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Design of a Portable Camera Based Text and Product Label Reading Product for Blind People

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Abstract*: Assistive technologies are being developed for visually impaired people in order to live confidently.This paper proposes a prototype system of camera based assistive text reading framework to help bind persons read text labels and product label packaging from handheld objects in their daily lives. The paper is framed into three stages,1)Image capturing,2)Data Processing,3) Audio Output First-Image Capturing- using an mini web camera, the text which the user need to read get captured as an image and have to send to the image processing platform, Secondly Text recognition using Tesseract-Python OCR algorithm the text will get filtered form the image, Finally The Speech output-A Filtered text will be passed into this system to espeak module to get an audio output .this can be able to insist the blind people in their daily life. The entire application will run on Raspberry pi, Raspberry Pi Model 2 Version 1.1 is used here for processing after the boot load as per the application program Raspberry pi will get executed.

Keywords: ARM11, Raspberry Pi, camera based assistive text reading, optical character recognition

I. INTRODUCTION

In worldwide there are 314 Million visually impaired people and blind, out of which 45 million are visual impairment which was released by “World Health Organization” in 10 facts regarding blindness. The valuation of The National Health Interview Survey 25.2 Million adult Americans, are blind or visually impaired. The Valuation of The National Census of India there are 21.9 Million People disabled people in the country ,out of which more than 15 Million People are blind [1][2].

Reading is obviously necessary in today’s society . Printed text appears everywhere in the form of receipts, bank statements, report statements, restaurant menus, classroom notes, product labels, instructions on medicine bottles, etc. Optical aids, Screen Readers and video magnifiers can help blind users and those with low vision to access documents, there are few devices which provide good access to common hand-held objects such as product labels, and objects printed with text such as prescription medication bottles. The ability of people who are blind or those who have significant visual impairments to read printed labels and product packages will enhance their independent living and foster economic and social self-sufficiency so here we are going to propose a system that is useful to blind people.

II. LITERATURE SURVEY

Different text extraction methods are studied as Text localization and Text recognition in natural scene images of real-world scenes. In [3], a survey was done on several ongoing researches on camera based document analysis such as text detection, extraction, enhancement, recognition and its applications.

In [4], [5] methods based on sliding windows are discussed which are more robust to noise, but they have high computational complexity as in this input whole image is scanned with windows of multiple sizes.C.Yi and Y. Tian et.al., proposed a method of adjacent character grouping to calculate the image patches that contain fragments of text strings [6].

Rule based and learning based methods are also proposed for text extraction. Learning based methods model text structure and extract representative text features to build text classifiers.

L.Ma et.al., [7] performed classification of text edges by using histograms of oriented gradients and local binary patterns as local features on the support vector machine model.In [8] a finger worn device containing a button camera and microcontroller is implemented.

This device assists the visually impaired by reading paper-printed text. Majid Mirmehdi et.al [9] proposed a mobile head mounted device for detecting and tracking text. A real-time text detection algorithm is used for text detection and extraction. Zhu et.al [10]

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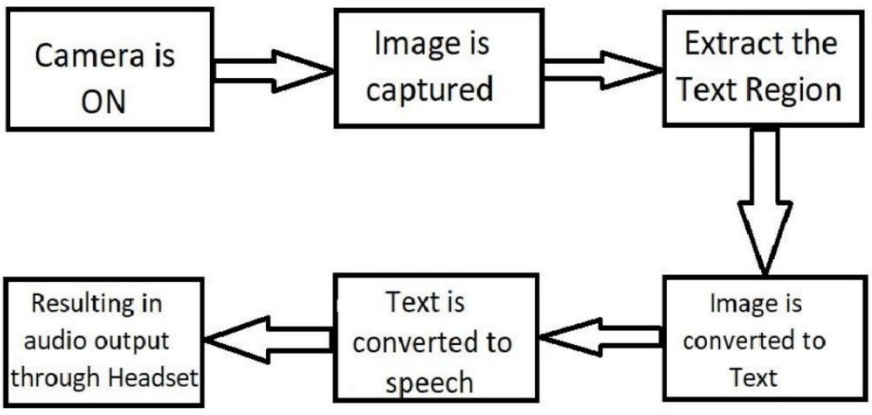
proposed an algorithm for video text detection, text localization and text extraction approach in videos. Christin Wolf et.al, proposed a method for contented based image in multimedia documents [11].

In [12] a mixture-of- Gaussians-based background subtraction technique is used to determine the region of interest in video and moving object region is extracted. Then, text localization and recognition algorithms are used to acquire text details. In [13] a camera based assistive text reading framework is proposed that helps blind persons to read text labels from hand-held objects in their daily lives.

III. PROPOSED DESIGN METHODOLOGY



This paper describes about the designing of a portable camera based text and product label reading product for blind people only. The System Framework consists of three functional components they are: 1.Image Capturing2. Data Processing 3.Audio Output .The Image capture component camera collects scenes containing objects of interest in the form of images. The image format from the camera is in RGB24 format. The image is segregated and undergone to the pre- processing. We are using the Tesseract Python OCR Algorithm for extracting the text from the image. The text is converted into speech and the text file is then sent to e-speak module to give the audio. The audio output component is headset or an microphone to inform the blind user of recognized text data in the form of speech or audio**.**

A. Component required

1) *Raspberry pi 2:* The Raspberry Pi is a credit card sized single computer or SoC uses ARM1176JZF-S core. SoC, or System on a Chip, is a method of placing all necessary electronics for running a computer on a single chip. Instead of having an individual chip for the CPU, GPU, USB controller, RAM everything is compressed down into one tidy package. Raspberry Pi needs an Operating system to start up. In the aim of cost reduction, the Raspberry Pi omits any on-board non-volatile memory used to store the boot loaders, Linux Kernels and file systems as seen in more traditional embedded systems. Rather, a SD/MMC card slot is provided for this purpose. After boot load, as per the application program Raspberry Pi will get execute.
2) *Web Camera:* The web camera is used here in the project to capture the images of text labels and product labels. A webcam is a video camera that feeds or streams its image in real time to or through a computer to a computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and emailed as an attachment. When sent to a remote location, the video stream may be saved, viewed or on sent there. Unlike an IP camera (which connects using Ethernet or Wi-Fi), a webcam is generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops to monitors and raspberry pi.

3) *Computer Monitor:* A computer monitor is an output device which displays information in pictorial form. A monitor usually comprises the display device, circuitry, casing, and power supply. The display device in modern monitors is typically a thin film transistor liquid crystal display with LED backlighting having replaced cold-cathode fluorescent lamp backlighting. Older monitors used a cathode ray tube Monitors are connected to the computer via Digital Visual Interface HDMI, Display Port, Thunderbolt, low-voltage differential signaling (LVDS) or other proprietary connectors and signals. Originally, computer monitors were used for data processing while television receivers were used for entertainment. From the 1980s onwards, computers and their monitors have been used for both data processing and entertainment, while televisions have implemented some computer functionality. The common aspect ratio of televisions, and computer monitors, has changed from 4:3 to 16:10, to 16:9.Modern computer monitors are easily interchangeable with conventional television sets. However, as computer monitors do not necessarily include components such as a television tuner and speakers, it may not be possible to use a computer monitor as a television without external components.

4) *Computer Mouse:* A computer mouse is a hand-held pointing device that detects two-dimensional motion relative to a surface. This motion is typically translated into the motion of a pointer on a display, which allows a smooth control of the graphical user interface. The first public demonstration of a mouse controlling a computer system was in 1968. Originally wired to a computer, modern mice are often cordless, relying on short-range radio communication with the connected system. Mice originally used a ball rolling on a surface to detect motion, but modern mice often have optical sensors that have no moving parts. In addition to moving a cursor, computer mice have one or more buttons to allow operations such as selection of a menu item on a display. Mice often also feature other elements, such as touch surfaces and "wheels", which enable additional control and dimensional input.

5) *HDMI Cable:* HDMI is a connector and cable capable of transmitting high-quality and high-bandwidth streams of audio and video between devices. The HDMI technology is used with devices such as an HDTV, Projector, DVD player,or Blu-ray player. And to connect you raspberry pi to your personal computer.

IV. RESULT

Fig.1:Monitor

Fig.2: Connections are made to Raspberry Pi

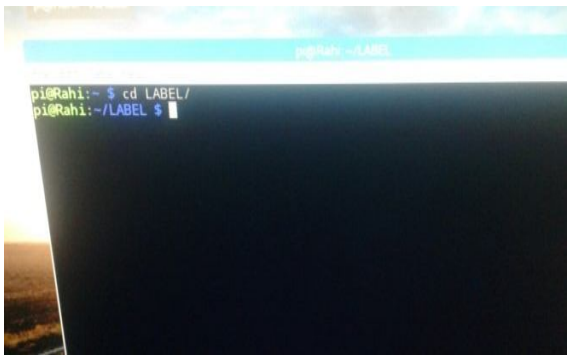


Fig.3: Command Prompt Mode In Raspberry Pi Mode

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Fig.4: A Sample Product Label is Captured with the help of Web Camera

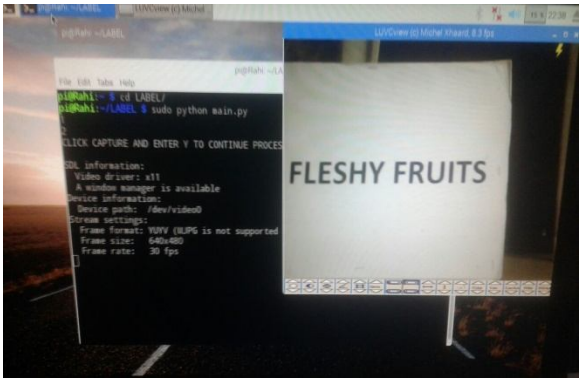

Fig.5: The Display of The Monitor Showing the Camera Output

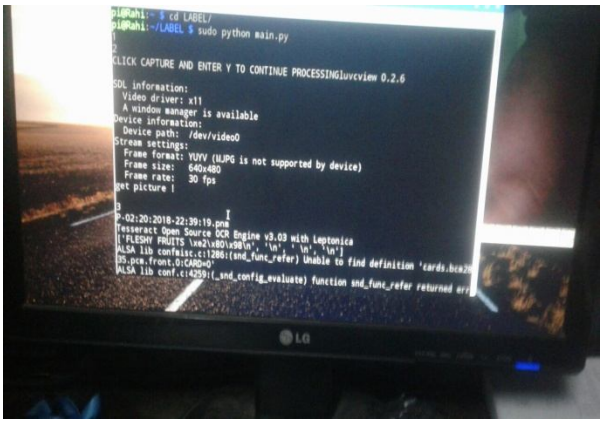

Fig.6: After the Picture is Captured , it shows get picture on the monitor and we have to press enter to send it to the image processing Tesseract Python -OCR platform to extract the text and then send to espeak module to hear the sound

Fig.7: A Sample Headset of 3.5 mm pin is connected to the raspberry pi audio port. With This we can hear the audio after the text is converted into speech.

V. CONCLUSIONS

This paper gives we have described a prototype system to read printed text on hand- held objects for assisting blind persons. In order to solve the common problem for blind users, we proposed a camera based assistive text reading frame work to help blind persons read text labels and product packages. This method can effectively distinguish the object of interest from background or other objects in the camera vision. To extract text regions from complex backgrounds, we have proposed the advanced "Tesseract-Python Algorithm" This is the text localization algorithm. Off-the-shelf OCR is used to perform word recognition on the localized text regions and sent to espeak module to transform into audio output and by inserting the headset into the raspberry pi audio jack the blind users can hear the audio output .

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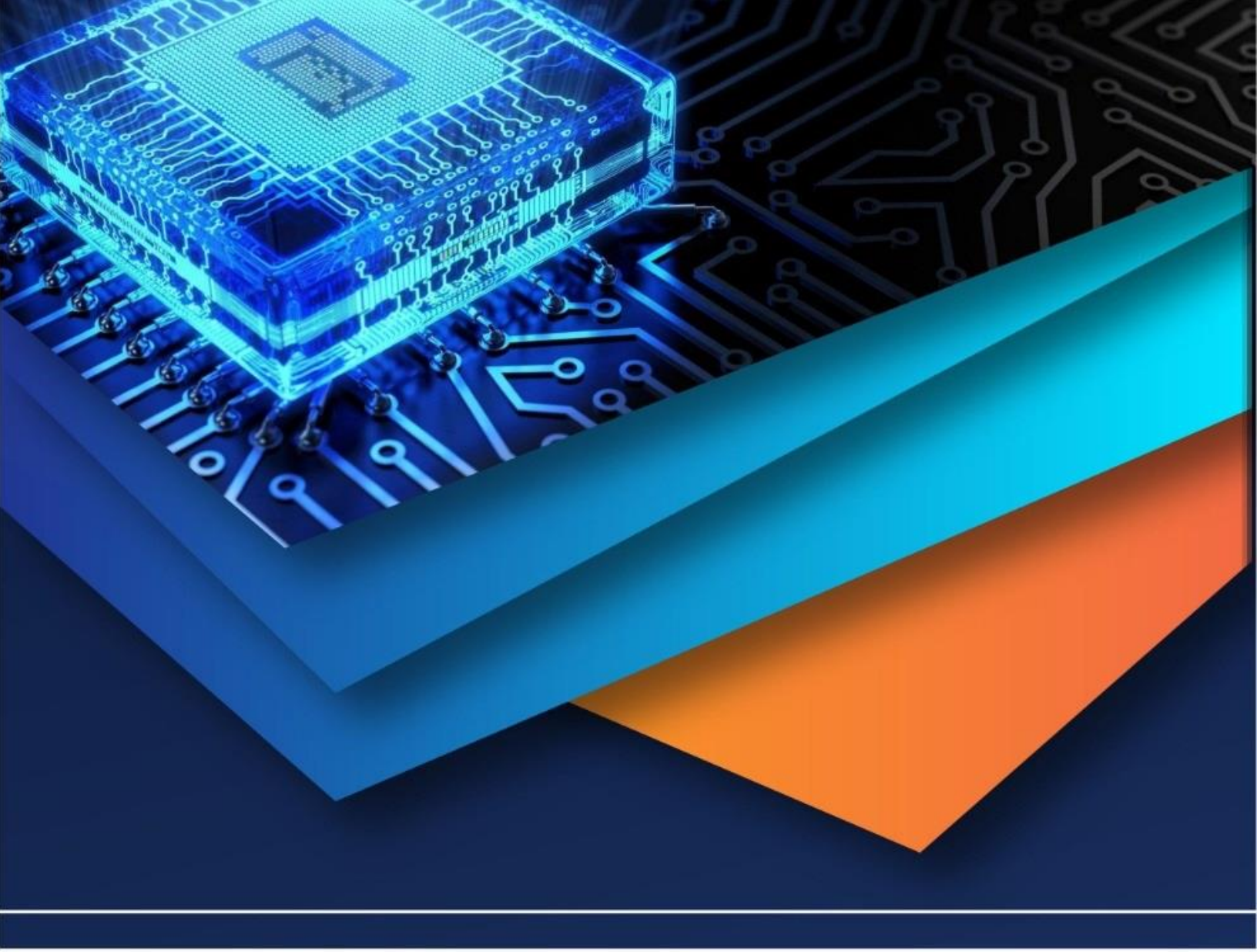

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