

Development of a Text to Braille Interpreter through Optical Image Processing

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Abstract - Many valuable paper documents they are usually scanned and kept as images as backup. Extraction of text from images using tesseract is quite helpful process and thus it need some tool to convert English to Braille. This project plays an important role in braille translation. Since 19th century braille system has been the main system used by visually impaired people for writing and reading.in order to convert document or a book into braille format this application extract a text from image and then convert it into braille. This will prove beneficial for converting old books or documents into braille format. The paper represents complete methodology on how scanned images and how it is translated into braille format. The scanned images are pre-processed and converted to grayscale and then passed through an adaptive threshold function for conversion to binary image. Binary image then sent for Text Recognition using Google's powerful Tesseract Optical Character Recognition engine which is considered to be the best Open Source OCR Engine currently available. Text is then converted to a six dot cell Braille digital format using a set of rules provided by www.iceb.org. Translation to Braille includes conversion of numbers, alphabets, symbols and compound letters, translated text can then be saved for printing.

Keywords- Braille Translator, OCR, Tesseract, Optical Character Recognition, Image Processing.

I. INTRODUCTION

As the beginning of civilization, man wrote records and documents of transpired events and knowledge learned. These records are the base of our society today. Written information are studied and taught from primary school to advance studies. The footprint of technology can be seen clearly in the advancement of education. There are studies who analyzed the effects of modernization to the visually impaired, had foreseen the problems they could face in the future.

Some have already started to start a cause by creating assistive technologies for communication with the blind. Likewise, there are studies which use refreshable braille display as a medium of communication. The ongoing improvements led to studies utilizing optical image processing, such as processing of image to text as well as conversion of ASCII file and displayed through a refreshable braille device. Furthermore, an algorithm was proposed wherein segmented characters could be analyzed from motion pictures through an optical character recognition (OCR) software. Another study about image processing and conversion was conducted about a kind of Braille paper automatic marking system. A method was proposed on recognizing low-resolution characters using a

super-resolution technique before the recognition to enhance the resolution of images taken by the portable digital camera. This method is important especially to those who will be using low resolution cameras. A step closer to braille reading devices was the two-way SMS based communication technology, specifically designed for the blind. A more advanced technology presented a design and implementation of a portable keyboard and speaker with a braille refreshable display that is a comparatively low cost for the communication between the blind, deaf, deaf-blind and unimpaired .

As compared to these previous studies, there has been no exact work that has been conducted that is able to give assistance to the visually-impaired people regarding their reading education. What makes the research stand out from other existing technology is that it adapts to the reading capability of the users introduced by the systems modes of reading. Furthermore, it uses Tesseract technology, one of the best OCR engine to have been developed for its high accuracy.

II. AIMS AND OBJECTIVE

a) Aim

The aim is to implement web-application for translating text to braille code. The development of this braille interpreter with an image to text to braille conversion opens up possibilities to curious and interested visually impaired people to read any printed books and reading paraphernalia.

b) Objective

- Identify a technique to converting plain text to braille based on specific code format.
- to design the web based application to translate the text to braille code by dividing the image into braille.
- Web based applications for Braille code translator.
- Provide a feature where, user can download converted Braille text in Image Format (png), Text File (.txt).

III. LITERATURE SURVEY

Paper 1: A System For Fast Text-To-Braille Translation Based On Fpgas:

This paper describes a fast text to Braille translator based on Field Programmable Gate Arrays (FPGAs). Compared with most commercial methods, this translator is able to carry out the translation in hardware instead of using software. To achieve the fast translation, a FPGA with big programmable resource has been utilized, and an algorithm, proposed by Paul Blenkhorn, has been revised to perform the fast translation. The translator has been described using Very high speed integrated circuit Hardware Description Language (VHDL). The test results shows that the software base commercial translator and hardware based translator accomplish the same results. Moreover compared to Blenkhorn's original algorithm this system achieve superior throughput.

Paper 2: Improving Optical Braille Recognition in Pre-processing stage:

Braille documents are captured and processed and converted into natural text using Optical Braille Recognition (OBR) system. Braille data or information

which is embossed on Braille plate is most commonly captured by mobile camera or scanner into Braille image is the input to OBR. Preprocessing is the first stage performed by OBR system. The Noise introduced while Image captured using camera, mobile or scanners involve irregular lightness, low quality image due to less pixel camera, impulse noise, diverse gray-level values, angled or slanted image captured as a result of human error, deformation or warp of image document, deprived or disabled dots, appearance of unwanted dots, irregular gap between adjacent dots that represent a character.

Paper 3: Braille Image Recognition for Beginners:

Visually impaired people used braille format which consist of dots. Alphabets in braille format have their own pattern and sometimes it is way more different than normal alphabet. Hence people who do not uses braille find it difficult to recognize the pattern. This paper helps beginners to recognize the braille image. The outcome of this study is expected to translate a braille image patterns into a readable alphabet text. A technique of Bag of Features (BOF) is proposed for the recognition of the braille image. On the other hand, the image classification is done using a Support Vector Machine (SVM) technique. Seventy-eight of braille images is tested. From the testing performed, it is found that 97.44% of correct recognition accuracy is achieved which revealed that the proposed techniques are applicable for braille image recognition.

IV. EXISTING SYSTEM

Several proposals have been made for computerized the use of production rules derived from a Markov system. This Approach has been followed by W. A. Slaby. This system allows non-experts to modify rules to perform translation of experts to modify rules to perform translation of. This method uses a decision table with input classes and states and table with more than one thousand rules for translation. The "window" was at the end or in the middle of the word. These are mostly concerned with the varied use of textual symbols, letter sign placement, and problems introduced by syllabification rules.

V. COMPARATIVE STUDY

me	on	gy	ge	tage
Development of a Text to Braille Interpreter for Printed Documents through Optical Image Processing.	Joshua L. Dela Cruz, Jonaida Angela D. Ebreo, Reniel Allan John P. Inovejas, Angelica Romaine C. Medrano.	OCR, Image Processing.	Output available in multiple format Text, Image etc.	
A system for fast text-to-braille translation based on fpgas.	Xuan Zhang, Cesar Ortega-Sanchez and Iain Murray.	Field Programmable Gate Arrays.	Hardware-based fast translation.	Super high maintenance cost.
Braille Image Recognition for Beginners.	Shafaf Ibrahim, Nor AzrinTarmizi, NurbaitySabri, NurFarahinMohdJohari, Ahmad Firdaus Ahmad Fadzil.	Support Vector Machine (SVM) technique.	Perfect to learn Braille reading.	Applications are limited only for study purpose.

Improving Optical Braille Recognition in Pre-processing stage	Vishwanath Venkatesh Murthy, M Hanumanthappa	Optical Braille Recognition (OBR) system	Image enhancement.	Poor image processing.
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Table 1: Comparative Study

VI. PROBLEM STATEMENT

There are several applications and websites available to braille translation. However, most of them are not free and have terrible user interface and the subscription cost is high, because of high cost the service became less accessible to user. Software like this should be and must be available to everyone whoever needs it.

VII. PROPOSED SYSTEM

OCR is not a new field and a lot of documentation has been published in this area. Currently the best open source OCR engine available. Only a few GUI devices that use the power of the Tesseract API. So far no work has been done to use the OCR engine for Braille translation. Braille OCR is currently the only open-source GUI image application that uses the power of the Tesseract engine to extract text from images and convert them into Braille, which can ultimately help the visually impaired. Text extracted using tesseract from given Image will be stored in a string, for further processing. The saved string will get passed on to text to braille conversion algorithm, where each character of that string will transformed into its unique braille format. Braille is a system that uses raised dots to combine letters and numbers. It is used to help blind or partially sighted people to read and write. A complete Braille cell has two incremental points with three columns. The position of the point is determined by the digits from one to six. There are 64 possible combinations as there are no dots for word space. Braille is a series of characters or "cells" consisting of six extended point patterns and arranged in a rectangle with two columns of three points. The pattern arrangement corresponds to the written alphabet.

VIII. ALGORITHM

The Algorithm for Translating Plain Text to Braille:

Step.1: Start

Step.2:

- String Plain_Text = "Text To Convert";
- List words = Plain_Text.split(" ");

Split he text into words by dividing them based on white space characters.

Step.3:

- number = chr(⠠);
- result+=
- number + numbers.get(word[index]);

Handle the numbers first For each word,

First 10 letters of the alphabets and Numbers 0-9 use the same symbols

- An escape code (⠠) is placed before groups of numbers, To differentiate numbers and letters.

Step.4:

- capital = chr(⠠);
- result += capital + char.lower();

Handling the capital letters.

Escape codes (⠠) is added to the beginning of each capital letter and the letter is changed to lowercase.

Step.5:

- braille = build_braille(trimmed_word,
- shavings, index, braille) + " " ;

Build the translation.

Step.6: Exit

IX. MATHEMATICAL MODEL

The color image is translated into binary image that can be used for pre-processing using the equation-1 that compute color image into grey scale.

$$(0.3R + 0.6G + 0.1B)/3 \dots (1)$$

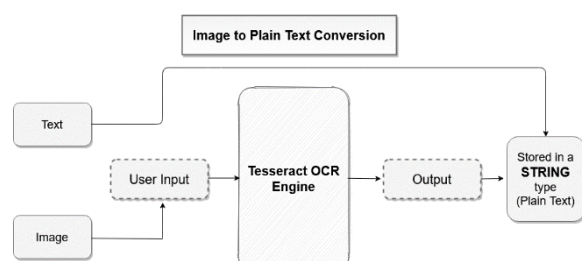
A pixel color in an image is a combination of three colors Red, Green, and Blue (RGB). ... The conversion of a color image into a grayscale image is converting the RGB values (24 bit) into grayscale value (8 bit). Various image processing techniques and software applications converts color image to grayscale image.

The reason for differentiating such images from any other sort of color image is that less information needs to be provided for each pixel. ... In addition, grayscale images are entirely sufficient for many tasks and so there is no need to use more complicated and harder-to-process color images.

The mathematical model work in terms of colors, it targets primary colors which are R (red) G (green) B (blue) and divides them by 3 resulting into colored to grayscale image.

X. SYSTEM ARCHITECTURE

MODULE 1



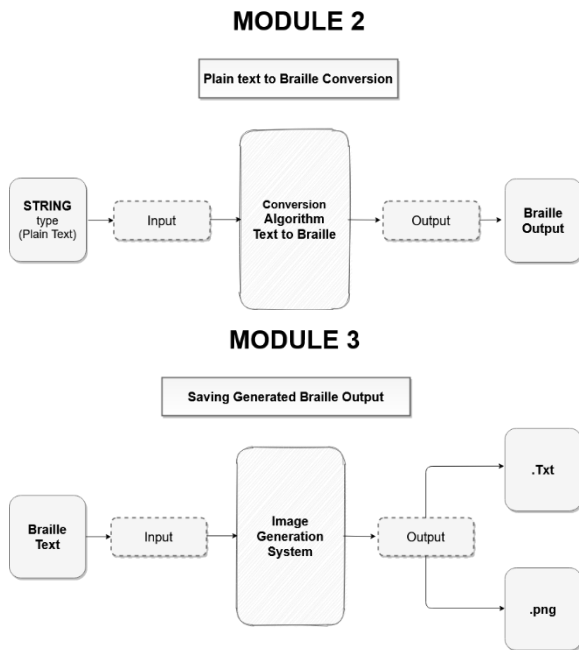


Fig.1: System Architecture

Description: 4 Step Process

1. Uploading Image
2. Extracting Plain Text by Scanning Image
3. Converting English To Braille
4. Saving Braille Code output as TXT file

XI. ADVANTAGES

- OCR Accuracy with respect to Varying Height and Camera Angle for Arial 6 braille cells, making it a good alternative to braille printed books.
- This application converts an image document to Braille format and thus this application can help a lot of visually impaired people.
- This application is also currently the only tool that extracts text from images and converts it to Braille.
- Organizations such as School Institutions for Blind Community can be very beneficial from this System where they can use this System for preserving documents, storing books in digital braille format.
- This System will be an Open Source. So that anyone can have access to it as there will be no need of subscriptions or purchase required.

XII. DESIGN DETAILS

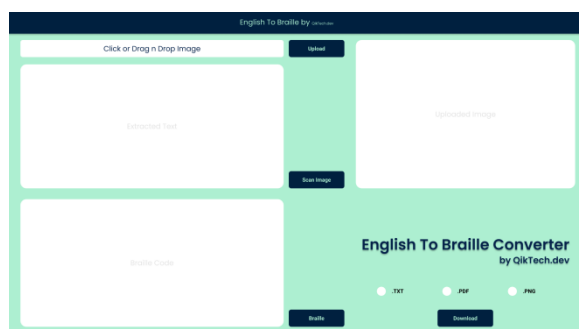


Fig 2: Website Ui

The website is a single page application. You can upload, scan, convert image into a Braille text and download the converted text.

XIII. CONCLUSION

Thus, We have tried to implement the paper “Joshua L. Dela Cruz, Jonaida Angela D. Ebreo, Reniel Allan John P. Inovejas, Angelica Romaine C. Medrano.”, “Development of a Text to Braille Interpreter for Printed Documents through Optical Image Processing.”, IEEE 2017 and according to the implementation the conclusion is for the conversion of plain text into Braille Language. System has performed extraction of text from an input image and then passing the text for conversion into Braille Language. This process benefits to schools, parents or anyone who can help blind people for reading purposes, also can help preserving documents in Digital Braille Format. Hence the above project was successfully implemented.

REFERENCE

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