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Raspberry Pi based Reader for Blind Person Using Image Processing

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Abstract: *In our India, there are so many peoples who are suffering from blindness. In their life, so many problems faced by them. One of the problems is the related to educational sector. In the educational sector, they have been suffering from many challenges i.e., reading books, newspaper, writing, and so many things are related to this. Without any type of help, they cannot see what they read. Therefore, in motive of supporting them, we have proposed" Raspberry pi reader for blind persons". This project aims to create a raspberry pi reader that utilizes image processing techniques to convert printed text into audible speech. The camera module captures images of printed text which are then processed using optical character recognition (OCR)algorithms extract text from the images which is then converted into speech using text to speech (TTS)synthesis. The Tesseract platform is used to assist the OCR technology. Python programming is used by raspberry pi for conversion of printed text image to text file and then to audio output.*

Keywords: Raspberry pi, OCR, TTS etc

I. INTRODUCTION

The people who are visually impaired faced the various difficulties in their daily life. There are many existing solutions to the problem assisting individuals who are blind to read. We focus on improving the competence of blind people by Providing them with a solution where details are given in the form of audio. In this project raspberry pi based reader is an automatic document reader. Which designed on the raspberry pi microprocessor is a key component of entire system. This project is useful for visually impaired people to accessing printed information and also help for educational, professional and recreational purposes. Whatever printed text is there that converts into audio output using OCR technology. By combining hardware components such as camera module, audio output along with software functionalities optical character recongnition (OCR), text-to-speech (TTS), OpenCV etc. OCR is used very frequently for segmenting the image in pattern recognition and object identification. Braille readers cannot skim read and may take up to three times as long as others students to read a text. Students with some vision may be large print readers .Many will be unable to read examination questions and hand-outs in standard print or read their own hand writing when answering questions.

II. LITERATURE REVIEW AND OBJECTIVE

In [1] it is observed that the visually impaired people finding difficulties to roll their day today life and it is important to take necessary measure with the emerging technologies to help them to live the current world irrespective of their impairments. In the motive of supporting them, we have proposed a smart spec for the blind persons which can perform text detection thereby produce a voice output. This can help the visually impaired persons to read any printed text in vocal form. A specs inbuilt camera is used to capture the text image from the printed text and the captured image is analysed using Tesseract-Optical Character recognition (OCR).

In [3] describes a there are many existing solutions to the problem of assisting individuals who are blind to read, however, none of them provide an efficient reading. We focus 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 project uses a camera-based assistive device which can be used by individuals to read printed text. The scheme is to implement an embedded

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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.

In [4] Ray Kurzweil proposes K-Reader Mobiles, specially designed movable reading assistant for visually impaired people. "K-Reader Mobile" runs on cell phone and allows the user to read mail and many other documents. But this fails to give an economical solution.

In [5] Athira Panicker proposes a smart shopping assistant label reading system with voice output for the blind using the raspberry pi. This system only reads documents from clear flat surface and it does not read from complex backgrounds.

III. MATERIALS AND METHODS

In this Proposed System Used OCR Algorithm for recognize the text. Image to text conversion.

- **Capturing Image: -** Develop code to capture images using the camera module connected to the Raspberry Pi. Ensure that the images captured are clear and well-lit to improve text recognition accuracy.
- **Pre-processing Image:-** Implement image pre-processing techniques to enhance the quality of captured images and improve text recognition accuracy. This may involve operations such as resizing, noise reduction, and contrast adjustment.
- **Text Recognition:-** Utilize the Tesseract OCR library to perform text recognition on the pre-processed images. Extract the text from the images and store it for further processing.
- **Converting Text to Speech:** Convert the recognized text into speech using a text-to-speech (TTS) synthesis library such as pyttsx3 or TTS. Ensure that the synthesized speech is clear and understandable.
- **Classification OCR**: - Optical character recognition (OCR) is process of classifying optical patterns contained in a digital image. The character recognition is achieved through Segmentation, feature extraction and classification. OCR (optical character recognition) is the recognition of printed or written text characters by a computer.

IV. BLOCK DIAGRAM

The Raspberry Pi-based reader for visually impaired individuals utilizes image processing technology to capture images of printed text, which are then processed through Optical Character Recognition(OCR) to convert the text into speech.

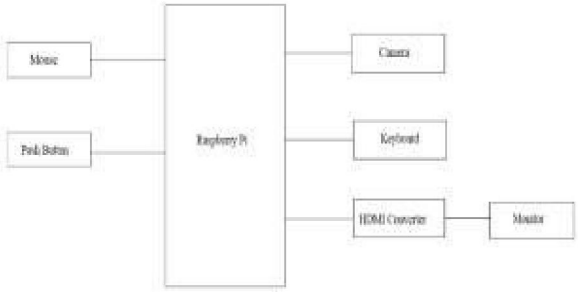

Fig 1.1. Block Diagram

This system, controlled by raspberry pi board, enables users to read independently by capturing a full view of the paper upon button press, processing the image, recognizing the content, and announcing it through a speaker. This innovative solution empowers blind individuals by providing greater accessibility and independence in reading without the need for human assistance or tactile writing systems.

V. FLOW OF PROCESS

The Raspberry Pi reader for blind person utilize the following process given in figure 1.2

Firstly install required software libraries and dependencies for interfacing with hardware components. Set up any additional tools needed for image processing, text-to-speech conversion, or other functionalities.

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Image Acquisition

Develop or utilize existing code to capture images using the camera module or any other image-capturing device connected to the Raspberry Pi. Implement techniques for image stabilization or focus adjustment to ensure clear image capture.

Image Processing

Utilize image processing algorithms to extract text from captured images. This may involve techniques such as Optical Character Recognition (OCR) to convert text from images into machine-readable format.

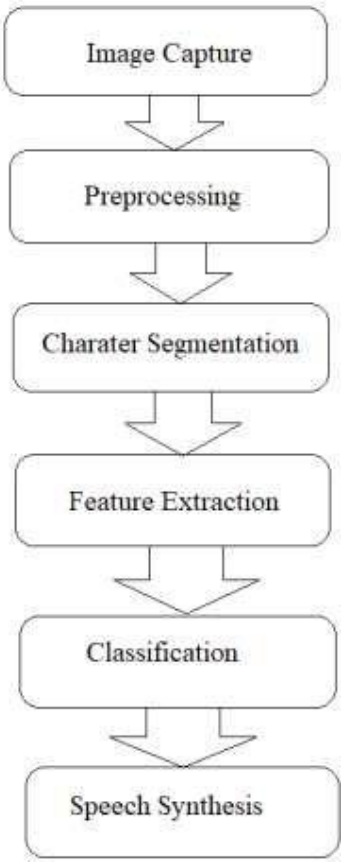

Fig 1.2. Flowchart

Text-to-Speech Conversion

Integrate text-to-speech (TTS) functionality to convert extracted text into audible speech. Choose suitable TTS libraries or services compatible with the Raspberry Pi environment. Adjust speech parameters such as speed, pitch, and volume for optimal user experience.

Speech Synthesis

Once the text is processed, analysed, and prosody is generated, the synthesized speech is produced using either concatenative or parametric synthesis methods. The synthesized speech output can be in various formats, including audio files, real-time streaming audio, or integration with other applications for spoken feedback.

OBSERVATIONS:

Observation is a critical aspect of any Raspberry Pi-based reader for blind individuals using image processing. Here's a detailed methodology focusing specifically on observation: Observation played a pivotal role in our project, as we

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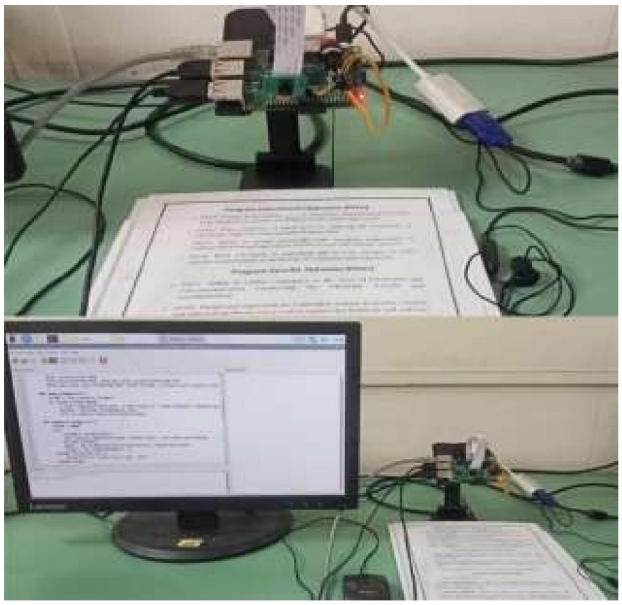
focused on understanding the structure and content of printed materials through image processing techniques. By analyzing document layouts, extracting text, and performing semantic analysis, we aimed to provide blind users with a rich and contextual understanding of the content they were accessing.

VI. CONCLUSION

In conclusion, developing a Raspberry Pi-based reader for blind individuals using image processing offers a promising solution to enhance accessibility to printed text. This paper focuses on a portable pi reader that can help to solve the problems of visually impaired people by assisting them to recognize characters. Through this project, we aimed to leverage the capabilities of the Raspberry Pi platform along with image processing techniques to convert visual information into audible speech, thereby empowering blind users to access printed materials independently.

VII. RESULT

The Raspberry Pi-based reader for blind people utilizing image processing technology has been successfully developed and tested. The device offers enhanced accessibility, improved independence, increased efficiency, customizable features, and the potential for continuous development. By converting visual information into audio.



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