# Design and Testing Algorithm for Real Time Text Images: Rehabilitation Aid for Blind

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## Abstract

There is a possible demand of an assistive device for blind and partially blind people which can assist to read any printed text or book without converting the literature into Braille. This is enable access to text and books easier and reduces the cost of conversion of Braille. Our proposed system can read texts to live video taken from ring based hardware. Than our system will process images extracted from video and will Zone based OCR to convert into computer understandable character which would be corrected using Frequent Pattern tree algorithm and would be set to a text to speech software. The proposed hardware can not only have camera but also having buzzer and vibrator to give physical stimuli to blind user.

**Keywords: video; optical character recognition; Zone based feature extraction; Text to speech; Rehabilitation engineering; assistive device; blind people**

## I. INTRODUCTION

There are 285 million (2850 lakh) visually impaired people in the world, out of which 39 million are completely blind [1] . Moreover, there are more than 2 billion people in the world who are illiterate, as they cannot read or write [2]. Developing technological assistive tools for visually impaired people will make them more independent, contributing to a balanced social life.

This project is aimed to develop a low cost assistive technology for all such people, to help them read English literature. Reading machine is mechatronic device using optical character recognition and text to speech technology in order to output synthetic voice from printed text helping blind and visually impaired people to go through typed text [1]. This assistive technology provides auditory and tactile feedback. It is small scale and mobile, which enables a more manageable operation with little set-up. The corresponding system can handle regular printed material such as books, letters, reports, memoranda, etc., in most common fonts and sizes. Modern reading machines can now reads text with images and still give a consistent output using sophisticated software algorithms to remove graphs, pictures and figures from the text inputted[3].

Many assistive technologies helping visually impaired people have been developed [5]. However they still face some challenges. First, the systems developed are either embedded in mobile phones or computer which significantly decreases their usability for visually impaired people. Another issue is related to OCR part of the system, the recognition of character is still subject to intensive research, but attain a decent performance.

## II. SYSTEM TECHNOLOGY

The development of such systems required the development of two technologies that are central to these systems, namely OCR (Optical Character Recognition) and TTS (Text-to-Speech).

### *A. Optical Chracter Recognition*

Optical character recognition is one of the cornerstones of reading machines. It is the conversion of images of type written or hand written text in to machine–encoded text or more specifically in to text file [4]. It is wildly used to input data from any form of printed text hardcopies. Modern OCR techniques give very good results.

### *B. Text-to-speech*

Text-to-Speech or speech synthesis is the production of human speech using a computerized process. The computerized unit is called synthesizer. The speech output is generated after the concatenation of different speech units stored in the system's database. These units can be words or whole sentences depending on the system and the output's quality desired.

## III. OPTICAL CHARACTER RECOGNITION PROCESS

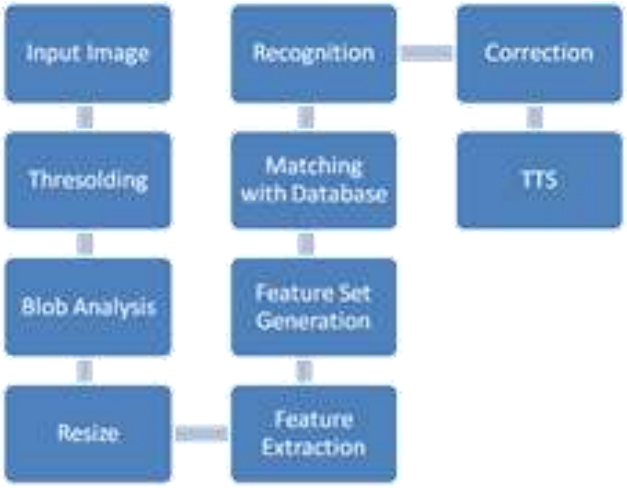



Fig. 1: Block diagram of OCR

### *A. Feature Extraction:*

## IV. DESIGN OF THE SYSTEM

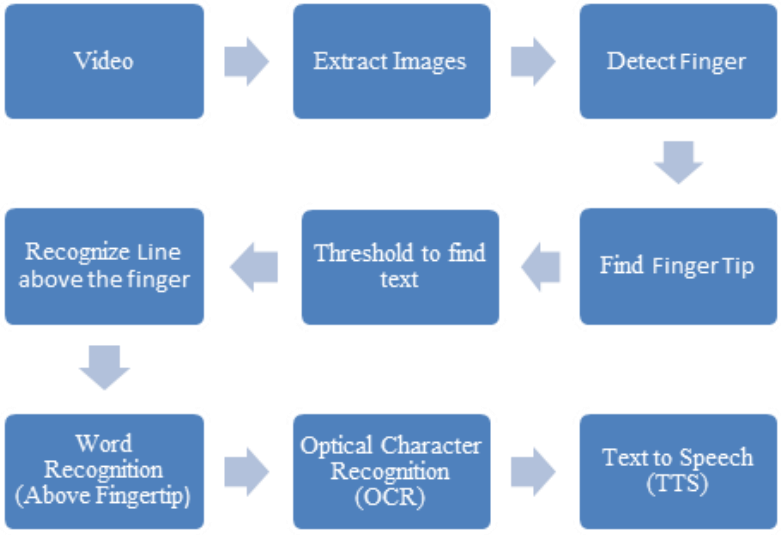



Fig. 2: Block diagram of the system

## V. COMPONENT SPECIFICATION

Reader for blind is an index-finger wearable device that supports the visually impaired in reading printed text by scanning with the finger. This work features novel hardware and software that includes haptic response, video-processing algorithms and different output modalities. The index finger-worn design helps focus the camera at a fixed distance and utilizes the sense of touch when scanning the surface. This system does not require many buttons or parts.

The reading machine is considered for visually impaired people. The machine takes the printed text as an input and produces speech thanks to the OCR and TTS systems that are merged in the standalone machine. The reading machine is composed of 12M pixels web camera is warn on the index finger and takes a picture of the print text to send it to the integrated computer. The integrated computer then uses the OCR software, which outputs a text file to be processed by the TTS software resulting in waveform speech to be outputted by the speakers.

The reading machine main goal is to integrate the components of image capture, OCR and TTS into one user-friendly device designed for visually impaired people. In contrast with the computer and mobile phone applications, it ensures an easy way for visually impaired people to read documents and does not require external assistance.

### *A. Hardware details:*

I use 12M-pixel web camera as scanner device with Frame rate 25FPS at 50Hz cycle (30FPS/60Hz). One vibration motor is embedded on it for haptic feedback. Attach one buzzer for auditory feedback. When system cannot find more word block along the line I trigger an event to let user know they reached the end of printed line.

Ring based Web camera

Arduino based hardware

### *B. Software Details*

To accompany the hardware, we developed a software in MATLAB that includes a text extraction algorithm, hardware control driver, integration layer with OCR and simple Text-to-Speech reader (TTS). Simple TTS reader is a small clipboard reader. Simply copy any text and it will read aloud

The text-extraction algorithm expects an input of a close-up view of printed text. I start with image binarization. Then detect the finger and find its position. Then after I detect line above the finger and then find the word above the finger. These characters are sent to the OCR system. Here we use template matching for character recognition for faster performance.

Creating templates: image from A to Z in upper case and lower case and number from 0 to 9 are taken in to different variables and are preprocessed. All these variables are stored in the form of a cell in which each sub matrix represents a letter. The same process is done for printed upper case, printed lower case and printed numbers. All the model inputs are saved under the same variable name like 'templates.mat' in the memory.

## VI. EXPERIMENTAL RESULT

1. Input image

2. Image Acquisition

3. Skin Detection

4. Find finger tip

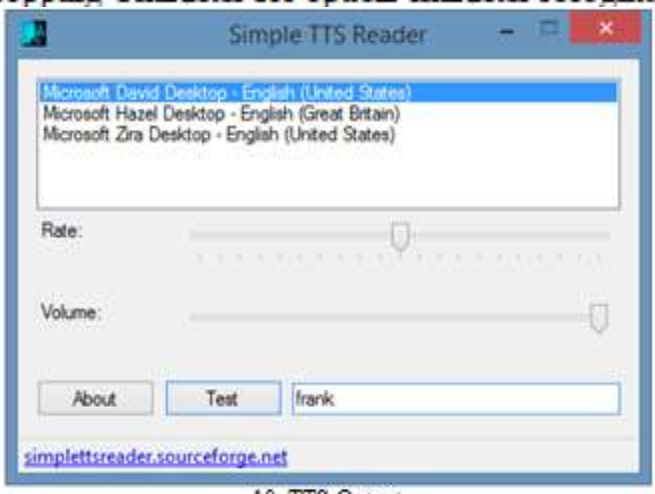
5. Thresholding

6. Line Abstraction

7. Nearest Region

8. Red Boundary

9. Cropping Character for optical character recognition




10. TTS Output

## VII. CONCLUSION

It also combines OCR and TTS for specific application. It considered as assistive technology for blind and partially blind people for reading purpose. It promotes educational purposes and knowledge for visually impaired people. The computing world has a lot to gain from Zone based feature extraction. Their ability to learn by example makes them very flexible and powerful Finally, I would like to state that even though zoning have a huge potential we will only get the best of them when they are integrated with computing and used FP Tree based correction method for eliminate OCR error.

## ACKNOWLEDGEMENT

This research paper is made possible through the help and support from everyone, including: parents, teachers, family, friends, and in essence, all sentient beings. Especially, please allow me to dedicate my acknowledgment of gratitude to first and foremost to my guide Prof. Priyank shah for his continuous support and encouragement. and my principal and all faculties of my college, parents, friends who provide advice and financial support. The product of this research paper would not be possible without all of them.

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