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SMART READER FOR BLIND PEOPLE USING RASPBERRY PI 3 B

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Abstract : ***This paper presents an automatic document reader designed for those with visual impairments, utilising the Raspberry Pi hardware. It manages the add-ons that serve as a user interface for the system, such as a speaker and camera. Python computer programming and image sensing devices are utilised in Optical Character Recognition (OCR) technology to identify printed characters. Both online and offline techniques are used in the OCR process. It first transforms a picture into text, and then it uses the GTTS (Google Text To Speech) library to turn the text into speech. With its improved configuration (RAM: 1GB, ROM: 8GB), the Raspberry Pi 3B Model offers an ecosystem for running Python code. This is adequate for storing voice in mp3 format and running Python code.***

Ketwords: OCR Technology, GTTS, Python, Rasberry pi 3b

I. INTRODUCTION

1.1 Introduction

The issue of helping the blind read has various solutions now in place, but none of them offer an effective reading experience. By giving them a solution where the details are provided in the form of an auditory signal, we want to increase the competency of blind individuals. Using OCR technology, the Raspberry Pi-Based Reader is an automatic document reader for the blind.

The suggested idea makes use of an assistive technology that is camera-based and allows people to read printed text. The plan is to use a Raspberry Pi board to implement an embedded system based picture capturing technique. The design is compact and portable, which aids in obtaining results with minimal setup. It was influenced by earlier study with visually challenged individuals. We have included a text read-out system here for those who are blind or visually impaired. Image to audio output (Speech) conversion is accomplished via OCR and Text-to-Speech synthesis. The suggested gadget has a camera that serves as the digitization input device. An OCR software module processes the digitised script.

For character and line of reading recognition, a protocol is followed. The Open CV (Open source Computer Vision) libraries are used in software development for character recognition and text picture capture. Depending on the user's selection, the output devices receive the final identified text document. The output device is either a speaker or a headset that is attached to the Raspberry Pi.

1.2 Objectives

In order to help the visually challenged, this study will use a system, namely the Raspberry Pi system and its accessories working together, to translate text into speech.This project's primary goal is to efficiently convert written and printed materials into playing audio. The ability to record speech in the memory and playback of these audio files at a convenient moment is a unique feature of this device.

II. LITERATURE SURVEY

E-Learning Web Accessibility Framework for Deaf/Blind Kannada-Speaking Disabled People, Rajendra A.B., Rajkumar N., Bhat S.N., Suhas T.R., Joshi S.P.N. In: Proceedings of ICRIC 2019 (eds. Singh P., Kar A., Singh Y., Kolekar M., Tanwar S.). 2020; volume 597 of Lecture Notes in Electrical Engineering. Cham and Springer

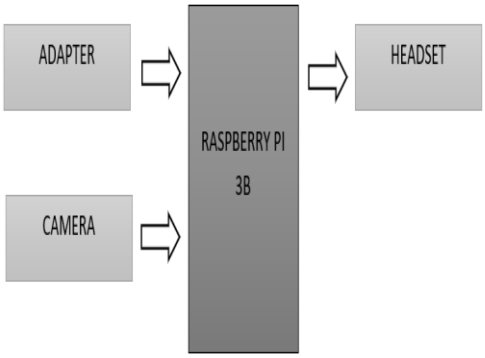
Lee J, Jeon W, Cha Y, Yang H. Automatic page-turning mechanism with near-field electroadhesive force for linearly

correctable imaging. In: IEEE/RSJ international conference on intelligent robots and systems; 2017. P. 1.

Trivedi A, Pant N, Shah P, Sonik S, Agrawal S. Speech to text and text to speech recognition systems-a review. IOSR J Comput Eng. 2018;20(2):36–43.

III. METHODOLOGY

3.1 Block Diagram



The suggested Smart Book Reader's block diagram. The three primary components of it are the input, the processing unit, and the output. The numerical keypad, camera, and microphone are the three input methods used by the smart reader. The camera is used to take a picture of the printed text. The Raspberry Pi module makes up the processor unit. The speaker and headphones make up the output, and we must provide input in the form of the page display. A Raspberry Pi camera records the text, which the processor then uses to identify and extract using OCR technology. The Text To Speech Conversion (TTSC) is then used to transform the retrieved image into a speech signal. The speaker or headset plays the transformed audio signal.

Optical Character Reorganization:
Optical Character Recognition is a content recognition technique that makes it possible to convert written content or printed copies of the information into editable, delicate copies or content recordings. OCR is used to convert an image into an editable content document and verify the content of the picture. It is a common method for digitising printed messages so they can be electronically changed, found, stored more compactly, displayed online, and used in machine processes like interpretation, AI, and psychological processing. There are two types of OCRs: ones that detect printed characters and ones that detect text that has been handwritten.

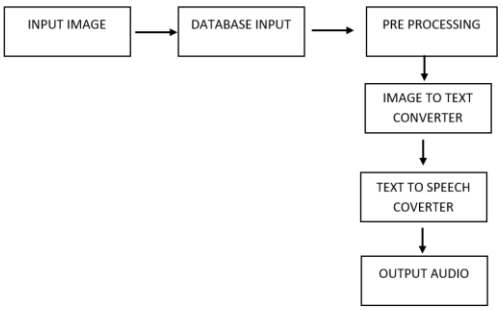


Fig. Flow process of OCR Technology

3.2 Flow Process

A. IMAGE CAPTURING
The first stage involves placing the archive under the camera so that the camera can take a picture of the predetermined report. Because of the high-goals camera, the quality of the photo taken will be great in order to receive prompt and clear recognition.

B. PRE-PROCESSING
Three steps make up the pre-preparation stage: linearization, noise removal, and skew correction. The captured image is examined for distortion. There are possible results when the introduction is made from the left or the right, skewing the image. This is where the image is first brightened and digitised. The ability to detect skewness looks for an introductory edge within 15 degrees. If this is found, a simple picture pivot is carried out until the lines line up with the actual flat pivot, producing a skew-corrected image. Before processing the page further, the disturbance caused by the catching or the poor quality of the page must be removed.

C. IMAGE TO TEXT CONVERTER
The ASCII estimations of the perceived characters are handled by Raspberry Pi board. Here every one of the characters is coordinated with its comparing format and spared as standardized content interpretation. This interpretation is further conveyed to the sound yield.

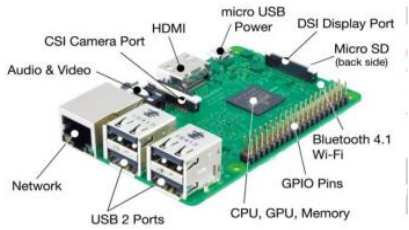
D. TEXT TO SPEECH
The extent of this module is started with the finish of the retreating module of Character Recognition. The module plays out the undertaking of transformation of the changed content to capable of being heard structure. The Raspberry Pi has an on-board sound jack, the on-board sound is created by a PWM yield and is negligibly separated. A USB sound card can incredibly improve the sound quality and volume. As the acknowledgment procedure is finished, the character codes in the content record are handled utilizing Raspberry Pi gadget on which perceive a character utilizing Tesseract calculation and python programming, the sound yield tunes in.

3.3 Hardware Description

3.3.1 Raspberry pi 3 B
Raspberry Pi 3 Model B is the earliest model of the third-generation Raspberry Pi. It replaced Raspberry Pi 2 Model B

in February 2016. See also the latest product in the Raspberry Pi 3 range.

- Quad Core 1.2GHz Broadcom BCM2837 64bit CPU
- 1GB RAM
- BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board



Features

- Processor: 64-bit quad-core ARM Cortex-A53
- Clock frequency: 1200 MHz
- RAM: 1024 MB

3.3.2 Camera Module Raspberry Pi rev

- The Raspberry Pi Camera Module rev 1.3 replaced the original Camera Module in April 2016. The v2 Camera Module has a Sony IMX219 8-megapixel sensor (compared to the 5-megapixel Omni Vision OV5647 sensor of the original camera).

- The Camera Module rev 1.3 can be used to take high-definition video, as well as stills photographs. It's easy to use for beginners, but has plenty to offer advanced users if you're looking to expand your knowledge. There are lots of examples online of people using it for time-lapse, slow-motion, and other video cleverness. You can also use the libraries we bundle with the camera to create effects.

IV. RESULT

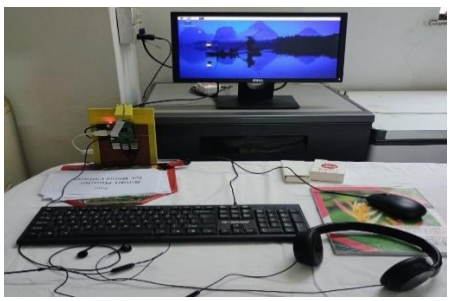


Fig. Final Result

We have used Raspberry pi camera Rev 1.3 and hold a printed paper of standard font containing motivational thoughts in front of camera for capturing the image. After that we have used OCR technology with the help of Raspberry pi for converting image to text and GTTS library for converting the text to audio. We heard the sound with the help speaker/ headset with in few minutes. Above photograph shows a homemade Raspberry pi stand as a input, a device with Raspberry pi OS installed, Printed papers with motivational thoughts and a headset to hear the output sound.

V. CONCLUSION

In the Smart Reader of visually impaired people, we have proposed a simple and efficient algorithm for conversion of image to speech. This method can effectively distinguish the object of interest from background or other objects in the camera view. OCR (Optical Character Recognition) technology is used to convert image to text format. And the text will be converted into speech using GTTS (Google Text To Speech) library.

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