EYE ASSISTANT

Using mobile application to help the visually impaired.

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Abstract- **Mobile devices or portable smart gadgets are largely used in our day-to-day life now. These devices can be very useful in helping people who are visually impaired and assist them to make their life easier. This paper presents an android application that recognizes objects using real time object and text detection by scanning them. The application can run on the device without any remote server. Our solution uses a voice feedback to tell the user about the detected object. The app doesn't need any photograph to detect the object. To enable robust recognition, we first segment the object from the background using tensorflow machine learning API based on iterative diagram cuts. We then formulate the recognition problem as an instance retrieval task and the user gets to know the object through a text to speech method. The system is designed to help a visually impaired person know about the environment around them. This app can be run on any low-end smartphone devices.**

Keywords- **visually impaired; android application; scanning; TensorFlow; text to speech; image recognition; text recognition.**

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I. INTRODUCTION

Mobile phone has become a very significant device for out day to day life. Information of the whole world is in our hands due to this device. Nowadays we cannot imagine living without a mobile phone for even a day. From food to deliver service to calling taxi services, we are all dependent on mobile phones and it's applications. The use of mobile phone is growing every day. This is because it makes our life easier and makes various services easily accessible. According to GSMA data, which is an online mobile reviewer plateform, it is expected that the number of mobile phone user will pass around 5 billion [1]. In 2016, 56 percent of population in worldwide has owned mobile phone already and especially the use of smartphone is rapidly growing [2]. By 2014, it is estimated that around 70 percent of population were smartphone user [3]. By 2019, it is expected that the number of smartphone user will grow by 2.7 billion. The statistic can be seen in Figure 1.
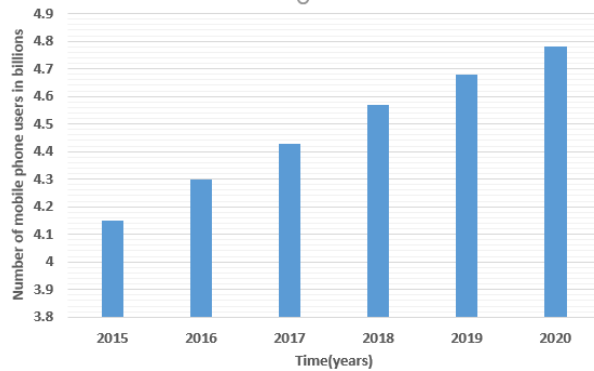

Figure 1. Number of mobile phone users between 2015 to 2020 (in billions)[4].

Visual impairment does not always mean complete loss of eyesight. According to the World Health Organization there were more than 285 million visually impaired living in the world in 2012 [5]. Even a slight visionary inability can affect a person's day to day life hugely. As represented in Figure 2 the number of visually impaired people have increased all over the world.
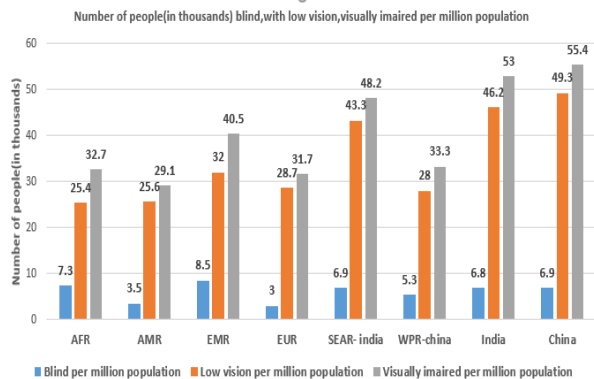

Figure 2. Number of people (in thousands) blind, with low vision & visually impaired per million population [6].

The inability to see the surrounding makes it difficult to move around or do anything on one's own. A lot of objects have the same texture or shape which makes it even harder for a visually impaired person to sense what objects are around or they holding. Nearly one-third of people with vision loss suffer from clinical depression, a rate that is twice as high as the general population of the same age [7]. Visually impaired people suffer in many ways. The proposed system is an android application that detects

objects by scanning them and replying with a voice feedback that can assist any visually impaired person. As usage of mobiles have increased and price has reduced in the past few years drastically, this vastly used and easily accessible device seemed better choice for this system.

II. SMARTPHONE APPLICATIONS

There are quite a few applications out there in the market that is similar to ours. Some of them are costly to use. This application is open to all. Existing applications are mostly used to detect currency bills of different countries. A few of them are there that detects objects around them. But nearly all of them requires taking a picture of the object or the bill and save it in memory before it can detect what object it is. What makes our application different from all the others is that our application does not need to take a picture of the particular object, but instead it scans the object and recognizes the object using real time object detection. It is easy to use for blind people. That way the visually impaired does not have to worry about taking a proper picture nor does he have to worry about.

A. How does it work

We have used two features for the application. A user can recognize object and can hear any text over voice. So, for these two features we have used an open source machine-learning framework, which helps to detect any object and google text to speech API to recognize text.

I. Object Detection

In this case, when a user wants to detect what object is it or what is the name of a particular object the user needs to open camera. For this, we used google camera API that can detect camera hardware information and eventually open the camera. For displaying any object texture View class is used to take frame. Later by using TensorFlow machine learning framework we have trained our dataset and then imported the trained dataset. For detecting object our algorithm take input by using camera and feed the input to the algorithm then communicate with trained model and eventually make the prediction. Figure 3 represents how algorithm actually works to detect object.
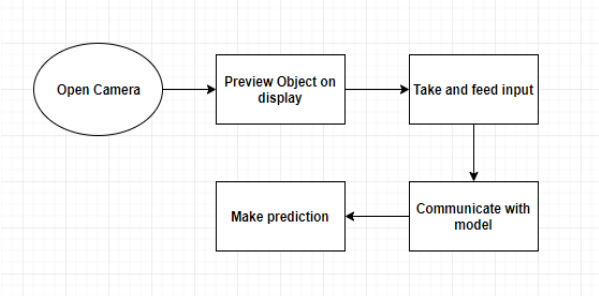

Figure 3. Flow chart showing object detection algorithm works.

II. Recognize Text

Optical Character Recognition (OCR) gives a machine power to read any text. OCR is the best way to recognize any text which make visually impaired user able to hear text out loud. Camera takes individual frame using detect methods and TextRecognizer. To read any text straight from camera, when any texts become available we have implemented processor in OcrDetectorProcessor which handle all the detections. From TextRecognizer ReceiveDetections will receive text blocks when text becomes available. For this, Text Recognizer is used to detect image and process the image that determines what text appears within the image and finally make an audio synthetic voice using text to speech API to give output. Figure 4 illustrates how the text to speech API works in that application.
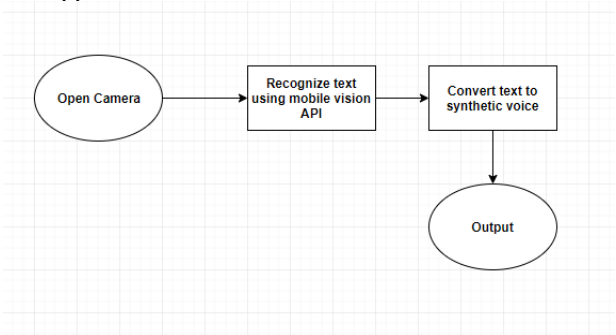

Figure 4. Flow chart of text to speech algorithm.

B. How to use

Visually impaired have difficulty being aware of their surrounding and recognize objects. In our app, at first they need to open the app and it will start working without any other command. The mobile camera will scan the object and the real time data will be processed evaluated with the system dataset and finally it will give the result. A user can just open the app using Google assistant just using voice. Later the user is asked whether the user wants to recognize object or recognize text. Figure 5 illustrate how to use the application.
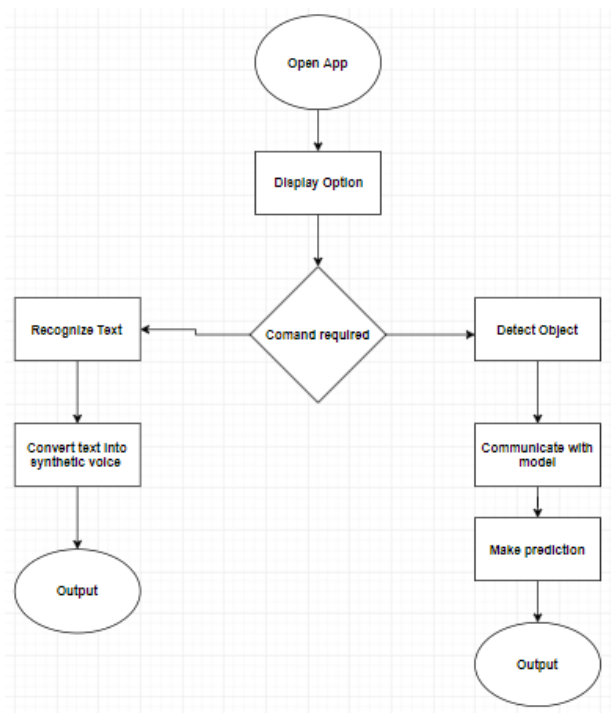
Figure 5. Flow chart showing the work of application.

III. TESTING THE APPLICATION

The whole system testing is done using a Huawei phone. In this system a user can open the application by using Google assistant and user can choose if user wants to recognize object or read any text. The system is very easy to use and user friendly. Figure 6 shows the interface. If the user chooses the "Detect Text" option then the camera opens and if you hold it against any text the app can read it out to the user. If the user chooses the "Detect Object" option then again the camera opens and if it is held against any object then the app tells the user what object it is.
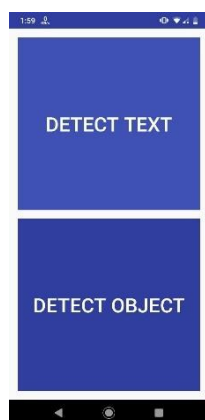

Figure 6. A user can detect object and detect text

For detection we have trained some data that are available around us. We have used tensorflow machine

learning API, which is developed by Google brain team. So a user who has a poor vision can recognize any object. After testing the application we saw that the recognition accuracy for every object is more than 80 percent. So we can fairly say that if we train more data and develop the application then it will be able to detect as much objects as possible and with better accuracy rate. Figure 7 shows how a user recognize object.

Figure 7. Object recognition test.

We tested our app for recognizing text and we saw that our app can recognize all the text that we tested. As we have trained our app in English so our app can detect all texts written in English. So if the user holds the camera against a text the app gives out a clear output of the text and reads it out to the user. As our target users are visually impaired or blind people, this text recognition can help them in many ways to identify anything written around them or on any object. Figure 8 shows how text to speech works in real time.

Figure 8. Real time text recognition

IV. FUTURE WORKS

The app we have built so far is suitable to be used by people with poor vision or visually impaired. In future, we

intend to add voice command so that fully blind people will be able to use the app easily. Currently the data in our app is limited data. We have used CIFAR 10 data set where there are 600 images of 10 objects, which we have trained. Our plan for the future is to work with many more data sets and to train them so that a blind or visually impaired user can use the app to recognize objects of their day-to-day life easily.

IV. CONCLUSION

Our client targeted is people who are visually impaired and we have noticed that their life is quite difficult. We created the app with features, which can help them make their life easier by knowing what's around them by using our app. We have seen that all the applications similar to ours have been made before but those app need to capture image and then return what object it is. But our application does not need to take an image and it only scan object and then tells the user what object it is. That way the visually impaired user doesn't have to delete images from memory every now and then.

V. REFERENCES

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