A survey on Camera Based Assistive Technologies for Visually Impaired peoples

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Abstract - *Today there are various camera based technologies available for blind or visually impaired peoples that enhance independent living and foster economic and social self-sufficiency. Various devices developed to make the life of blind people easy. A number of portable reading assistants systems like barcode scanners, product identifier, indoor and outdoor object detection, road navigator have been designed specifically for the visually impaired peoples. For designing these systems various algorithms were used. This paper provides survey on all algorithms and technologies used in designing various systems for visually impaired peoples.*

***Key Words*: OCR, Computer Vision, CDS, Object detection, KNFB.**

1.INTRODUCTION

As per the survey of World Health Orgaanization in 2012, there were 285 million people were visually impaired of which 246 million peoples had low vision and 39 million peoples were blind [1]. Loss of vision also often equals loss of independence or freedom and a serious decline in quality of life. This number is increasing rapidly as the baby generation ages. Recent developments in computer vision, portable computers and digital cameras make it feasible to assist these individuals by developing a camera-based products that combine computer vision technology with other existing commercial things.

Research in assistive technology used for visually impaired people has resulted in some useful hardware and software tools in widespread use. The most successful products to include Braille note takers and screen readers, text magnifiers and document scanners with optical character recognition (OCR).

A common concern among the visually impaired population is the difficulty of accessing the vast array of printed information that normally sighted people take for granted in daily life. Such information ranges from printed documents such as prescriptions, books, restaurant menus, utility bills and magazines to informational signs labeling addresses, streets and businesses in outdoor settings as well office numbers, elevators and exits found indoors. In addition, a variety of “non-document” information also be read, including LCD/ LED displays required for operating a various host of electronic appliances such as stoves, and DVD players, microwave ovens, and barcodes or other information labeling the contents of packaged goods such as medicine containers and grocery items. Great progress has been made in providing solutions to this problem by OCR harnessing, which has become a mature and mainstream technology after decades of development. Early OCR systems for visually impaired users (for example, the Arkenstone Reader and Kurzweil Reading Machine) were bulky machines that required the text to be read be imaged using a flatbed scanner. More recent incarnations of these systems have been implemented in portable platforms such as cell (mobile) phones (for example, the KNFB readerb) and tablets (for example, the IntelReaderc), allow the user to point the camera of device's toward a document of interest and have it read aloud in a matter of seconds. It is important to note that an important challenge or major limitation of mobile OCR systems for visually impaired users is the difficulty of pointing the camera accurately enough to capture the required document area; thus, an important feature of the KNFB reader [2] user interface is that it provides guidance to the visually impaired user to help her/him frame the image properly.

2.RELATED WORK

A number of portable reading assistants have been designed specifically for the visually impaired.

2.1 Survey on indoor and outdoor object detection

X. Yang, Y. Tian, C. Yi, and A. Arditi [3] develop a efficient and robust algorithm to detect elevators and doors based on general geometric shape of objects, and by combining all edges and corners. The algorithm is sufficient enough to handle small inter-class differences between different objects such as doors and elevators, as well as large intra-class variations of the object model among different indoor object environments. To distinguish an bathroom door from a office door, we extract the text information and recognize the text information associated with the detected objects. Firstly extract text regions with multiple colors from indoor signs . Then text characters are applied to filter out background interference localization and layout analysis of text strings were applied. By using off the shelf optical character recognition (OCR) software products the extracted text is recognized . The object type, orientation, and location can be displayed as speech for blind travelers. Figure 1 shows the indoor object detection.

Fig -1: Typical indoor objects (first row) and their associated contextual information (second row). (a) a bathroom, (b) an exit, (c) a laboratory, (4) an elevator.

Shraga Shoval, Johann Borenstein, and Yoram Koren [4] describes the use of a mobile robot obstacle avoidance system as a guidance device for blind or visually impaired people. Just like auditory signals can guide the blind traveler around obstacles, electronic signals are sent to a mobile robot's motor controllers, or alternatively, they provide an "acoustic image" of the surroundings. The concept Navbelt has been implemented and tested in a new traveling aid for the blind.

Ivanchenko, V. Coughlan, J. and Shen [5] proposed a system in which walking in trafficked areas or particular crossing a street. That requires awareness of the environment around oneself , flow of traffic and good control of one's walking direction and to avoid drifting out of the crosswalk. Technology that increases the pedestrian's safety in these situations may valuable, such as a mobile phone system using computer vision to orient the user not only to the crosswalk but also provide information about the walk lights timings. Figure 2 shows the system working.

Fig -2: Crosswatch system for providing guidance to visually impaired pedestrians at traffic intersections.

2.2 Survey on Landmark detection

Artificial landmarks are used to facilitate the detection process. For example, the color markers developed by Coughlan and Manduchi [6] shown in Figure 3 are designed so as to be highly distinctive (thus minimizing the rate of false alarms) and easily detectable with moderate computational cost . Artificial landmarks can be optimized for easy and fast detection by a mobile vision system.

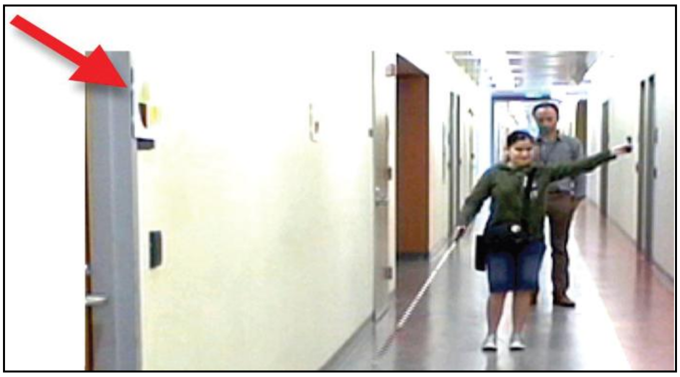

Fig-3: Experiments with a blind user searching for a landmark which is represented by a color marker on the wall using a cellphone camera.

This is an advantage with respect to natural landmarks, whose detection is more challenging. On the other hand, artificial landmarks (as well as beacons such as Talking Signs) involve an infrastructure cost -they must be installed and maintained, and represent an additional element to be considered in the overall environment design.

2.3 Survey on product identification

Chucai Yi, Yingli Tian, Aries Arditi [7] propose a camera-based assistive text reading framework to help blind persons to read text labels and product packaging from hand helding objects in daily lives as shown in figure 4.

Fig – 4: Blind persons capturing images of the object in their hands.

To isolate the object from cluttered backgrounds or other surrounding objects in the camera view, we first propose an effective and efficient motion based method to define a region of interest (ROI) in the video by asking the user to object shake. This method extracts moving object region by a mixture-of-Gaussians based background subtraction method. In the extracted ROI, text localization and recognition are conducted to acquire text information.

Xiaodong Yang, Shuai Yuan, and YingLi Tian [8] developed a camera-based prototype system which recognizes various clothing patterns in four categories (plaid, patternless, striped ,and irregular) and identifies eleven clothing colors. The system consist a microphone, a camera, a computer, and a Bluetooth earpiece for audio description or audio feedback of clothing patterns and colors. A camera placed or mounted upon a pair of sunglasses is used to capture images of cloths. The cloth colors and patterns are described to blind users verbally. This system can be controlled by speech as input through microphone. To recognize clothing patterns and colors, they had proposed a schema to extract statistical properties and a novel Radon Signature descriptor from wavelet sub bands to capture global features of clothing patterns. Figure 5 shows the Intra-class variations in clothing pattern images.

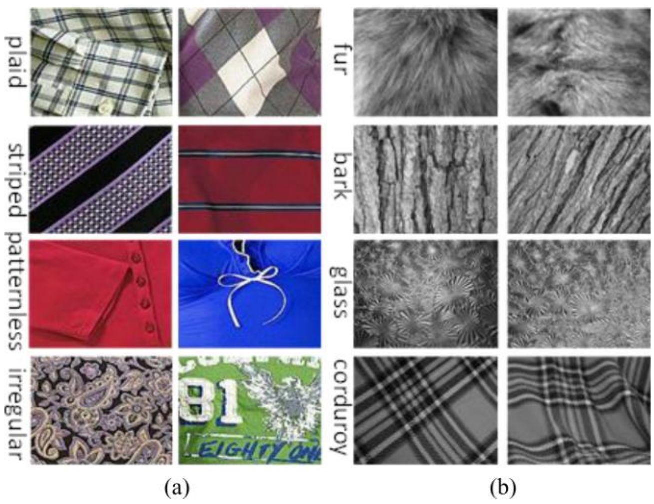

Fig -5: Intraclass variations in clothing pattern images and traditional texture images. (a) Clothing pattern samples with large intraclass pattern and color variations. (b) Traditional texture samples with less intraclass pattern and intensity variations.

3. FUTURE SCOPE

OCR software offer the function of scanning and recognition of text and perform best with document images with simple backgrounds, standard fonts, a small range of font sizes, and well-organized characters. This is the big limitation for few of the systems those uses OCR software.

In Future the other method like Context Dependent Similarity (CDS) may be use. Using method the whole document, product or any object image is compare and matches with the database images and this method provide more accurate results than OCR.

4. CONCLUSION

In this paper, the various assistive techniques for visually impaired people are survey. These system in daily life for visually impaired peoples can their enhance independent living and foster economic and social self-sufficiency. All the technologies and system were designed considering the need, characteristics and expectation of visually impaired peoples. Most of the systems are portable to use so that it is easy to carry those system by visually impaired peoples.

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