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# Smart Communicator for Dumb People

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**Abstract:** *This project presents the Smart Communicator for Dumb People. The project is developed on Raspberry Pi module3. 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. In this research these images are converted into the audio output (Speech) through the use of Text-to- speech synthesis. The conversion of printed document into text files is done using Raspberry Pi which again uses Python programming. The text files are processed by Open CV library & python programming language and audio output is achieved.*

**Keywords:** Image Capturing, Raspberry-Pi, OCR Process, Text to Speech Convertor, Open CV Library, etc.

## I. INTRODUCTION

Human communication today is mainly via speech and text. To access information in a text, a person needs to have vision or good education. However, those who are deprived of vision or dumb people can gather information using their hearing capability. Reading is very important in today's world. Blind people are an integral part of our society. However, their disabilities have forced them to be dependent on others for assistance for daily life activities such as shopping, reading signpost etc. Most published printed works do not include braille or audio versions, and digital versions are still a minority. On the other hand, Dumb or Blind people are not able to read the simple warnings in walls or signals that surround us because they are not educated. Thus, the development of a portable device that can perform the image to speech conversion, whether it's has a great potential and utility.

## II. BRIEF LITERATURE SURVEY

There are many existing solutions to the problem of assisting individuals who are Dumb to read, however, none of them provide an efficient reading. This report focuses on improving the competence of blind people by providing them with a solution where the details are given in the form of audio signal. Raspberry Pi-Based Reader is an automatic document reader for visually impaired people using OCR technology. The proposed work uses a camera based assistive device which can be used by individuals to read printed text. The scheme is to implement an embedded system-based image capturing technique using Raspberry Pi board.

The design is inspired by prior research with visually impaired people, and it is small and portable, that helps in achieving result in little setup. Here, we have put forward a text read out system for visually impaired people. OCR and Text-to-Speech synthesis is used to convert images into audio output (Speech). The proposed apparatus has a camera which acts as the input device for digitization and this digitized script is processed by OCR (software module). A procedure is followed for recognition of characters and the line of reading. In the context of software development, the Open CV (Open-source Computer Vision) libraries are employed to capture image of text and character recognition. The final identified text document is given to the output devices based on the choice of the user. Headset connected to the Raspberry Pi or a speaker act as the output device.

**Objectives**

- To study the existing system.
- To design the block diagram.

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- To decide the components specification and device in system.
- To design the circuit diagram and simulate it using suitable software.
- To design the PCB and implement hardware.
- To test the circuit and observe the result.
- To prepare report and presentation

## III. PROBLEM STATEMENT

The problem of adjusting the distance between book and camera can be solved by designing a robotic table that flips the pages automatically. By providing a battery backup to the raspberry pi, the main aim of the proposed project of portability can be achieved. By enhancing application, the electronics labels, vehicles number can be scanned and processed and can be used for traffic monitoring.

A K-Reader Mobile number of portable reading assistants are designed specifically for the visually impaired. "K- Reader Mobile" is a mobile application which allows the user to read mail, receipts, fliers, and many other documents. But these systems fail to give an economic solution to the problem and are available on specific platforms.[1] This paper proposes smart shopping assistant label reading system with voice output for blind using raspberry pi. This system aims at the document to be read must be nearly flat, placed on a clear, dark surface and contain mostly black text printed on white background and it does not read from complex backgrounds. [2] This paper proposes a Navigation System for blind people to navigate safely and quickly. In this system obstacle detectionand recognition is done through ultrasonic sensors and USB camera.

This system detects the obstacles up to 300 cm via ultrasonic sensors and sends feedback in the form of beep sound via earphone to inform the person about the obstacle. [3] This system proposes a Wearable Obstacle Avoidance Electronic Travel Aids for Blind that presents a comparative survey among portable/wearable obstacle detection/avoidance systems to inform the research community and users about the capabilities of these systems and about the progress in assistive technology for visually impaired people. [4]

This paper proposes Automatic detection and recognition of signs from natural scenes. It presents an approach to automatic detection and recognition of signs from natural scenes and its application to a sign translation task. Author has applied the approach in developing a Chinese sign translation system, which can automatically detect and recognize Chinese signs as input from a camera and translate the recognized text into English but its only work in Chinese language. [5] This paper proposes a system for converting English text into speech. The feasibility of converting English text into speech using an inexpensive computer and a small amount of stored data that has been investigated. But it's not suitable for all memory range of computers. The feasibility of converting English text into speech using an inexpensive computer and a small amount of stored data has been investigated.

The feasibility of converting English text into speech using an inexpensive computer and a small amount of stored data has been investigated. The text is segmented into breath groups, the orthography is converted into a phonemic representation, lexical stress is assigned to appropriate syllables, then the resulting string of symbols is converted by synthesis-by- rule into the parameter values for controlling an analogue speech synthesizer. The algorithms for performing these conversions are described in detail and evaluated independently, and the intelligibility of the resulting synthetic speech is assessed by listening tests [6]

## IV. METHODOLOGY

The framework used in this system is the raspberry pi board. The raspberry pi 3 Model B is a single board computer. Figure 1 shows the complete architecture of the proposed work Smart Communicator for dump people. The system is designed around raspberry PI, which is nothing, but a minicomputer used to control the complete circuit action of the system. In this system, we have designed a power supply unit to provide the required power supply to the circuit components of the system. The power supply is designed to provide regulated power supply asper the requirement. The architecture of the system consists of a camera which is used to scan the printed textimage which is to be read by the system.

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This camera captures the image of the text printed on the paper for reading purpose. The web camera is connected to the USB port of raspberry pi. The raspberry pi has an OS named RASPION which process the conversions.

**Block diagram:**

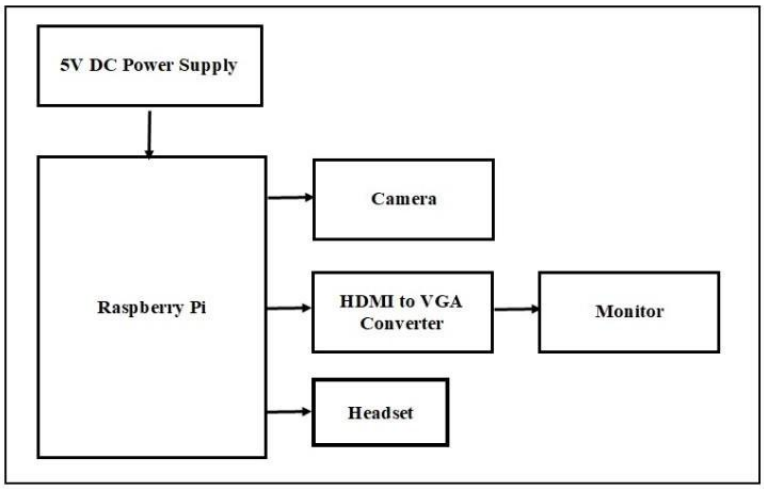



**Figure 1:** System Block Diagram

Raspberry pi 3B model of 2GB variant is connected with power supply of 5V, 3A adaptor. Camera module is connected to CSI port of raspberry pi 3B model which capture the Text Image or Printed Text feed data and send tothe model. The data of Text Image or Printed Text feed is stored in micro-SD card which is inserted in raspberry pi model. And speaker is connected to module for an audio output.

**Image Capturing:**

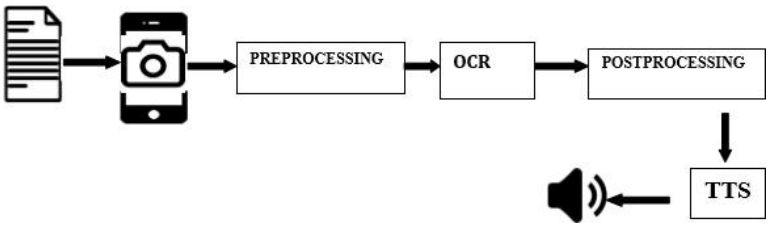
The first step is the one in which the document is placed under the camera and the camera captures an image of the placed document. The quality of the image captured will be high to have fast and clear recognition due to the high- resolution camera.

**Pre-Processing:**

The pre-processing stage consists of three 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 rightorientation. Here the image is first brightened and binaries.

**Image to Text Convertor:**

The ASCII values of the recognized characters are processed by Raspberry Pi board. Here each of the characters is matched with its corresponding template and saved as normalized text transcription. This transcription is further delivered to the audio output.



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The optical character recognition process flow is demonstrated in the above block diagram. An API request is sent for the OCR operation to be performed. The input image is read and pre-processed accordingly. The text is formattedand extracted from the image. Using the trained dataset, the image sent into the OCR engine is computed. The OCR engine tries to analyze the characters in the image and find the appropriate solutions. Once the engine finishes the analysis, it sends the data for another step of pre-processing and formatting to exclude any unnecessary items. OnceThis process is completed, we will finally have the text data required. After this, an API response can be generated back to the user with the converted text data from the image.

**Text to Image Convertor:**

The text file of scanned document is read by using the gTTs library of and converts that audio file (.mp3). After thatthrough music player of raspberry-pi so the user can hear it by using audio jack or sound. A Text-to-speech synthesizer is an application that converts text into spoken word, by analysing and processing the text using NaturalLanguage Processing (NLP) and then using Digital Signal Processing (DSP) technology to convert this processed text into synthesized speech representation of the text. The text-to-speech (TTS) synthesis procedure consists oftwo main phases.

The first is text analysis, where the input text is transcribed into a phonetic or some other linguistic representation, and the second one is the generation of speech waveforms, where the output is produced from this phonetic and prosodic information. These two phases are usually called high and low-level synthesis. The input text might be for example data from a word processor, standard ASCII from e-mail, a mobile text-message, or scanned text from a newspaper. The character string is then pre-processed and analyzed into phonetic representation which is usually a string of phonemes with some additional information for correct intonation duration, and stress. Speech sound is finally generated with the low-level synthesizer by the information from high-level synthesize.

## V. RESULTS

Thus, in our project we have successfully captured printed text or text images by the camera. Convert the printedtext into machine encoded text and then successfully converting text into appropriate audio.

**Following are some implemented results and output images**:

Figure 3 below shows stand mounted PCB board.

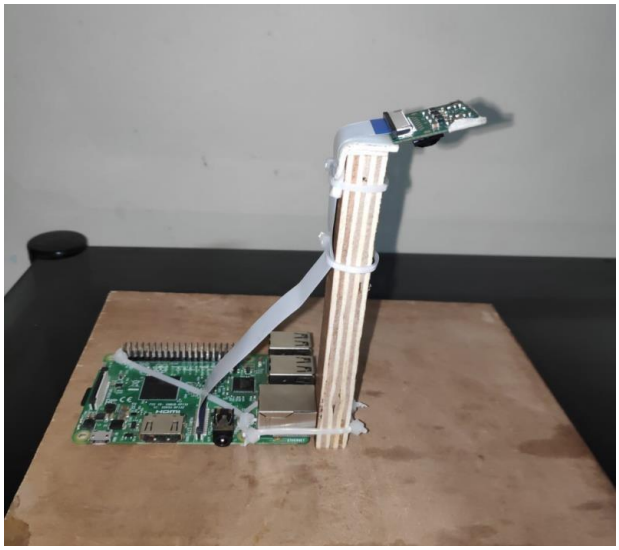

**Figure 3:** PCB board mounted on stand

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Figure 4 below shows the clicked mage by **Raspberry Pi camera.**

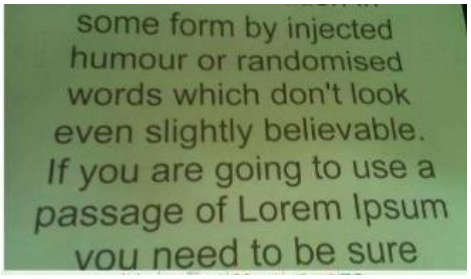



**Figure 4:** Clicked Image by Raspberry Pi camera.

Figure 5 below shows the image observed in open CV library.

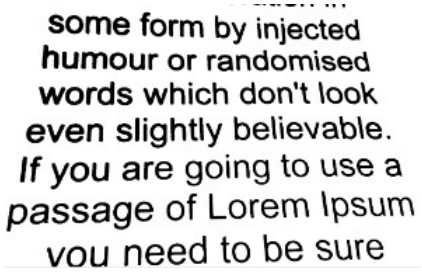


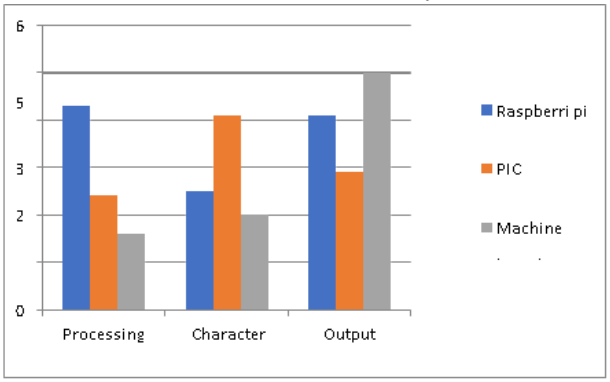

**Figure 5:** Enhanced Image with Open CV library

## VI. DISCUSSION

Comparison of existing book readers with the proposed technology here. Various Book reader has been evolved for using various technologies. The Book reader has been developed using neural technologies and machine learning has a disadvantage of recognizing the hand written style. It was difficult to understand the pattern of a character or number. But using Raspberry Pi it was easy to recognize the correct format. Pic Micro controller has been used to develop book reader which was unable to tune the sound, recognize the shape used in the image. It has been solvedby Raspberry Pi Micro controller with its inbuilt feature of sound tuning. The figure 12 explains the comparison between our microcontroller Raspberry Pi with the other controllers and existing system such as PIC, Machine learning with various features such as processing, Character recognition, Performance, Output.

**Result:** In the future, we can use these projects to read the entire book by using this project.

**Table 1:** Performance Analysis



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## VII. CONCLUSION

Before the development of this project. The Dumb people or Blind people get more problem to read printed text or wallboards. Sowe develops a system which can convert that printed text or images text into appropriate audio. Text inputs like the alphabets, sentences, words, and numbers are given to the system. Text to speech conversions is achieved and receives a better result which is audible and perfect. This system is very much used in the web applications, email a reading, mobile applications and so on for making an intelligent speaking system.

## ACKNOWLEDGMENT

NCCC 2022 Team of NBN Sinhgad School of Engineering.

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