

# Design and Developing of Techniques to Assist the Visually Impaired People

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**Abstract** – According to WHO (World Health Organization) over 280 million people worldwide live with visual impairment which prevents them from basic access to written or visual material. They often need to identify objects around them. How do these people see or recognize objects and read? The only way is by touching and listening. That is the major problem faced by visually impaired people, to detect the object without touching it and in this pandemic situation with COVID like deadly virus around, touching any object directly with bare hands is not safe. In past decades, many efforts have been done in developing several devices or techniques to assist the visually impaired. Many of those are too costly or heavy or don't help the visually impaired much. So, the goal of the proposed system is to develop an android application that will help them to recognize and identify various objects and currencies, detect faces in front of them, understand image/ scene text in real-time using object, face, text and currency detection and recognition algorithms and get the current location they are at and assist them hence leading to improve independence and ease of its user.

**Keywords:** Visually Impaired, Object Detection, Object Recognition, Text Recognition, Currency Recognition, Face Detection.

## 1. INTRODUCTION

The term Visual Impairment as experts describe refers to total or partial vision loss which cannot be fixed even with any corrective means such as eyeglasses or contact lenses. Vision Loss is most often accompanied by loss of independence and the person needs some sort of assistance to carry out day to day activities. They often need to identify objects around them, from a pen to clothing items to a person, read from a note to a bill. Hence, the proposed system 'DigiEye' is an android application developed to assist visually impaired people. DigiEye has the following features: 1) Object Detection 2) Currency detection 3) Text detection 4) Face detection 5) Current Location 6) Current Time The proposed system 'DigiEye' assist people with low vision or blindness get things done easily without any human assistance. DigiEye uses the device camera to detect objects, faces, text, currency and get current location and time when requested and then the app audibly describes those objects for people with visual impairment.

## 2. PROPOSED SYSTEM

The proposed system is an android application 'DigiEye'. DigiEye is designed for the blind and low vision community. DigiEye App has a range of visual recognition features that enables blind and visually impaired users to independently access visual information around them. It helps visually impaired people detect and recognize text, objects, faces, currency notes and also get their current location.

DigiEye enables visually impaired people to detect:

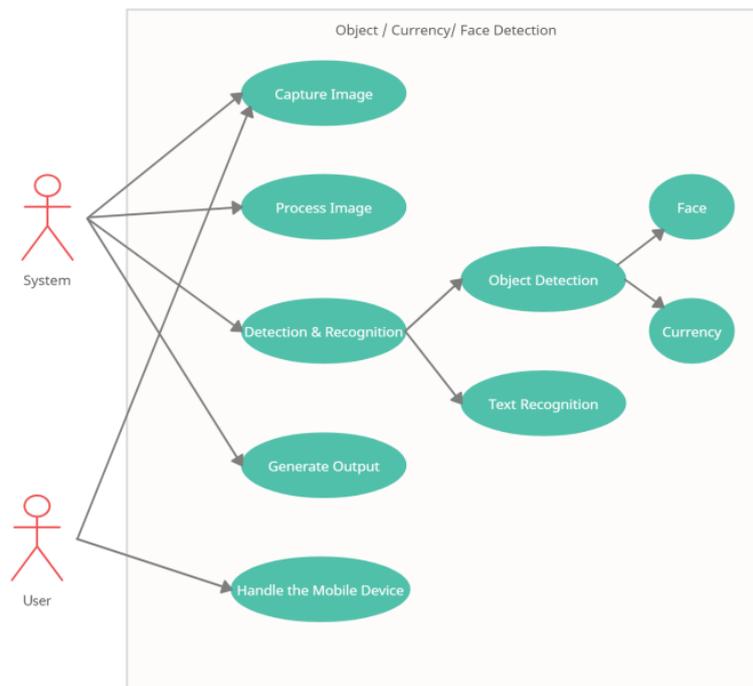
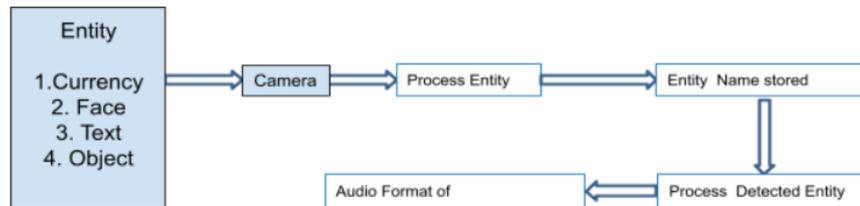
- 1) Object – quickly detects and identifies the object in front of the device's camera.
- 2) Currency – Recognizes currency notes in front of the camera.
- 3) Text – Speaks text detected in the picture clicked
- 4) Face – Detects faces in the picture clicked

DigiEye enables the visually impaired people to get:

- 5) Their current location, where they at
- 6) Current time

### 3. SYSTEM ARCHITECTURE DESIGN

The goal of the proposed system is to develop an android application that will help them to recognize and identify various objects and currencies, detect faces in front of them, understand image/ scene text in real-time using object, face, text and currency detection and recognition algorithms and get the current location they are at and assist them hence leading to improve independence and ease of its user.



### 4. APPLICATION DESIGN

DigiEye is designed keeping blind and visually impaired people in focus. The application is designed by following several best accessibility practices to ensure a good user experience for users who are blind or have a visual impairment.

The peculiarity of User Interface (UI) (Fig. 1) of the DigiEye app –

1. The buttons in the application have large touch targets this makes the buttons easier to distinguish and touch.
2. Adequate colour contrast is used for the UI elements
3. On every button click, voice assistance is provided which help better understand the use of the button

### 5. IMPLEMENTATION

Features of DigiEye application are:

- 1) Object Detection
- 2) Currency detection
- 3) Text detection

- 4) Face detection
- 5) Current Location
- 6) Current Time

#### *5.1 Object Detection*

For the Object Detection module, we have used Tensorflow lite. Tensorflow is an open-source software library used for machine learning applications such as neural networks, etc.

In TensorFlow, we have used the TensorFlow Object Detection API which is an open-source framework built on top of TensorFlow that makes it easy to construct, train and deploy object detection models.

There are already trained models for detecting objects in that framework.

It includes a collection of pre-trained models trained on various datasets such as the

1. COCO (Common Objects in Context) dataset
2. KITTI dataset
3. Open Images Dataset.

Input: An image that consists of one or more objects.

Output: One or more bounding boxes (e.g. defined by a point, width, and height), and a class label for each bounding box. Again as our end-user is visually impaired we are providing an audio output of the detected object

#### *5.2 Currency Detection*

Just like the Object Detection Module we have used TensorFlow to detect currencies

We have trained a separate TensorFlow model to detect various currencies.

Input: An image of currency.

Output: Our end-user is visually impaired we are providing an audio output of the detected currency

#### *5.3 Text Detection*

Text detection and recognition is a task of extracting text data in a machine-readable format from still images, video frames, live video stream and scenes.

In this application text detection module uses Google's ML Kit. With ML Kit's text recognition APIs we can recognize text in any Latin-based character set. We can recognize text in images, such as text in street signs, price tag, social media post etc.

ML Kit's Text Recognition provides both on-device and cloud-based APIs. Here we are using free on device API.

Input: Image with Text

Output: Extracted text from image

#### *5.4 Face Detection*

This module uses Google's ML Kit to detect faces. With ML Kit's face detection API, we can detect multiple faces in an image and identify key facial features. We also get the contours of detected faces.

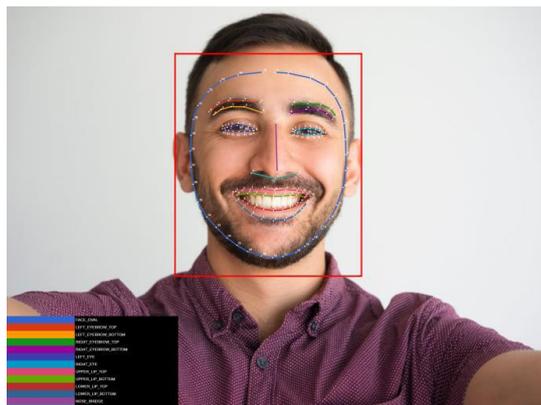


Fig. 2: Face Detection

The application uses Google Location Services API to get current location of the user. These services allow applications to get periodic updates of the device's geographical location.

### 6. RESULT DISCUSSION



Fig. 3: Application UI

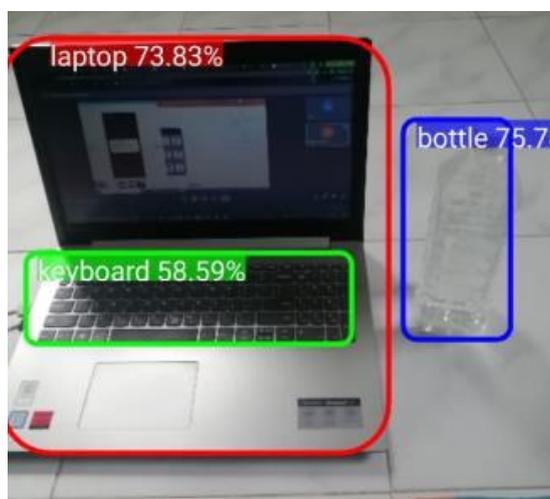


Fig. 4: Object Detection

In future we hope this application helps many visually impaired in easing their life by assisting them with their day-to-day activities.

This work can be extended by adding additional functionality such as:

- 1) Multilingual Support: As of now the proposed application only supports English language and audio-visual outputs given to the end user are in English. This functionality can be updated and application can be made available in multiple languages so that worldwide users can get output in their native language and can benefit from the DigiEye application.
- 2) Face recognition: The application will detect and recognize and save faces in the image taken. So that the user can get to know who is in front of him/ her.
- 3) Accuracy: As of now the application has accuracy of 60-70% for modules like object detection, text detection and currency detection. In future accuracy can be increased by implementing advanced future researches.

## 7. CONCLUSIONS

In this paper, we have proposed an intelligent, portable assistance system to assist visually impaired people. The application is mobile based because today almost everyone uses smart phones. It is easy to carry and user friendly unlike other assistive systems and devices. There are many standalone assistive systems and devices which work on an individual challenge faced by the blind people. But maintaining and carrying all those heavy and costly devices together is very hard, here the user gets overwhelmed and confused. Hence, the main focus is to incorporate all the techniques and technologies under one roof which promotes ease of use, independence and usability resulting in improved quality of life.

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