International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 4 Issue: 3 223 - 225

Accessible Shopping System for Blind and Visually Impaired Individuals

Ashwini .V. Mhaske
Dept of E&TC
Government college of Engg.
Jalgaon ,Maharashtra
mhaskeashwini1@gmail.com

Prof. Mahesh. S. Sadavarte
Dept of E&TC
Government college of Engg.
Jalgaon ,Maharashtra
maheshsada@yahoo.co.in

***Abstract*—** Self-Dependency of disabled persons is very important in their daily lives. This is a cost effective prototype system that help blind persons to shop independently. This paper presents a camera-based label reader for blind persons to read names of labels on the products. The proposed framework can be classified as image capturing, data processing audio output. In Image capturing web Camera is use to capture the image of object or product packaging and captured image is send to the image processing Platform. In Data processing the image is processed internally and the text will get filtered from the image. Finally, the filtered texts are output to blind users in the form voice. The Tesseract library is used to get the plain text from text region and flite library is used to get audio output. This proposed framework is implemented using Raspberry Pi board.

Keywords- *camera-based label reader, open CV, Tesseract Library,Raspberry-pi board.*

*****

I. INTRODUCTION

According to National Census of India there are 21.9 Million disabled people in the country ,out of which more than 15 million people are blind[16]. Blind people are an imperative part of the society. As we know reading is very important in today's society. As we know printed text is everywhere in the form of reports, documents, receipts, passbook, restaurant menus, product packages, instructions on medicine bottles, etc. Due to this disability they have less access to computers, Internet, and high quality educational software. Consequently, they have not been able to improve on their own knowledge, and have significant impact on the commercial, economic, and educational ventures in the society.

Many systems [2], [16], have been designed that have some assurance for portable use. Optical character recognition software is used for Portable assistive readers. These systems can be used to recognize text information within the image. But these systems perform better with document images which contain text bits with simple background, standard fonts. Thus these systems are not able to recognize the product labels with complex backgrounds, multiple colors, different fonts, and different font styles. Portable bar code reader [16] is designed for blind user to access information about the different commercial products. But for blind person, the big limitation of this reader is, it is very hard to exactly locate the barcode and to correctly point the barcode reader at the barcode.

Figure 1 shows different examples of commercial products. Text label printed on the commercial products vary in fonts, colors, font style and backgrounds with decorative patterns. Some applications such as K-Reader which are designed specifically for blind users perform well when detecting text information from documents, receipts [2].

But these systems fail to give an economic solution of the problem and are available on specific platforms.

Figure 1:Different Example of Commercial Product

Also, these systems are not able to read text from commercial products with complex background, cylindrical surfaces (e.g. medicinal bottles) and other packaged products. Whereas a number of assistive reader systems have been designed especially for blinds, the proposed system presents a portable and economic solution.

The proposed framework is one of the techniques which work out as a portable assistive product label reader. It is implemented on small single board computer –Raspberry pi, in order to provide an economic and portable solution. The rest of the paper is organized as follows- Section II gives an overview of the previously published methods of robust text detection algorithms. Section III describes Framework of proposed system. Section IV describes Hardware and Software parts of the proposed system and section V concludes the paper.

II. LITERATURE REVIEW

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] 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. This system is built using Web camera, Mini Laptop and Microphone. The proposed framework implements the similar concept but on a portable platform Raspberry Pi board, which makes the proposed framework more handy, portable and within economic reach of any visually impaired person.

III. FRAME WORK AND SYSTEM ARCHITECTURE

The proposed framework is implemented on single board computer –Raspberry pi, in order to provide portable and economic solution. The system framework consists of three functional components they are:Scene Capture,Data Processing and Audio Output. The camera is used to capture the image containing object of interest. The data processing component is used for extending our proposed algorithms, including1) to extract the image of the object held by the blind user from the complex background, object- of- interest detection is used; and 2) text localization and text recognition that transforms image-based text information into readable codes. Finally, the audio output to inform the blind person of recognized text codes.

The system contains usb camera as the input unit to capture the image of object. The raspberry Pi module is used for data processing .Earphone is used for audio output. The block diagram of proposed system is shown in fig.2

The web camera is to capture the image of object or handheld product packaging. The camera is interfaced with ARM microcontroller through usb.Then input image is processed using ARM microcontroller unit. OCR technology is used for conversion of extracted text label image to readable codes. The ARM11 microcontroller performs the processing and provides audio output through earphone. The earphones are connected to audio jack .

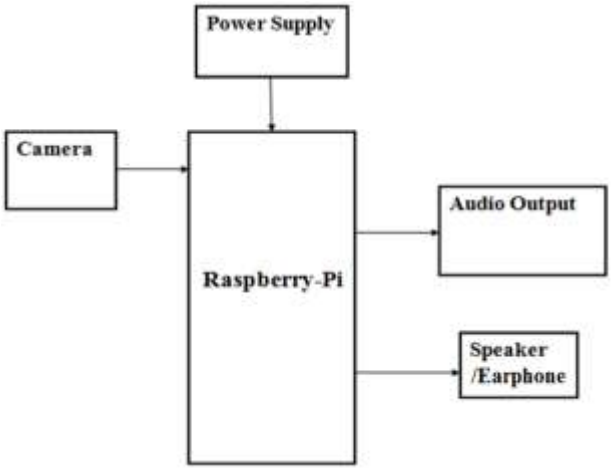

Figure 2:Block Digram

The image is processed using Open CV library. In Proposed system TESSERACT library is used for OCR technology, and filt library is used for audio output.

IV. HARDWARE SPECIFICATION

A. *Raspberry Pi*

The assistive product label reader system includes a power supply to Raspberry Pi board ,connecting earphones to the 3.5mm audio jack and interfacing camera. The Raspberry Pi [14] board will be powered through USB cable or battery. It is a credit card sized single computer or Sock uses ARM1176JZF-S core. System on a Chip(SoC), is a method in which all electronics for running a computer are placed on a single chip. The CPU, GPU, USB controller, RAM everything is compressed down into one small package. Operating system is used to start Raspberry Pi. In the aim of cost reduction, the Raspberry Pi skips any on-board non-volatile memory used that stores the Linux Kernels,file systems and boot loaders as seen in many embedded systems. For this purpose SD/MMC card slot is provided.

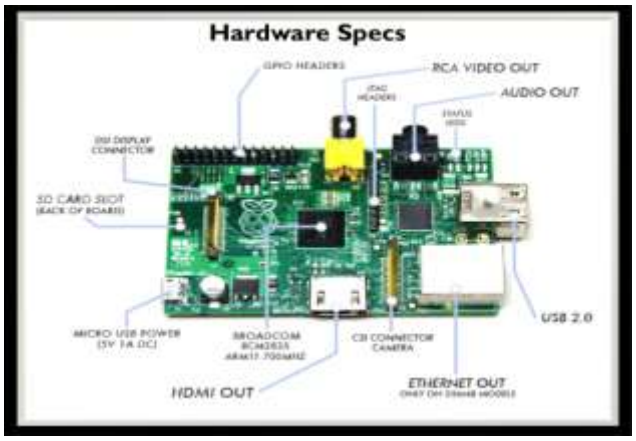

Figure 3: Raspberry Pi Development Board

B. Features

- USB ports:
  The Raspberry Pi 2 has four USB ports, allowing you connect it to keyboards, mice,WiFi dongles, and USB sticks containing all your files.
- Ethernet port:
  The traditional way to connect to the internet is via a wire called an Ethernet cable. This method is easier to set up than WiFi and may provide faster internet,but you're then limited by the length of the cable.
- MicroSD card slot:
  A little SD card is used as the Raspberry Pi's hard drive. This is where the operating system will live once it on there. Most computers won't be able to directly connect to a microSD card, but you can get an adaptor that plugs into normal SD card slots.
- Audio out:
  This looks like a headphone socket because that's exactly what it is. A 3.5mm jack to be precise, this allows to connect the Pi to computer speakers.
- Power:
  This is the kind of small charging port. Micro USB power supply 5v, 700mA=3.5w which is less than a bulb.
- HDMI port:
  A standard HDMI cable to connect your Raspberry Pi to your chosen screen, to see (and hear) whatever it's doing.

V. SOFTWARE SPECIFICATION

OpenCV [16] is an open source (see http://opensource.org) computer vision library available from http://SourceForge.net/projects/opencvlibrary. OpenCV was designed for computational efficiency and provides real time applications. This library contains over 500 functions that span many areas in vision, including factory product inspection, security, user interface, stereo vision, camera calibration ,medical imaging and robotics. Because computer vision and machine learning of often go hand-in hand, OpenCV also contains a full, general-purpose MLL(Machine Learning Library),which is focused on statistical pattern recognition and clustering. The Machine learning library is highly useful for the vision tasks that are at the core of Open CV's mission, but it is general enough to be used for any machine learning problem.

VI. CONCLUSION

In this paper, a camera-based assistive text reading framework is proposed that helps blind persons to read text labels and product packaging from hand-held objects. The framework is implemented on single board computer – Raspberry pi, which provide an economic and portable solution. An algorithm based on Extremal regions is used to extract the text regions from complex backgrounds. Using Tesseract library text data from captured image is extracted. The obtained text data will be uttered through the ear phones using Flite library.

REFERENCES

[1] National Census of India- http://censusindia.gov.in/Census_And_You/disabled_population.aspx

[2] KReader Mobile User Guide, knfb Reading Technology Inc. (2008). [Online]. Available: http://www.knfbReading.com

[3] K. Jung, K.I. Kim, A.K. Jain, "Text information extraction in images and video: a survey", Pattern Recognition, 37 977-997S, 2004.

[4] X. Chen and A. L. Yuille. "Detecting and readingtext in natural scenes." Computer Vision and Pattern Recognition, IEEE Computer Society Conference on, 2:366–373, 2004.

[5] R. Lienhart and A. Wernicke, "Localizing and segmentingtext in images and videos," Circuits and Systems for VideoTechnology, vol. 12, no. 4, pp. 256 –268, 2002.

[6] C. Yi and Y. Tian, "Text string detection from natural scenes by structurebased partition and grouping," IEEE Trans. Image Process., vol. 20, no. 9,pp. 2594–2605,Sep. 2011.

[7] L. Ma, C. Wang, and B. Xiao, "Text detection in natural images based onmulti-scale edge detection and classification," in Proc. Int. Congr. ImageSignal Process., 2010, vol. 4, pp. 1961–1965.

[8] Nanayakkara, S., Shilkrot, R., Yeo, K. P., and Maes, P." EyeRing: a finger-worn input device for seamless interactions with our surroundings". In Augmented Human ,2013.

[9] Carlos Merino-Gracia,, Karel Lenc,Majid Mirmehdi, " A Head-Mounted Device for Recognizing Text in Natural Scenes "Lecture Notes in Computer Science Volume 7139, pp 29-41,2012.

[10] Chengjun Zhu, yuanxin Quyang, Lei Gao, Zhenyong Chen, Zhang Xiong."An Automatic Video Text Detection, Localization and Extraction Approach". School of computer Science and Technology, Beihang University, SITIS - Pages 166-175-2006.

[11] Christin Wolf, Jean-Michel Jolion, and Francoise Chassaing."Text localization, enhancement and binarization in multimedia documents". In Int. Conf. on Pattern recognition, pages 1037–1040, Quebec City, Canada., August 2002.

[12] Rajkumar N, Anand M.G, Barathiraja N, "Portable Camera-Based Product Label Reading For Blind People", International Journal of Engineering Trends and Technology (IJETT) – Volume 10 ,Issue No : 1 - Apr 2014.

[13] Chucai Yi, Student Member, IEEE, YingLi Tian, Senior Member,IEEE, Aries Arditi," Portable Camera-based Assistive Text and ProductLabel Reading from Hand-held Objects for Blind Persons" IEEE/ASMETransactions on Mechatronics.

[14] www.raspberrypi.org

[15] opencv.org

[16] ScanTalker, Bar code scanning application to help Blind Identify over one million products. (2006). [Online] Available:http://www.freedomscientific.com/fs_news/PressRoom/en/2006/ScanTalker2-Announcement_3–30–2006.asp