

# A Smart Reader for Visually Impaired Individuals

Shraddha Hingankar<sup>1</sup>, Prachi Tardekar<sup>2</sup>, Prof. Santoshi Pote<sup>3</sup>

<sup>1</sup>B.Tech Student, Dept. of Electronics and Communication Engineering, Usha Mittal Institute of Technology, SNDT Women's University Mumbai, India

<sup>2</sup>B.Tech Student, Dept. of Electronics and Communication Engineering, Usha Mittal Institute of Technology, SNDT Women's University Mumbai, India

<sup>3</sup>Professor and Guide, Dept. of Electronics and Communication Engineering, Usha Mittal Institute of Technology, SNDT Women's University Mumbai, India

\*\*\*

**Abstract** - Smart Reader for Blind People, developed on Raspberry pi. It uses Optical character recognition for conversion of image to text and text to speech is used to convert the text into speech output and also python programming language is used. The Raspberry Pi 3 camera is used to capture an image of the printed text. The image preprocessing is used for different function like binarization, de-noising, de-skewing, segmentation and feature extraction.

**Key Words:** Raspberry pi 3b, Optical Character Recognition (OCR), Text to speech (TTS), Pi-camera, Speaker, Headphone

## 1. INTRODUCTION

In smart reader for blind People the raspberry pi, OCR, TTS engine is used. The raspberry pi 3 camera is used for capturing the image. The Optical character recognition is used for converting image into text format. In the world 285 million people are visually impaired[1]. In this project we are going to develop model in which the image first converted into text and then text is converted into speech. This project help blind people to read the book without taking help of others. The python programming is use for raspberry pi. In this project Raspberry Pi processor board used. It peripheral device required for this project are camera, speaker, regulator LM2576, flashlight. Optical Character Recognition or OCR is implemented in this project to recognize characters and then after recognize the character the text to speech engine is used for audio output through speaker. In the project setup, the camera is mounted on a stand in such a position that if a paper is placed in between the area marked by angular braces, it captures a full view of the paper into the system. Then after that the system takes the photo. The image capture by the camera then converted into text and text is converted into speech.

## 2. LITERATURE SURVEY

“OC based facilitator for the visually challenged”: The paper encouraged us to do this project. From this paper we got to know that there are many people who are facing the BVI problem. Also this paper gave us brief idea about OCR technology and the implementation details which were very useful. We found this as reference and have tried to approach in a efficient way [1].

Smart Reader for Visually Impaired People Using Raspberry Pi: This paper propose that how to convert image into text and text into audio. Also this system give complete information about hardware and software implementation for blind reader.

Raspberry Pi Based Reader for Blind People : The software Implementation and programming along with the details of ocr engine were very useful from this paper. This paper gave the detail information about which engines to be used for image to text conversion , and text to speech [2].

“OCR based automatic book reader for the visually impaired using Raspberry PI” – This paper provided the case study and from this paper we learnt to build a system on English language, and we were able to think that in other language can also be done, which we put it in advancement [8].

Michael Mc Enancy Finger Reader Is audio reading gadget for Index Finger IJECCE Vol. 5, Issue 4 July-2014: This paper encouraged us to build the entire blind reader system mechanism.

## 3. PROPOSED WORK

Image Capturing: First step is to capture an image from the document or book and the document or book is placed under the camera which is help to capture an

image from the document or book [2]. The camera used to capture an image is raspberry pi 3 camera.

**Image Pre -processing:** Image pre-processing is to remove unwanted noise in the image by applying appropriate threshold [6]. It is used for correcting skew angles, sharpening of image, thresholding and segmentation.

**Text extraction:** In this paper we use tesseract ocr engine which is used to extract the recognized text.

**Text to speech :** After extracting the text the text will be converted into speech. The text to speech synthesizer is used to convert text into speech. At last stage the speech output will get through

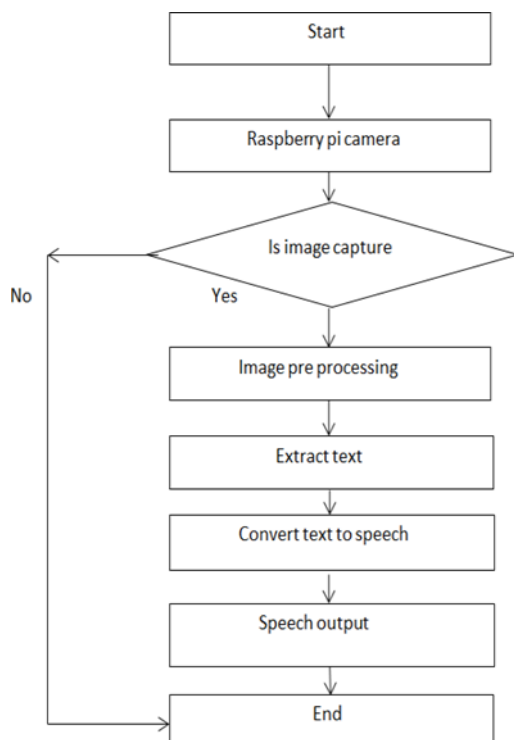


Fig.1. flowchart of OCR

**A. HARDWAR IMPLEMENTATION**

1. Raspberry Pi 3 Model B: Raspberry pi nowadays is very important in embedded system development also its makes development very fast and one can build the demo project within hours. Here we use raspberry pi 3 model B as the processing platform as it act as both processor and controller. It supports Debian based OS and hence it is portable pocket computer.

The Raspberry pi 3 model B is 10 times more powerful than 1<sup>st</sup> generation. It has wireless lan and Bluetooth connectivity. The Raspberry Pi 3 has quad-

core ARM Cortex-A53 processor. The Raspberry pi is credit card size single board computer. It has 40 general purpose input and output pins.

The technical specification of raspberry pi 3 model B include [2]:

- 802.11n Wireless LAN
- Bluetooth 4.1
- Bluetooth Low Energy (BLE)
- 4 USB ports
- Full HDMI port
- Ethernet port
- Consolidated 3.5mm sound jack and composite video
- Camera interface (CSI)
- Display Interface (DSI)
- micro SD card space



Fig.2.Raspberry Pi 3 model B

2. Use of Raspberry pi :

It has four USB ports through which four models can be connected to a time and used simultaneously. Python, which is the programming language of raspberry pi is an object oriented programming and it is comparatively easier to read and understand because of its similarity to English language [4].

Raspberry Pi is a microprocessor it is just like a pc with less specifications or a credit size computer. The Raspberry Pi has found its way in to the hobbyist market for computing, but it is also very capable for other business and personal use as well. An extremely low power draw, small form factor, no noise, solid state storage, and other features make it an attractive solution for a small and lightweight server.

It uses the Optical character recognition technology for the identification of the printed characters using image sensing devices and computer programming. It converts images of typed, handwritten, or printed text

into machine encoded text. The result is book reader that can read the book aloud to you .

### 3. Raspberry pi 3 camera module:

Raspberry pi 3 camera is used to capture the image of printed text .The camera can be directly plug into raspberry pi 3 model B camera port It is light weight and portable

Specification:

- a. 5-megapixel OV5647 sensor in a fixed-focus module
- b. Picture resolution is 2592 × 1944
- c. Support 1080p30, 720p60 and 640x480p60/90 video record
- d. Dimension: 25mm x 24mm x 9mm



Fig.1 . Example of an image with acceptable resolution

- 1) Speaker/Headphone –As an output device for listening to the speech output.
- 2) Bench support –A rectangular plywood for hosting the mechanism, Camera, and RIP system all together tightly
- 3) Book -The main source of knowledge, for capturing image and turning mechanism.
- 4) Flash Light-To get the best quality of image so the ocr can extract all the words clearly
- 5) Power Supply-It is the device that supplies electrical energy to the output loads .And also its gives a regulated power supply of +5V with a output current compatibility of 100mA

## B. SOFTWARE IMPLEMENTATION

Software is a set of instructions and programme which decides the functionality of hardware. In our design we have used python 3 .also installed open cv library, tesseract OCR and gtts

Python 3:

In our project Raspberry pi is instructed to do the task using python. As it is easy to use and user friendly language with lot of features and packages available. There is no need of installation of it because in pi there is inbuilt software of python 3 which comes with pip 3 as its package installer.

Open CV library:

It stands for open source computer vision library which contains set of algorithms and special inbuilt functions that handles computer vision. It supports wide variety of programming languages. The most commonly used is python. We can install open cv library in raspberry pi by typing “sudo apt-get install python-opencv” on command window. Once it is successfully installed , one can run python code by importing cv2 library of open cv.

In this open CV is used for capturing the image of books page using pi camera and apply it inbuilt functions for pre- processing like de-skewing, noise removing, binarizing etc. so that we get clear image for converting it to text by OCR module.

Optical Character Recognition:

OCR has played important role in this module .OCR or Optical Character Recognition is a technology which is used to recognize text from printed scanned documents through the optical mechanism. Tesseract is an optional character recognition engine . To install it type “sudo apt-get install tesseract-ocr” command in the terminal.

OCR software is used to convert image into text format. It is a conversion of image of typed or handwritten or printed text into machine encoded text [3]. It is use for blind and visually impaired people also use for automatic number plate recognition. Tesseract is a type of OCR engine with matrix matching. The selection of Tesseract engine is due to its flexibility and extensibility of machines and the fact that many communities are active researchers to develop this OCR engine and also due to this reason Tesseract OCR can support149 languages. In this project we are identifying English alphabets and also the two basic languages Marathi and hindi .



For different languages:

1. We can check the languages available by typing "\$ tesseract --list-langs" on the terminal
2. To download tesseract for specific language use "\$ sudo apt-get install tesseract-ocr-LANG", LANG is the three letter code for the languages.
3. Download the .trainedata file for the languages and place it in \$ TESSDATA\_PREFIX. Directory . this should be same as where the tessdata directory is installed.
4. Tesseract does not have feature to detect languages. To detect languages install langdetect via pip by typing "\$ pip install langdetect" command.

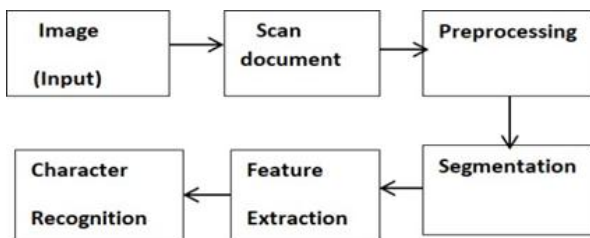


Fig.4.Working Principal

Google Text to Speech :

Google Text to Speech is an API developed by Google for reading out text on the screen. i.e. which is use as a screen reader application. It is open source software and could be used by various programmers on different platform. This software helped in the project as it was implemented using python. This API supports over 50 languages and also sounds very natural. In this the programmer also has the option to change the accent, the speed and the many other things just by changing the source code according to the preference.

Installation of this API is simple by running the following command in terminal "sudo pip install gTTS" This API helps to read out the converted text from tesseract in the form of audio output by speaker. TTS, is a form of speech synthesis that converts text into audio output.

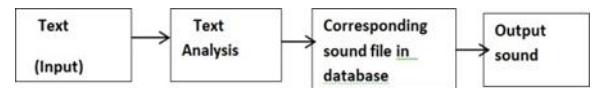


Fig.5.TTS Working Principal

#### 4. CONCLUSION

In this analysis, we've got represented a epitome system to scan written text and handheld objects for helping the blind individuals. This project is based on hardware and software implementation. Also it is made on various platform like python programming optical character recognition (OCR) & text-to-speech (TTS) conversion which are run on Raspberry Pi 3B model.

#### REFERENCES

- 1) Sonth , Shalini , and Jagadish S. Kallimani. "OCR based facilitator for the visually challenged." 2017 International Conference on Electrical, Electronics, Communication, Computer, and Optimization Techniques (ICECCOT). IEEE, 2017.
- 2) Goel, Anush, et al. "Raspberry Pi Based Reader for Blind People." International Research Journal of Engineering and Technology 5.6 (2018): 1639-1642.
- 3) Chaudhari, Harshada. "Raspberry Pi technology: a review." International Journal of Innovative and Emerging Research in Engineering 2.3 (2015): 83-87.
- 4) International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 06 Issue: 04 | Apr 2019 www.irjet.net p-ISSN: 2395-0072© 2019, IRJET | Impact Factor value: 7.211 | ISO 9001:2008 Certified Journal | Page 170 BLIND READER USING RASPBERRY PI
- 5) International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887 Volume 7 Issue III, Mar 2019- Available at www.ijraset.com
- 6) Raspberry pi 3b, Optical Character Recognition (OCR), Text to speech (TTS), Pi-camera, Speaker, Headphone
- 7) Gurav, Mallapa D., et al."B-LIGHT:A Reading aid for the Blind People using OCR and OpenCV." International Journal of Scientific Research Engineering & Technology(IJSRET),ISSN(2017).

- 8) James, S. Aaron, S. Sanjana, and M. Monisha: OCR based automatic book reader for the visually impaired using Raspberry PI." International Journal of Innovative Research in Computer and Communication 4.7 (2016).