some hardware implementation which basically deals with a final handheld device that can read or capture the image from the Braille text or image or a print and can obtain the output through speech using OCR (Optical Character Recognition) and TTS (Text to Speech) Technique.

This application has been developed to support the young visually impaired and also to support them to be more independent and knowledgeable to the new technology in an early age. Optical Braille Recognition and Optical Character recognition are useful for visually impaired people who are unable to read text documents or Braille script but require access to the documents' content.

Index Terms— Optical Braille character recognition, line segmentation, character segmentation, dot mesh.

I. INTRODUCTION

According to the WHO, there are over several billion deaf and dumb people in the world and over million in our country India. In their daily life they face plenty of problems like in communication with the people. Proposed project deals with the conversion of Braille of English and Kannada Language to Speech output, which is cost effective and a handheld device.

The eSpeak module, a compact, open source, software speech synthesizer for Raspberry pi is utilized which converts the predefined text to speech. The generated codes even correspond to actions like switching on the fan, lights etc.

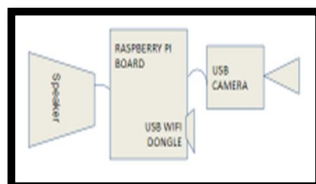


Figure 1 Block diagram of the project

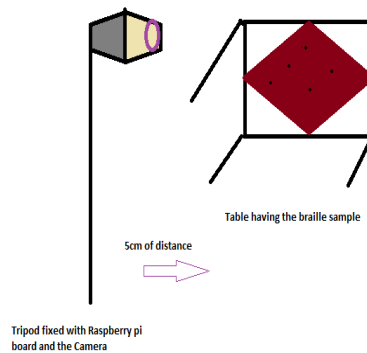
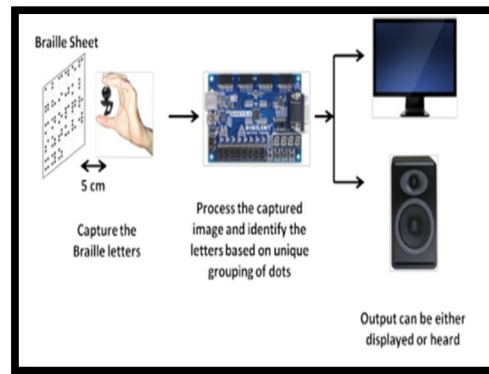


Figure 2 Experimental Setup

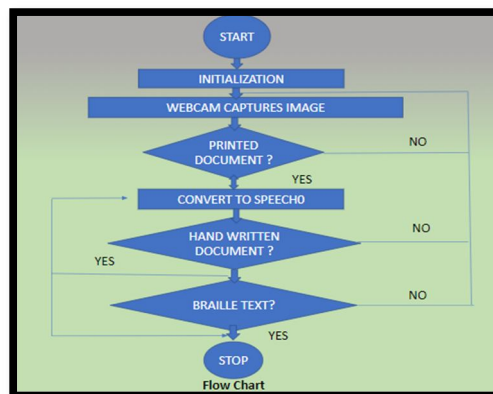


Figure-3 Algorithm of the project

A. Survey Done

Use Case of the Project Based on the Survey:

1. Kids can learn fast
2. Introduction to technology
3. Processing is fast
4. English Braille and text conversion would be more useful devices can be used by 1 class
5. Multiple language usage models
6. Can reduce the efforts of the visually impaired teachers.

This type of learning is called as “Goli Press” as and it represents the 6 cells of the Braille script. The learning involves the movement of the balls towards each of the (representing each Braille letters both in English and Kannada) of the empty spaces/cells and each Braille script is read from left to write and the writing involves right to left form of procedures.



Figure 4 Traditional method of learning letters

As the school was a Kannada medium school, the students were more confident towards the Kannada Language than the English Language.

The time taken by them for analyzing the letter was more time taken and my proposed system is one which overcomes these issues.

According to the survey done the kids were still learning the letters in the old traditional methods.



Figure 5. Survey pictures taken (Krishna Build School, Hassan)

II. PROPOSED METHOD

The Braille image processing has about 3 parts:

1. Image pre-processing
2. Image segmentation
3. Image recognition

Pre-Processing

This step involves the scanning the Braille image which is to be processed. This process captures the image and removes the blurring and noise from the image..

Image-Segmentation

After the noise removal from the Braille image the next step is to obtain the exact Braille character using horizontal segmentation. The Braille cells must be segmented from both the sides.

Image-Recognition

The image is now having binary values representing each pixels of the Braille captures hence the calculated Braille cell sum is then equated to the value of the image to finally obtain the image.

Converting the Image: An image is a 3D image and it must be converted to 2D as it consumes less storage.

Cropping the image from the image obtained: The image must be cropped to exact size and dimensions.

Thresholding: Later the calculations are made removing the highest and lowest values.

Horizontal and Vertical Segmentation: From either the left side or the right side. After obtaining the image horizontal and vertical segmentation is done there is a separate algorithm designed for Kannada letter detection

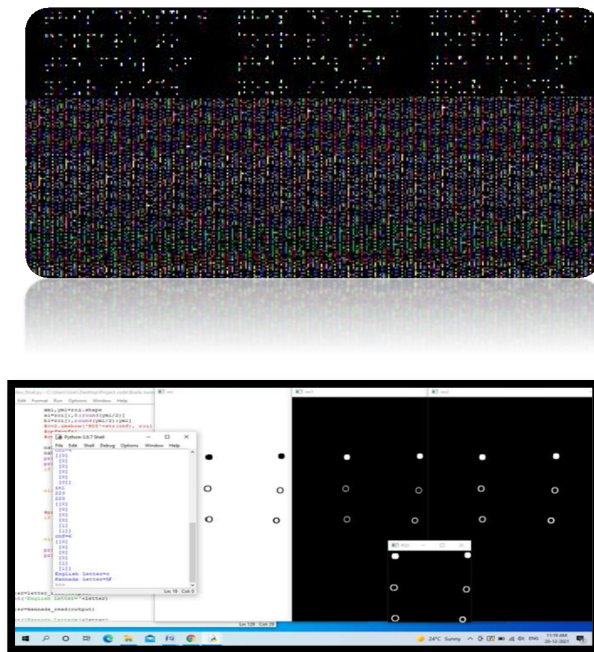
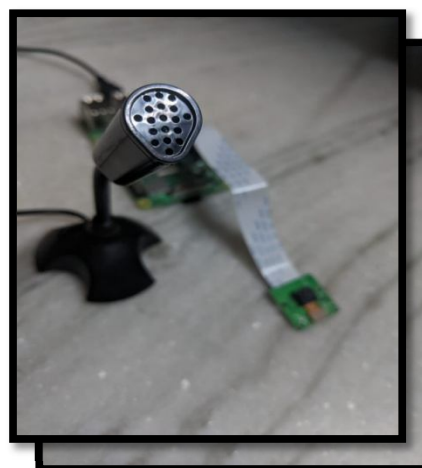


Figure-7 Final Result obtained for the Braille to Speech output

Hardware Interface



Added a MIC for Speech to text for easy access of visually impaired people-text to speech (2 use 1 device)

The algorithm for the 3 parts of the project has been successfully implemented.

The project is flexible and can be adopted for multiple languages based on the Braille script available.

PART 1: BRAILLE OF ENGLISH AND KANNADA LANGUAGE TO SPEECH OUTPUT

PART 2: TEXT OF ENGLISH TO SPEECH OUTPUT

PART 3: SPEECH TO TEXT OF ENGLISH LANGUAGE

Problems encountered and solutions obtained:

Intensity of the picture captured

Distance between the captured images should be about 5 centimetres.

Processing time of the 3 dotted or more is more when compared to that of single dotted cells of Braille.

III. RESULTS AND CONCLUSION

The part-1 of the project was done and it was completed with the software simulation part of both English and Kannada Language for Braille to Speech output and the outputs have been obtained successfully.

The hardware part has Raspberrien OS installed in the desktop and also SD card installed with the entire applied algorithm and executing it with hardware installed and obtaining the speech output through earphones or speakers.

VNC viewer has been taken as a supporting system to obtain a keyboard and mouse free system and the microcontroller can be just connected using the IP address of the board.

The conversion of English text to speech is also installed and in the last part of the project, to build communication, the speech to text part is also installed for English language.

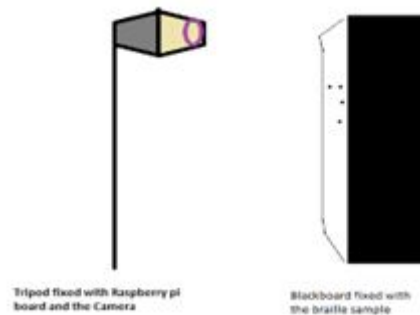


Figure 9 Experimental Setup

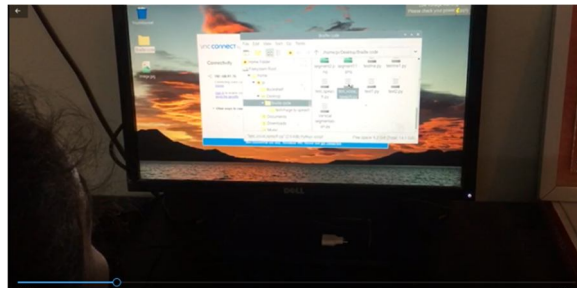


Figure 10 Experimental Setup (Speech to Text Conversion using MIC)

IV. FUTURE WORK

It can be used in blind schools and colleges.

Increased accuracy

Better quality of the text to speech synthesizer modules

Support for many Indian Languages like Kannada and Tamil.

ACKNOWLEDGMENT

My sincere thanks to PES UNIVERSITY, Krishna Blind School Hassan and my guide Mrs. Asha S Patil for providing all the facilities to conduct experiments related to this project.

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- [2] Novel Methodology for Kannada Braille to Speech Translation using Image Processing on FGPA.