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Smart Assisting for Visually Impaired People

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Abstract: *Project addresses the integration of a complete Text Read-out system designed for the visually challenged. The system consists of a web cam interfaced with Raspberry Pi which accepts a page of printed text. The OCR package installed in Raspberry Pi, scans it into a digital document which is then subjected to image processing like skew correction, segmentation to classify the text that is captured. After the classification, the text is readout by a text to speech conversion unit (TTS engine) installed in Raspberry Pi. The output is fed to an audio amplifier then it is read out. The simulation is just an initiation of the image to text conversion and text to speech conversion done by the OCR software installed in Raspberry Pi. The system finds interesting applications in libraries, auditoriums, offices where instructions and notices are to be read and also in the assisted paper documents. By using ultrasonic sensor, we will measure the distance between the blind people and obstacle then the distance will be played through audio output..*

Keywords: Visually Impaired People

I. INTRODUCTION

Visually impaired people face many difficulties for accessing printed text using existing technology. This Project provides a smart device for visually impaired which helps them to read a text document more efficiently.

This proposed project uses camera based assistive device that helps visually impaired people to read text document. The framework is for implementing image capturing technique in an embedded system based on Raspberry Pi board. The design is motivated by preliminary studies with visually impaired people, and it is small-scale and mobile, which enables them with a more manageable setup.

The proposed fully integrated system has a camera as an input device to feed the printed text document for text recognition and the scanned document is processed by a software module installed in the RaspberryPi calledOptical character recognition. Methodology is implemented to the recognition sequence of characters and the line of reading. OpenCV libraries are utilized to do image capture of text, to do the character recognition as part of software development.

Most of the access technology tools built for people with blindness and limited vision are built on the two basic building blocks of OCR software and Text-to-Speech (TTS) engines.OCR is used torecognize the text from a scanned text document.

Optical Character recognition is also useful for visually impaired people who cannot read text document, but need to access the content of the Text documents.OCR is used to produce a digitized textwith the non-computerized system. Digitizing texts also helps reduce storage space. Editing and Reprinting of a Text document that was printed on paper are time- consuming and labour intensive. It is widely used to convert books and documents into electronic files for use in storage and document analysis. OCR makes it possible to apply techniques such as machine translation, text-to-speech and text mining to the capture scanned page. Thetext document recognized by OCR is fed into TTS engine as Input. TTS Engine converts the recognized text into audio output. The output device can be a headset connected to the raspberry pi or a speaker which can spell out the text document loud.

II. METHODOLOGY

2.1 Software Requirement

- **Raspbian Stretch:** A Debian based computer operating system for Raspberry Pi.
- **Python:** An open source programming language supported on Raspberry Pi.
- **Putty:** An open source terminal emulator, serial console and network file transfer application.

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- **VNC Viewer:** Virtual network computing viewer is a program that represents the screen data originating from the server.

2.2 Hardware Requirement

- **Raspberry Pi:** Raspberry Pi is a single board computer which runs on Linux based operating system and is best suited for IOT.
- **Micro SD Card:** With NOOBS or USB pen drive
- **Micro USB:** power supply (2.1A).
- **USB Mic:** Audio input to raspberry pi is done through mic.
- **Ultrasonic Sensor:** it is used measure the distance.
- **Speaker or Earphone:** Text to speech is heard via speaker or earphone.

SL No	Components Name	INPUT	OUTPUT
1	Micro USB power supply	220v,50Hz	5Amps
2	Speaker	5v,0.5A	NA

III. SYSTEM DESIGN

3.1 Proposed System

The framework of the proposed project is the Raspberry Pi board. The Raspberry Pi B+ is a single board computer which has 4 USB ports, an Ethernet port for internet connection, 40 GPIO pins for input/ output, CSI camera interface, HDMI port, DSI display interface, SOC (system on a chip), LAN controller, SD card slot, audio jack, and RCA video socket and 5V micro USB connector.

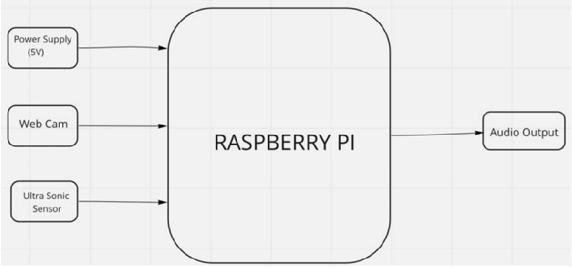
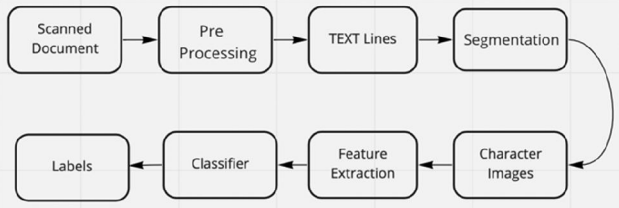


Fig. Block Diagram

The power supply is given to the 5V micro USB connector of Raspberry Pi through the Switched Mode Power Supply (SMPS). The SMPS converts the 230V AC supply to 5V DC. Raspberry Pi USB port is connected by camera. The Raspberry Pi has an OS named RASPIAN which process the conversions. The converted audio output is amplified by an audio amplifier. The page to be read is placed on a base and the camera is focused to capture the image. OCR converts text from captured image. The captured image is converted to text by the softwareTTS engine used to covert text to speech. The final output is given to the audio amplifier from which it is connected to the speaker. Speaker can also be replaced by a headphone for convenience.

3.1 Sub-System Architecture

OCR(Optical Character Recognition):



- **Image Capturing:** Image is captured using camera.
- **Pre-Processing:** Binarization and noise removal techniques are used to improve the quality of the printed text.

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- **Segmentation:** Breaking the whole image into subparts to further process them.
- **Feature Extraction:** Extraction of the most relevant information from the text image which is used to recognize the characters in the text.
- **Character Recognition:** recognition of the characters.

3.2 Text to Speech (TTS Engine)

- **Pre-Processing: P**rocess converts raw text into the equivalent of written–out words.
- **Text-To-Phenome:** Then assigns phonetic transcriptions to each word, and divides marks the text into prosodic units like phrases clauses and sentences.
- **Synthesizer:** It converts the symbolic linguistic representation into sound.

IV. RESULTS

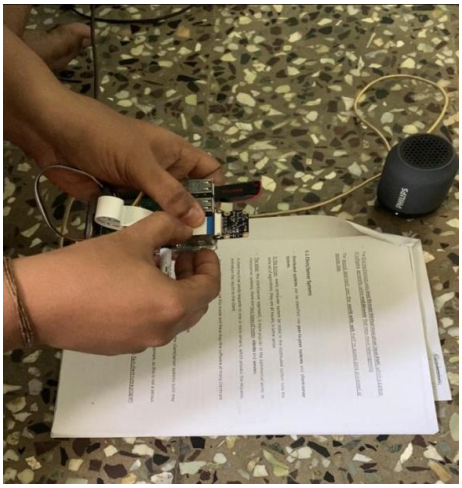

Fig. Placing device in threshold distance

Fig. Invoking OCR by pressing button

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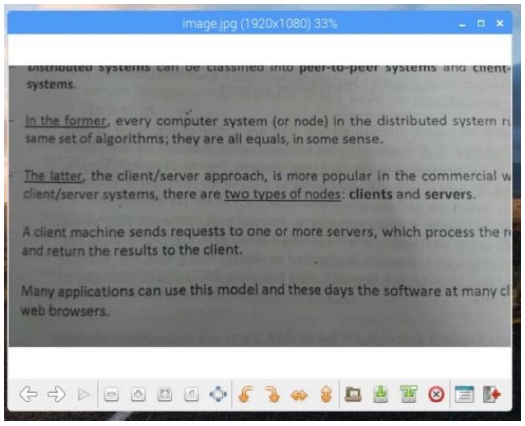

Fig. Captured Image from the Raspberry Pi

V. CONCLUSION

The project targets visually impaired people and reduces the difficulty of reading a document. It has a user-friendly interface customized for blind people, where the detection results are read out so that the user can clearly hear them. We have built a successful project which works with good quality typed documents. It gives more errors when the documents are handwritten. Project is less efficient with documents having both images and text. It works only when there is less noisy. Documents must be clear to get the pure results and it gives ASCII Values as output. Dark borders must be removed and here the images must scale up such that text is at least 10 pixels.

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