

# Object Detection In A Smartphone for Visually Impaired Users

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## Abstract

*This paper provides various important features of software modules constructed for android platform for visually impaired users. The object recognition module helps visually impaired user to recognize various objects around his/her surroundings. An approach is done in this implementation to recognize and extract various objects from an image on android platform. Captured images are converted into binary images using Thresholding technique for background and foreground separation, and by extracting the essential objects from the image by various techniques and matched extracted objects are compared to the database of objects, e.g. pen, book, mobile etc. The matched objects are generated as an output to the visually impaired user through speech generation.*

## Keywords

*Android OS, Image Processing, Speech Generation, Object Detection, Serialized Database, Visually Impairments.*

## I. Introduction

In day-to-day ongoing life everything is getting dependent on computer based technologies. Hence due to which many of the challenges is been evolved in these technologies. Computing environment is getting more closer towards Human Computer Interaction designs. As far as, out-door happenings are considered the blind face difficulties in safe and autonomous mobility depriving them of usual qualified and societal life [1]. As we know that the visually impaired user is always anxious to know what is going on in his/her surrounding, so a significant help is provided by the android application for computer system or smart phones with speech output to the visually impaired user.

Presently, the most enhanced choice of smart phones among visually impaired users is either an iPhone with a very worthy tool called VoiceOver or an inexpensive selection of one of the Android-based smart phones [2]. Using a modern smart phone has an advantage that they provide a wide range of services such as digital camera, speech recognizer, etc. By Gartner's analysis the Android platform has gained 70% share of total smart phone market[3]. Recently, the most popular smart phones being used are iPhone and Android phones, as iOS would be a costly approach for this system, so the essential implementations are made on Android platform.

We have delivered an Android based smart phone as a system for image processing and object recognition module which work on images captured by a visually impaired user using a built-in camera.

## II. Literature Survey

In the fields of Image Processing and Object Recognition a lot of exploration is being performed. Researchers have tried to develop more and more flexible, compact and reliable Object Recognition system for visually impaired people in the respective fields. However, all of them used various methods to make these Object Recognition systems successful and reliable for daily use.

Recognizer is an iOS application by LookTel[4]. It is a commercial application that is supposed to detect an object within the camera boundary view that was previously stored in a local database of objects or images. The application is delivered to help visually impaired user to recognize household objects. For reliable results, objects stored in the database should be captured by a sighted person in a predefined orientation. But, the limitation of the tool is that, as, the image is pre-loaded by a sighted person could be a drawback. Cause every time the blind user has to be dependent on the sighted person for its reliability.

An additional application projected for the blind users is the EyeRing project [5]. The EyeRing project consists of a VGA camera, AVR microcontroller, a Bluetooth module with control keys. This is a finger-worn device, converses with an Android smart phone. The chore of smart phone is dealing with speech processing algorithms and all image processing algorithms[6]. This solution, however, is expensive for the visually impaired people. As, this project is equipped with many of the instruments, makes this project complex to carry for a visually impaired person.

## III. Recognition Of Objects From Images Captured By Android Smartphone

Functional processing of the Android smart phone takes a Camera feed as an input and process it through image processing algorithms. Voice output module and object detection module is generated as a output and module performs the processing as required project is intended for.

The objective of the project is to design an application which would permit to identify objects from images recorded by the camera of an android smart phone. The object recognition algorithm should be insensitive to image registration parameters, i.e. stability, angle variation and clarity conditions. Moreover, the identified object should be robustly detected and confined in the image context, then, these identified objects are matched with the database of objects already preloaded in the Android smart phone.

The essential steps of the algorithm that we will be using in the application are shown in the flow diagram in Figure 1. Primarily, an RGB image is captured by an Android smart phone. Then, the image is transformed into grayscale (in our application methodology, color information is not considered for the object recognition module). After the grayscale image obtained, the edges are detected from the image, for detecting the edges we will be using sobel operator/canny edge detection algorithm depending on the reliability and efficiency of the resulting image.

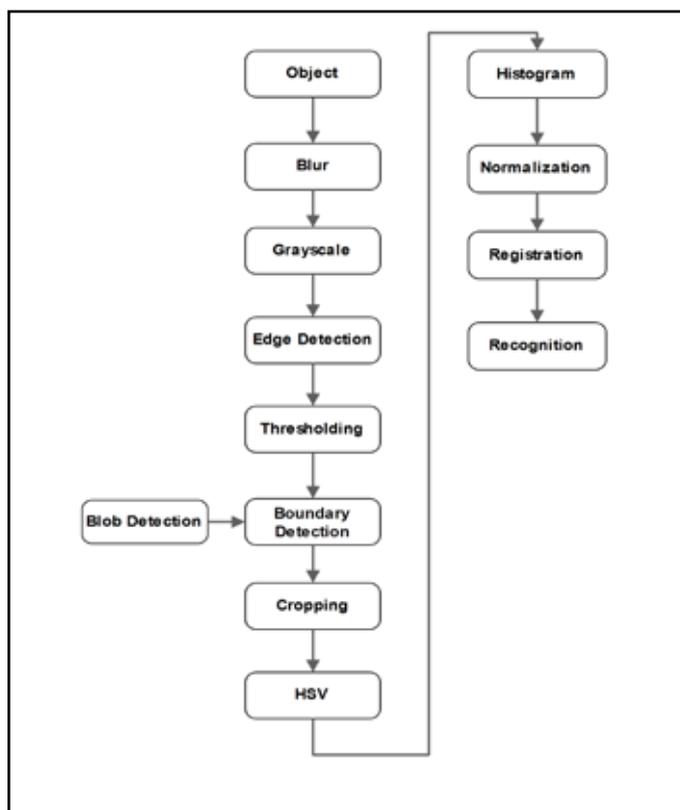


Fig. 1: Flow of Android Based Object Recognition Module.

Image thresholding, for background and foreground separation, and converting the essential image into pure black and white or binary image. After the resulting image obtained, blob detection algorithm is applied on the image for boundary detection of the essential objects needed from the image for e.g. if a particular image is considered the objects from the thresholded image are retrieved from the image and the essential objects are stored in the vector form. The objects obtained are converted from RGB to HSV, firstly the RGB separation is done i.e. R, G and B are separated. Now, the maximum and minimum value is considered of the R, G and B. The difference between maximum and minimum are stored in temporary variable for defining the HSV values. By using, the defined algorithm the Hue, Saturation and Value are obtained.

The resulting objects obtained are now separated and by using serialization methodology the essential objects are stored in binary format. Now the objects in binary format are compared with the already saved database of objects and the resulting output is generated, if the final result is matching, then the object is recognized otherwise it is considered as a new object and registered.

#### IV. Conclusion

The application that we are trying to develop will advance the way of people that are going to use the computing environment. The application being developed would lead to a better solution for communication and daily living for visually impaired people. It would be a fresh approach in the computing environment, and will lead to a successful and reliable approach. As, we are using all Android based integrations, which is totally an open source, due to which, the product we are developing will be an open source and can be used by every visually impaired person.

The application that we are trying to construct is currently under development and after final completion of the application it can be

used for further enhancement for visually impaired people. It can be further used for its use in cybernetics, computing environment and developing systems in digital world on many aspects like for understanding human behaviour based on their way of interaction and for further explores.

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