

# OPTICAL CHARACTER RECOGNITION FOR BLIND USING RASPBERRY PI

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**Abstract** - Visual impairment is one of the biggest limitation for humanity, especially in this day and age when information is communicated a lot by text messages (electronic and paper based) rather than voice. The device we've got projected aims to assist individuals with visual defect. In this project, we tend to developed a tool that converts associate degree image's text to speech. In this project an innovative, efficient and real-time cost beneficial technique that enables user to hear the contents of text images instead of reading through them as been introduced. It combines the concept of Optical Character Recognition (OCR) and Text to Speech Synthesiser (TTS) in Raspberry pi. This paper describes the look, implementation and experimental results of the device. This device consists of two modules, image processing module and voice processing modul<sup>[1]</sup>. The captured image undergoes a series of image pre-processing steps to locate only that part of the image that contains the text and removes the background. This project uses python coding is raspberry pi to convert input text to speech.

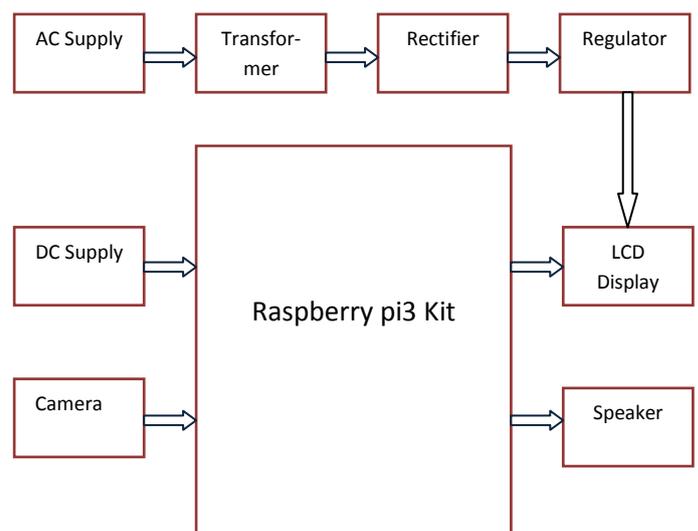
**Key Words:** Raspberry pi 3, Optical character recognition, OpenCV, Text to speech conversion, Python programming.

## 1. INTRODUCTION

In this world 7.4 billion humans, 285 million are visually impaired out of whom 39 million people are completely blind, and 246 million have mild or severe visual impairment (WHO, 2011). It has been expected that by the year 2020, these numbers can rise to seventy five million blind and two hundred million individuals with handicap. As reading is of prime importance within the daily routine (text being gift everywhere from newspapers, industrial product, signboards, digital screens etc.) of humans, visually impaired individuals face a lot of difficulties. Our device assists the blind people by reading out the text to them. There have been numerous advances in this area to help visually impaired to read without much difficulty. In this project, we wanted the device to be able to detect the text from printed text image and read it efficiently. Inspired by the methodology utilized by Apps like "CamScanner". Optical character Recognition (OCR) is a conversion of scanned or printed text images, handwritten text into editable text for further processing. In this paper, we have presented a robust approach for text extraction and convert it to speech. This device was tested on raspberry pi platform. The Raspberry

pi is initially connected to the internet through WiFi. The software is installed using command lines. The first setup is to transfer the installation script, second command is to convert it to executable form and the last command starts the script which does the rest of the installation work. Device got wind of is finished as in Fig.1 .The digital camera is manually targeted towards the text. Then, to take a picture, press capture button. After that, picture is taken and processed by Raspberry pi to hear the spoken words of the text through the earphone or speaker plugged into Raspberry pi through its audio jack<sup>[1]</sup>.

## 2. BLOCK DIAGRAM



The device consists of a Raspberry Pi 3B, speaker or earphones, Raspberry pi camera, power offer (230V AC) and a rectifier converts ac to pulsating dc. The voltage regulator regulates the voltage to a fixed level to power the Raspberry Pi. The camera should manually be pointed towards the text and an image is captured. This image is then processed by the Raspberry Pi and therefore the audio output is given through the speaker. The raspberry pi has integrated peripheral devices like USB, ADC, Bluetooth, WiFi and SPI. Raspberry pi 3 B+ Linux operating system named Raspbian stretch. In this system the printed text is placed under camera view by the blind person to ensure the image of good quality and fewer distortions. Then an applicable blind assistive system, a localization algorithm might prefer higher recall by sacrificing some precision.

### 3. WORKING PRINCIPLE

When capture button is clicked, this technique captures the document image placed before of the camera that is connected to Raspberry pi through USB. After selecting the process button the captured document image undergoes Optical Character Recognition(OCR) Technology. OCR technology permits the conversion of scanned pictures of printed text or symbols into text or info which will be understood or edited using a computer program. In our system for OCR technology, we have a tendency to ar mistreatment TESSERACT library. Using Text-to-speech library the info is going to be reborn to audio. The camera acts as the main vision in detection the image of the placed text document, the image is processed internally and separates label from the image by mistreatment open CV library and finally identifies the text that is pronounced through voice. Now the reborn text into audio output is listened either by connecting headsets via three.5mm audio jack or by connecting speakers via Bluetooth.

### 4. SYSTEM SPECIFICATION

#### 4.1 Software Specification

Operating system: Raspbian (Stretch)

Language: Python3

Platform: Tesseract, OpenCV (Linux-library)

Library: OCR engine, TTS engine

The operating system under which the proposed project is executed is Raspbian which is derived from the Debian operating system. The algorithms square measure written victimization the python language that may be a script language. The functions in algorithm are called from the OpenCV Library. OpenCV is an open source computer vision library, which is written under C and C++ and runs under Linux, Windows and Mac OS X. OpenCV was designed for process potency and with a powerful target period of time applications. OpenCV is written in optimized C and may profit of multi-core processors.

#### 4.2 Hardware Specification

##### HARDWARE REQUIRMENT

- a) USB Camera
- b) Raspberry Pi 3 Model B
- c) LCD Display
- d) Capacitors
- e) Transistors
- f) Cables & Connectors
- g) Diode
- h) PCB

- i) LEDs
- j) Transformer/Adapter

##### A) USB CAMERA



**Fig-1**

USB Cameras square measure imaging cameras that use USB a pair of.0 or USB 3.0 technology to transfer image information.USB Cameras square measure designed to simply interface with dedicated pc systems by victimisation a similar USB technology that's found on most computers.

##### B) Raspberry pi 3 Model B



**Fig-2**

The Raspberry Pi three Model B may be a small mastercard size laptop.Just add a keyboard, mouse, display, power supply, micro SD card with installed Linux Distribution and you'll have a fully fledged computer that can run applications from word processors and spreadsheets to games.As theRaspberry Pi three supports HD video, you'll be able to even produce a media centre with it.The Raspberry Pi three Model B is that the 1st Raspberry Pi to be ASCII text file from the point in time, expect it to be the defacto embedded UNIX system board all told the forums.

##### Raspberry Pi 3 Specifications

**SoC:** Broadcom BCM2837  
**CPU:** 4× ARM Cortex-A53, 1.2GHz  
**GPU:** Broadcom VideoCore IV  
**RAM:** 1GB LPDDR2 (900 MHz)  
**Networking:** 10/100 Ethernet, 2.4GHz 802.11n wireless  
**Bluetooth:** Bluetooth 4.1 Classic, Bluetooth Low Energy  
**Storage:** microSD

**GPIO:** 40-pin header, populated

**Ports:** HDMI, 3.5mm analogue audio-video jack, 4× USB 2.0, Ethernet, Camera Serial Interface (CSI), Display Serial Interface (DSI)

### 5. OPTICAL CHARACTER RECOGNITION

Optical character recognition (OCR) refers to each the technology and method of reading and changing typewritten, written or written characters into machine-encoded text or one thing that the pc will manipulate. It is a set of image recognition and is wide used as a type of knowledge entry with the input being some type of written document or knowledge recordsuch as bank statements, sales invoices, passports, resumes and business cards. The document is either scanned or an image is taken associated it's up to the program to acknowledge the characters and provides an output within the type of a text document.

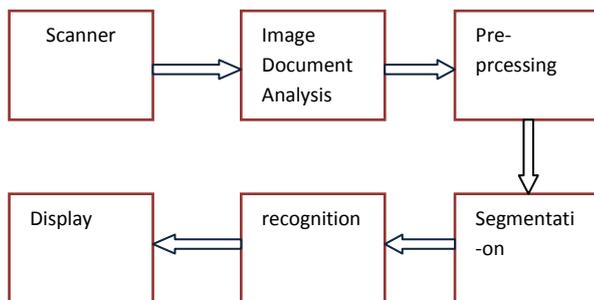


Fig-2 OCR Process Details

### 6. METHODOLOGY

#### 6.1 Image Capturing

The first step is the one in which the document is placed under the camera and the camera captures an image of the placed document. The quality of the image captured are going to be high thus on have quick and clear recognition because of the high-resolution camera.

#### 6.2 Pre-Processing

The pre-processing stage consists of 3 steps: Skew Correction, Linearization, and Noise Removal. The captured image is checked for skewing. There are possibilities of the image getting skewed with either left or right orientation. Here the image is first brightened and binarized.

The perform for skew detection checks for AN angle of orientation between ±15 degrees and if detected then an easy image rotation is disbursed until the lines match with the true horizontal axis, that produces a skew corrected image. The noise introduced during capturing or due to the poor quality of the page has to be cleared before further process.

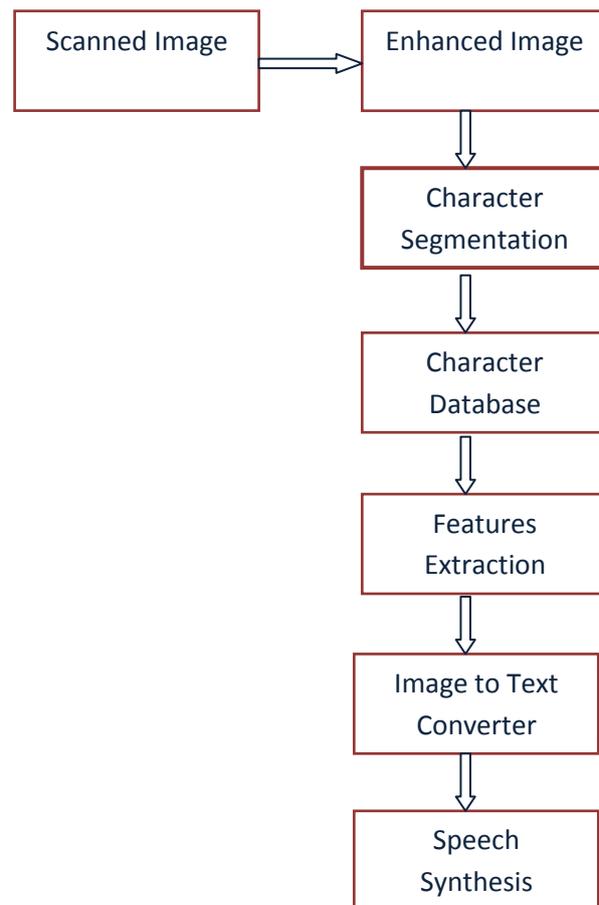


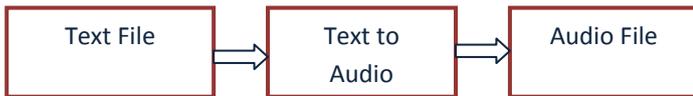
Fig-3 Flow of Process

#### 6.3 Image to Text Converter

The computer code values of the recognized characters area unit processed by Raspberry Pi board. Here every of the characters is matched with its corresponding guide and saved as normalized text transcription. This transcription is additional delivered to the audio output.

#### 6.4 Text to speech

The scope of this module is initiated with the conclusion of the receding module of Character Recognition. The module performs the task of conversion of the transformed text to audible form. The Raspberry Pi has an on-board audio jack, the on-board audio is generated by a PWM output and is minimally filtered. A USB audio card will greatly improve the sound quality and volume. As the recognition method is completed, the character codes within the computer file square measure processed mistreatment Raspberry Pi device on that acknowledge a personality mistreatment Tesseract algorithmic rule and python programming, the audio output listens.



## 7. RESULT



Fig-4 (a) Complete Setup

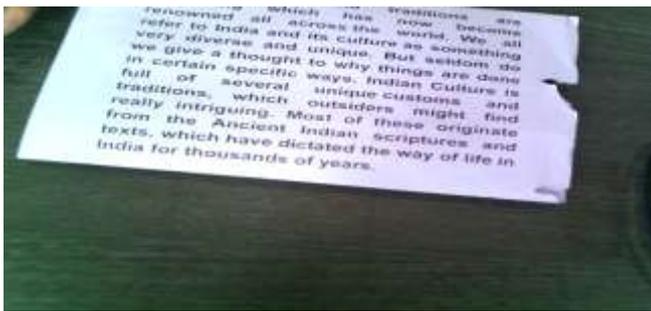


Fig-4 (b) Image Captured by webcam

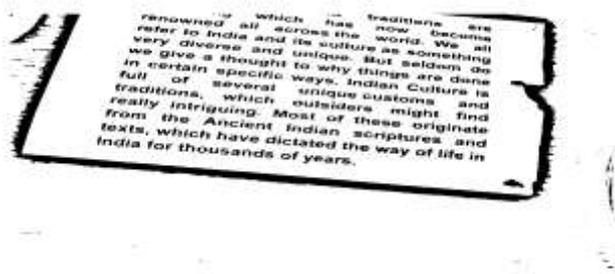


Fig-4 (c) Text Conversion

Any number or character in English alphabet can be read by this pi. Fig-3(a) shows whole complete setup of laptop, Raspberry pi3 and webcam. Fig-3(b) shows a sample image which has been captured using the webcam. The image which has been processed is displayed in the form window. Fig-3(c) shows the text form of the captured image which is converted into the audio output using Raspberry pi3.

## 8. CONCLUSION

The text to speech system is implemented with the help of Raspberry Pi board. The results of simulation are verified successfully along with various Samples have been used to test the output. The input image is processed efficiently by algorithm used and clear output is generated. This piece of equipment is affordable and productive to blind people. The device is tested with different text and verified. This device is useful for the society and compact. With this application blindness problem cannot be overcome completely, but it can help them at least to some extent.

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