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Book Reader Using Raspberry Pi for Visually Impaired

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Abstract - *This paper aims at making an open-source audio book software to build a book reader with raspberry pi controls. Here in this paper, we present the Pi Book reader which can read a real book aloud and also turn the pages of the book. The overall process of the project involves Image to Text conversion and then Text to Speech conversion. The image to text conversion is carried out with the help of OCR [Optical Character Recognition]. The Optical Character Recognition Technology can be used to convert various kinds of documents like images, scanned documents and PDF files. The OCR algorithm involves various stages like Scanning, Pre-processing, Feature Extraction, Classification and Recognition. Finally, E-Speak voice command software is used to convert the obtained text from OCR into speech command. This converted speech is read aloud by a speaker connected to the Raspberry Pi. The programming language that we have used is python. This project is practical and of great use for the visually impaired.*

Key Words: Raspberry Pi, OCR, Text to Speech Conversion, E-Speak software, Python.

1. INTRODUCTION

Although a number of reading assistants have been designed specifically for the visually impaired, to our knowledge, no existing reading assistant can read text from the kinds of challenging patterns and backgrounds found on some books. Such text information can appear in multiple scales, fonts, colours, and orientations. In order to help visually impaired people to read text from hand-held objects as well as books, we have developed a camera-based assistive text reading framework to track the interested area within the camera view and extract printed text information from the object or book. The proposed algorithm can be effectively used to handle different background patterns, and extract text information from any kind of hand-held objects or books.

The overall process flow involves capturing the current page of the book using a web camera, then the captured image is converted into binary representation. That is, the image is converted into a gray scale image. From the gray scale image, individual letters are extracted and recognized. All these processes are carried out by Optical Character Recognition algorithm. After undergoing various stages like Scanning, Preprocessing, Segmentation and Feature Extraction. finally, the extracted text is read aloud via a speaker connected to the Raspberry Pi. Once the current page is completed, a rotating arm driven by a motor is used to turn the page of the book.

2. PROPOSED METHODOLOGY

The main component in the proposed system is the Raspberry Pi. The proposed system is developed under python programming language. Figure 1 illustrates the block diagram of the proposed methodology.

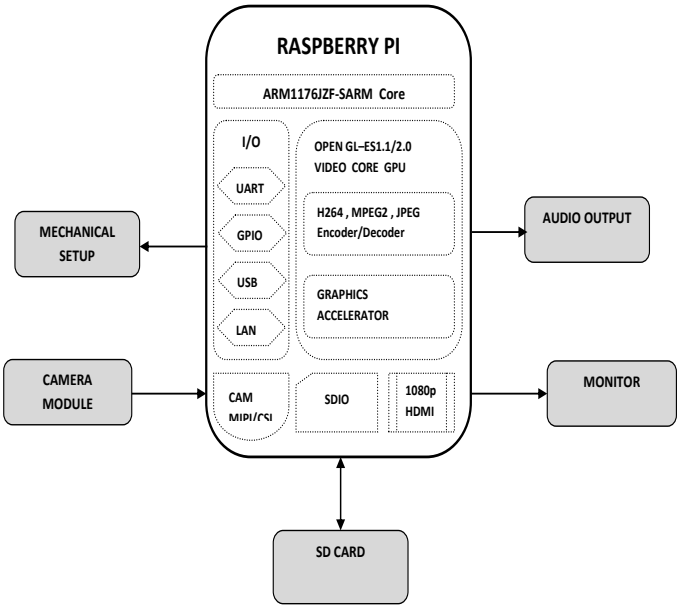

Fig -1: Block Diagram

3. FLOW OF PROCESS

Figure 2 illustrates the flow of process of the proposed method.

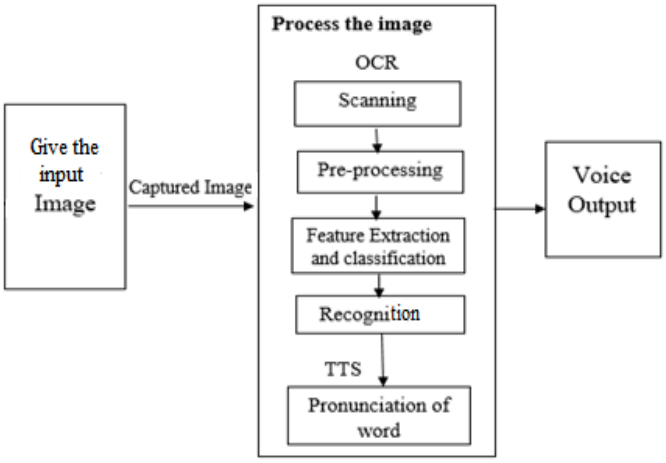

Fig -2: Flow of Process

3.1. OPTICAL SCANNING

The optical Scanning process involves capturing a digital image of the original document. The OCR optical scanners that are used will convert the light intensity into gray-levels. This process is called as Thresholding. Thresholding converts a multilevel image into a bi-level image of black and white.

3.2. LOCATION AND SEGMENTATION

Segmentation involves isolation of characters or words. Location of the text is done via pixels with x and y coordinates.

3.3. PREPROCESSING

The resulting image from the process of scanning may contain some amount of noise. Depending on the resolution of the scanner the characters may be broken or smeared. Hence preprocessing can be done to smooth the digitized character. In addition to smoothing preprocessing also involves normalization of the characters.

3.4. FEATURE EXTRACTION

This technique is used for capturing the essential characteristics of the symbols. Feature extraction is done by matching the matrix containing the input character with a set of prototype characters that represent each possible class.

3.5. RECOGNITION

The recognition is the process of identifying each character and assigning it to the correct character class.

4. RASPBERRY PI DESCRIPTION

Raspberry Pi is a low cost, credit card sized microcontroller. In the proposed system we have made use of version 3 of Raspberry Pi. The performance of the Raspberry Pi version 3 is ten times greater than that of the Raspberry Pi version 1. Here in this system we make use of an SD card of size 1 GB for the Raspberry Pi. The popular Operating System used with the Raspberry Pi is the Wheezy Raspbian OS. It runs under Linux platform. Figure 4 shows the Raspberry Pi microcontroller.

4.1. WHEEZY RASPBIAN

Wheezy Raspbian is a Debian-based operating system for Raspberry Pi. It is now officially provided as the primary operating system by the Raspberry Pi Foundation, for the family of Raspberry Pi single-board computers. Raspbian was developed by Mike Thompson and Peter Green. The initial build was completed in the year 2012. The Raspbian operating system is still under active development.

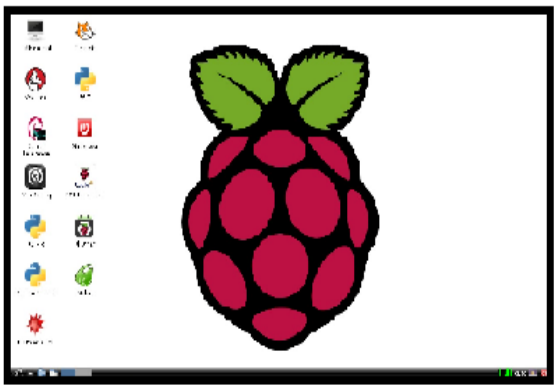

Fig -3: Wheezy Raspbian Desktop

Fig -4: Raspberry Pi

5. PYTHON

Python is a simple and easy to understand programming language. It has an effective approach towards object-oriented programming. Python's elegant syntax, together with its interpreted nature, makes it an ideal language for scripting and rapid application development in many areas on most platforms. More over python is an open source programming language.

6. OTHER HARDWARE REQUIREMENTS:

Apart from Raspberry Pi, we will need a Web camera for capturing the image and we will need a speaker to hear the audio.

Fig -5: Web camera, Speaker

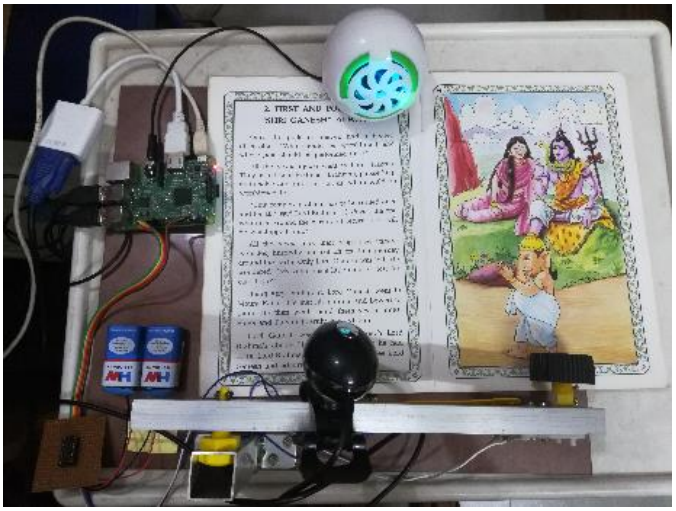

Fig -6: Complete Setup

7. SCREEN SHOTS:

A sample input image is shown in figure-7. The text that has been extracted from the image is shown in figure-8. This extracted text is read aloud by a speaker.

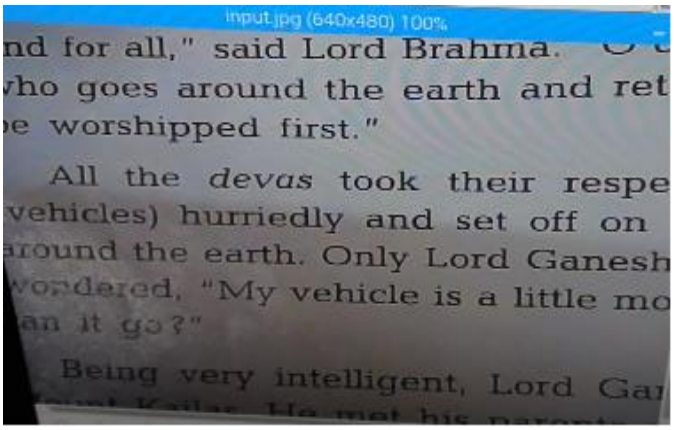

Fig -7: Sample input image

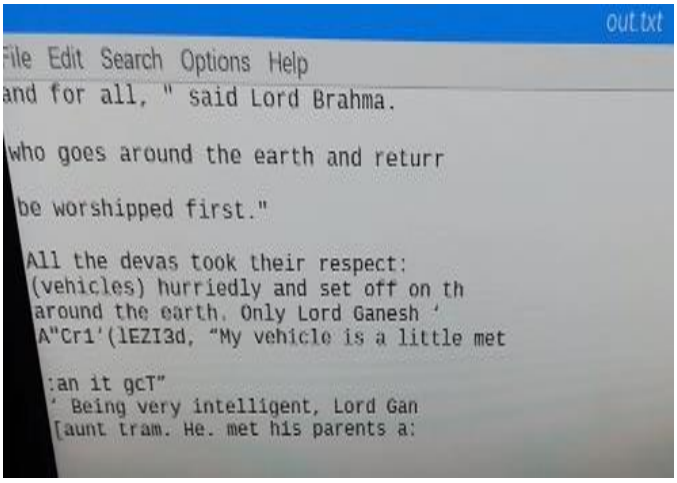

Fig -8: Extracted Text

8. CONCLUSIONS

A text detection and recognition with audio output system was successfully developed on Open CV platform. This system is very handy and useful for the visually challenged persons. Compared with a PC platform, the Open CV platform is portable and more convenient to use. This system will be helpful for visually impaired people to access information on written form and in the surrounding.

REFERENCES

[1] D. Velmurugan, M.S. Sonam, S. Parthasarathy, K.R. Arun, S. Umamaheswari, "A smart reader for visually impaired people using Raspberry pi," International Journal of Engineering science and computing,2016, vol.6.

[2] International Workshop on Camera-Based Document Analysis and Recognition (CBDAR 2005, 2007, 2009, 2011).

[3] X. Chen and A. L. Yuille, "Detecting and reading text in natural scenes," in Proc. Computer Vision Pattern Recognition, 2004, vol. 2, pp. II-366–II-373.

[4] X. Chen, J. Yang, J. Zhang, and A. Waibel, "Automatic detection and recognition of signs from natural scenes," IEEE Trans. Image Process., vol. 13, no. 1, pp. 87–99, Jan. 2004.

[5] B. Epshtein, E. Ofek, and Y. Wexler, "Detecting text in natural scenes with stroke width transform," in Proc. Computer Vision Pattern Recognition, 2010, pp. 2963–2970.

[6] A. Shahab, F. Shafait, and A. Dengel, "ICDAR 2011 robust reading competition: ICDAR Robust Reading Competition Challenge 2: Reading text in scene images," in Proc. Int. Conf. Document Anal. Recognition, 2011, pp. 1491–1496.