A Survey on Software Applications used for Object Recognition by the Visually Impaired

Shagufta Md. R. Bagwan[1], Dhanashri Joshi[2]

[1]Computer Engineering, Sinhagad Academy of Engineering, Kondhwa, Pune, Pune University, Maharashtra, India

[2]Sinhagad Academy of Engineering, Computer Engineering Department
Pune University, Maharashtra, India

Abstract: *The visually impaired people face problems in doing the basic activities in their life: personal, social or professional. The visually impaired users have a number of software applications designed for computers and touch-screen devices. Such people can largely benefit from a mobile phone based application. Such an application can be based on the android platform and installed on a Smartphone. It can detect major colors, locate direction and mainly recognize objects. In this survey we consider different applications that are useful for the visually impaired and how they can be enhanced to meet the high performance required.*

Keywords: Computer vision, visually impaired, image recognition, Smartphone

1. Introduction

Normal sighted people take for granted the different kinds of challenges faced by the blind or the visually impaired. They face many difficulties in doing outdoor activities .For e.g. In moving around, in locating an obstacle etc…Due to this it is difficult for them to lead a normal social and professional life. Also they cannot communicate or access the correct information as they are deprived of the visuals of the situation.

If such people have an aid to overcome their limitation it is of great use to them. There are software applications for computers and touch screen devices equipped with speech synthesizers to support them. Nowadays the Smartphones are a rage in people. They have become widely popular among the blind users too, say, the iPhone with a tool called VoiceOver, or Android based devices.

This Android Smartphone can be used for doing the daily living tasks such as those related to personal care systems, i.e. systems that enable the visually impaired to identify objects. There are applications that support the visually impaired by different means. There are powerful computer vision algorithms that can be used for image processing for this purpose.
Pre-recorded verbal messages are the means to communicate the results to the blind user.

2. Motivation for Survey

For the visually impaired users there is always a scope for innovation as the more the advances in technology the more will they be benefitted from the same. There are new technologies emerging everyday for their use. Performance and efficiency are of prime concern and hence, there is a constant urge to emerge with new technology. There are mobile applications based on Android platform in a Smartphone designed for them, knowledge of them may lead to more efficient technology for such users.

3. Existing Systems

There are systems that provide aid to the visually impaired users. Such systems are physical devices or the recently developed mobile applications.

3.1 Grouping of available solutions

3.1.1 Low-tech labeling systems
Contour pattern recognition: There are tactile devices that help the blind users in learning the Pattern Recognition. The main difficulty is in grasping the accurate shape of an object for its reconstruction. The actual shape may be different from the understood shape. To solve this problem, there is a Pattern Recognition technique that uses auditory labels based on the contour chain code. Freeman chain is used and shapes are represented as sequence of steps, each in one of the eight directions. Integer 0-7 designates each step. Braille language signs and messages are used to labels[1-2].

3.1.2 High – tech systems
There are systems that include RFID devices, 1-D & 2-D barcodes, auto-read labels. They need special tags / visual signs to be assigned to the systems [3].

3.2 Mobile phone Applications for the Visually Impaired

3.2.1 Symbian phones
Symbian phones using Mobile speak [4] or Talks were popular in the blind users few years back. They read the exact content from the screen by using synthesized voice. However, today with the improved gesture based user interfaces the blind users can easily use touch screen devices such as an iPhone or any other android smartphone. The android system suits the needs of visually impaired people. It has TalkBack tool that comments and reads GUI components.

3.2.2   Recognizer

it is a software developed by LookTel [5]. It is special commercial software for the visually impaired users, dedicated especially for iPhones.It recognizes an object within the scope of the camera, which was previously stored in the local database of the objects' images, for e.g. household objects. The database contains images that are taken by a sighted person. Proper orientation of the image is must for recognition.

3.2.3   EyeRing project

It is a finger worn device that interacts with the android smartphone[6].The mobile runs image analysis and computer vision algorithms and also speech processing algorithms. The EyeRing has camera, Bluetooth, controllers and other controls. It virtually does what a walking cane does. Also it detects colors and recognizes bank notes.

The disadvantages are that it is costly and requires additional device carriage by the visually impaired.

3.2.4   Image Recognition application for Visually Impaired[7]

It has three modules: color detection, light detection and Image recognition. Image captured by an in-built camera of the smartphone is recognized by the application installed on an android smartphone by comparing it with the database images. Scaling and local invariance are an advantage.

This object recognition algorithm is insensitive to image registration parameters like scale, rotation and also lightening conditions. Image is robustly detected. Localization of image is done.

SIFT [8] is a powerful computer vision algorithm which is used in this application. It computes feature descriptors which are not dependant on image registration conditions.
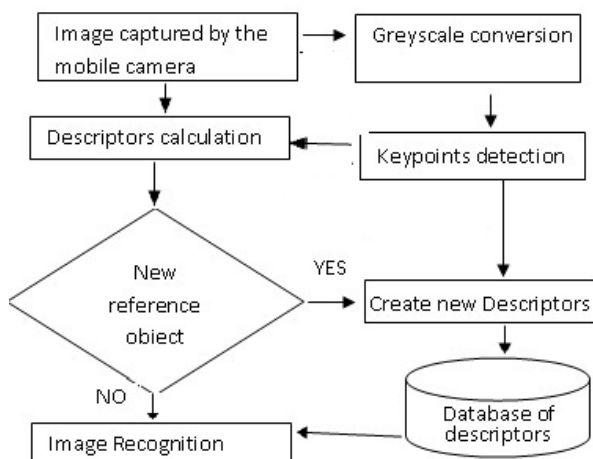

Figure 1: SIFT Algorithm steps

FAST algorithm [9] is also used as a corner detection algorithm to improve the performance of the application. Varying lightning conditions pose a problem in efficient working of color module. Light source is detected after a short time delay required to automatically capture the image by the in-built camera.

3.2.5   VisualPal

This is the proposed mobile application for the visually impaired. It is under development and is expected to be the fastest object recognizing application that runs on an android smartphone.
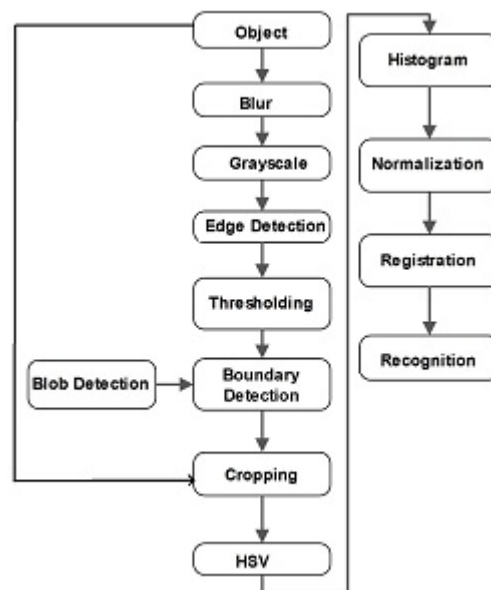
It has the feature of scaling invariance and object localization. Grayscale / Intensity as well as color information is used. Edge features and color features extraction helps in the faster computation speed. It uses most of the computer vision and image processing algorithms. The use of the combination of Artificial Neural Networks and distance measures increases the computational speed. It can run on the Android smartphone which are a rage in the market today. The visually impaired user can just install this application on his smartphone which can then be used to recognize objects. These objects are stored in the image database stored on the mobile.

4.   Conclusion

The visually impaired users are aided with many systems to overcome their weakness. Some are labeling systems, some require the use of physical devices in addition to these systems which many a times is an extra burden to carry. Some are installed mobile applications. Nowadays, mobile has become a basic need of common man. Hence, in recent times mobile applications are developed for Android Smartphones for the blind users too.. With the application which is under development, the visually impaired users can hope an efficient and computationally fast mobile application that detects object.

References

[1] Onishi J., Ono T. (2011) Contour pattern recognition through auditory labels of Freeman chain codes for people with visual impairments, International IEEE Systems, Man, and Cybernetics Conference, Anchorage, Alaska USA, pp. 1088-1093.
[2] Tinnakorn K., Punyathep P. (2011) A voice system, reading medicament label for visually impaired people,

Paper ID: OCT141181   1524

Proceedings of RFID SysTech 2011; 7th European Workshop on Smart Objects: Systems, Technologies and Applications, Dresden, Germany.

[3] Introducing Mobile Speak.http://www.codefactory.es/en/products.asp?id=316

[4] LookTel Recognizer. http://www.looktel.com/recognizer. Accessed 25th February 2013..

[5] Nanayakkara S. C., Shilkrot R. and Maes P. (2102) EyeRing: An Eye on a Finger. Intl. Conf. Human Factors in Computing (CHI 2012)

[6] D. Lowe (1999) Object Recognition from Local Scale-Invariant Features. International Conference on Computer Vision, pp. 1150-1157.

[7] K. Matusiak, P.Skulimowski and P. Strumillo (2013), Object Recognition in a mobile phone application for visually impaired users, University of Technology, Lodz, Poland.(HSI 2013)

[8] D. Lowe (2004) Distinctive image features from scale invariant keypoints. International Journal of Computer Vision, vol. 60, pp. 91-110.

[9] Rosten E., Drummond T. (2006), Machine learning for high-speed corner detection. European Conference on Computer Vision, pp. 430–443.

Author profile

Shagufta Md. R. Bagwan received the B.E . degree in Computer Science & Engineering from Karmaveer Bhaurao Patil College of Engineering and Polytechnic, Satara ,in the year 2009.Currently she is pursuing M.E degree in Computer Engineering from Sinhagad Academy of Engineering, Pune, Maharashtra, India

Prof. D. K. Joshi received her M.E in Computer Engineering from D. Y. Patil College of Engineering, Akurdi, Pune. She is associated currently with the Computer Engineering Department of Sinhagad Academy of Engineering, Kondhwa, Pune, Maharashtra, India