EYE FOR BLIND

Project Report
Submitted in partial fulfillment of the requirements for the degree of

BACHELOR OF ENGINEERING

by

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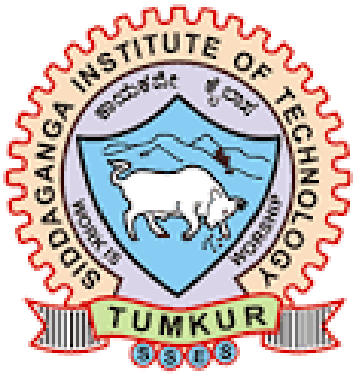

DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING

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DECLARATION

We, **Sumant Kumar [1SI17TE035]**, **Anushant Bhushan [1SI17TE004]**, **Pavan T.L [1SI17TE020]**, **Pramodh H.R [1SI17TE021]** hereby *declare* that the project work entitled **Eye for blind**, is a bonafide work carried out by us under the constant guidance of **Ms. Susmita Eswar, Assistant Professor**, Department of Electronics and Telecommunication Engineering, Siddaganga Institue of Technology, Tumkur is being submitted in partial fulfillment of the requirements for completion of Third year project work in the program of study of B.E.,in Electronics and Telecommunication Engineering. This work has not been submitted to any other university.

Place: SIT Tumkur
Date: 04/07/2020

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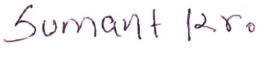
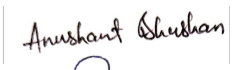
Sumant Kumar	
Anushant Bhushan	
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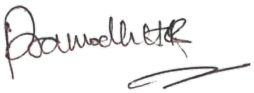
Pramodh H.R	

CERTIFICATE

This is to *certify* that the project Report entitled **Eye for blind**, submitted by **Sumant Kumar [1SI17TE035]**, **Anushant Bhushan [1SI17TE004]**, **Pavan T.L [1SI17TE020]**, **Pramodh H.R [1SI17TE021]** as the record of the project work carried out by the students, is *accepted as a Project Report submission* in partial fulfillment of the requirements for the award of degree of **Bachelor of Engineering**.

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ABSTRACT

Blind people faces many problems in our society. So, an idea comes up in mind with some solution for the problems they are facing. As they are blind, they are not able to read the ***medicine*** *name and they always depends on other person or care taker for help.*

Some of the people took advantage of their disability and cheat them by taking ***extra money*** *or by giving* ***less money****.*

Then the problem is how to make them independent in terms of ***medicine and cash transaction process****.*

To overcome the problem of ***blind persons*** *there is an innovative idea, where by making use of* ***machine learning, image processing, OpenCV, Django, TTS and OCR*** *technologies to develop a software assistant using* ***Talkback and VoiceOver*** *feature in android and iOS device which will guide the blind peoples and makes their life more comfortable.*

In this project make use of a camera of a device for getting the input, where the inputs are pictures of ***medicine*** *and of* ***currency****. These images can be manipulated and enhanced by using* ***image processing*** *and* ***OpenCV*** *tools in* ***Python****. Once the processed imaged is obtained then it is cropping and thresholding is done, In the next stage for medicine detection part extraction of medicine name took place, then conversion of text into speech using* ***TTS*** *technology took place and the output is obtained.*

Similarly, for currency detection the picture of currency is taken and then ***image processing*** *and* ***machine learning*** *algorithms are taken place to compare the input currency picture with predefined database of each currency that has already been prepared. Then the next process is to covert the value of currency into text and then the text is converted into speech using* ***TTS*** *technology and output is given.*

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ABBREVIATIONS

OCR	Optical Character Recognition
OpenCV	Open Source Computer Vision
CNN	Convolutional Neural Network
TTS	Text To Speech
AI	Artificial Intelligence
ML	Machine Learning
HTML	Hypertext Markup Language
CSS	Cascading Style Sheets
JS	JavaScript
HTTPS	Hypertext Transfer Protocol Secure
RGB	Red Green Blue
OS	Operating System
GUI	Graphical User Interface
IDE	Integrated Development Environment
IP	Internet Protocals
ROI	Region Of Interest

CHAPTER 1

INTRODUCTION

1.1 Motivation

One of the problem for visually impaired individuals is that they are mostly been cheated during money transactions such as they are not able to distinguish between different currency and also they face difficulty in taking their medicines as most of the medicine tablets are in same in size hence they face difficulty in identifying that which medicine they need to take in what quantity and at what time and for this thing they always need to depend on somebody else so taking their problem into account. So, an idea to develop an software based personal assistance that will guide them when they will face these two problems in future.

1.2 Objective of the Project

The main objective of this project work is to help the visually impaired individual (blind person) by protecting them from getting cheated in terms of money transaction and also to reduce their dependence on other people for taking right medicines in right quantity at right time. To fill this main objective, identified the following objectives for the proposed work.

(a) Machine learning model for currency detection.

(b) Algorithm to guide them with proper medicine name with prescribed doses using Image processing and OCR .

CHAPTER 2

SOFTWARE DESCRIPTION

2.1 Image Processing

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image.

It involves the operations required prior to data analysis and information extraction. Here image pixels are extracted then cropping, scaling, conversion of image into grey level,finding counters is done. In Figure 2.1. (a) and Figure 2.1. (b) thresholding and adjustment of brightness and contrast is shown respectively using image processing.[1]

Operations used under this project

(a) (b)

Figure 2.1: (a) Thresholding effect (b) Brightness and Contrast adjustment effect

- Thresholding of an image
- Brightness and contrast adjustment
- Image enhancement

2.2 OpenCV

OpenCV (Open Source Computer Vision Library) is an open source library of programming functions mainly aimed at real-time computer vision.It is library to all for image processing applications. CV2 library is used in this project for the manipulation of image for both currency and medicine detection. [2]

Converting an image RGB to gray scale using OpenCV function CV2.RGB2GRAY in Spyder IDE using python CV2 module is shown below in both Figure 2.2. (a) and Figure 2.2. (b) as a example of hundred rupee note.

Operations used under this project

- RGB to Gray Scale conversion
- Cropping of an image
- Capturing the image
- Resizing the image

(a) (b)

Figure 2.2: (a) Hundred rupees note image captured using OpenCV (b) Gray scale image of hundred rupees note using OpenCV

2.3 OCR

OCR is used to recognize the the characters from the captured image and convert it into textual information as shown below in Figure 2.3. where input is an image and output is a text. The basic process of OCR involves recognize the text of a image and translating

the characters into code that can be used for data processing. OCR is used here in this project as text recognition.[3]

Operations used under this project

- Pattern recognition : It is used to discriminate the fonts and formats by compare, and recognize.
- Feature detection : It is used to discriminate the letters and numbers by number of angled lines, crossed lines or curves in a character.

Figure 2.3: OCR

Tools were used under this project for OCR

- Tesseract Engine : Tesseract is an optical character recognition for which set-up of an engine has to be done earlier and its an open source to all and tesseract uses apache server.[4]

2.4 Machine Learning

Machine learning (ML) is the study of computer algorithms that improve automatically through experience.It is seen as a subset of artificial intelligence. Machine learning algorithms build a mathematical model based on sample data, known as ”training data”, in order to make predictions or decisions without being explicitly programmed to do so. In this project Machine Learning is Used for creating the dataset and train the model for the currency detection part in the project.[5]

Tools used under this project for machine learning

- Spyder IDE
- Anaconda
- Google Colab

2.5 Django

Django is a free and open source, full-stack web application framework, written in Python and widely used for web app development with administration GUI. Django is used in this project to give the user interface. Django upload our complete project files onto its own server.[6]

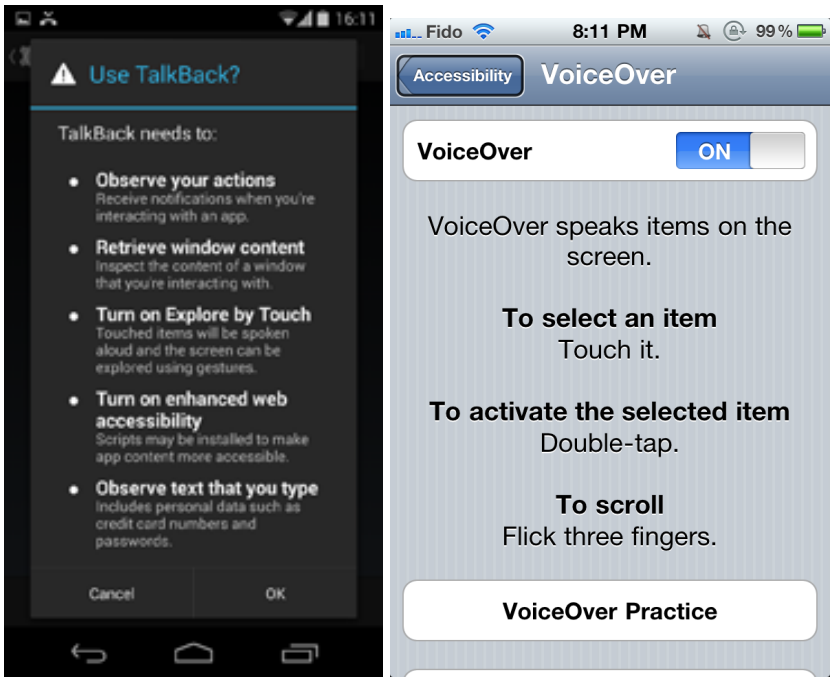
Tools used under this project for Django

- Virtual Studio Code : Used to write the code and commit the changes to the GitHub
- Anaconda prompt : Used to run the command for uploading files to the Django server, installing the required libraries and virtual environment setup for specific tasks.
- Google Chrome : Used to open the interface and development tools to edit the designs while making the interface.

2.6 Talkback and Voiceover

Features of both talkback and voiceover accessibilities in both android and iOS is shown above in Figure 2.4. (a) and Figure 2.4. (b).

- Talkback and voiceover is the accessibility service given by android and iOS respectively for Blind person.



(a) (b)

Figure 2.4: (a) Talkback feature in android (b) VoiceOver feature in iOS

- Talkback and voiceover provides spoken feedback as you navigate around the screen, by describing your actions and informing you of notifications. It is a system application and comes pre-installed on most of the Android devices.
- By using these feature it is very easy for the blind person to operate mobile phone.[7]

Steps to be followed for talkback by blind person:

- Press Volume up and Volume down keys for 3 second to turn on talkback feature
- Click on medicine and currency web app
- Choose the file button
- Select the camera option among the all option and click the medicine or currency image
- Select the image by using done button at bottom right on the screen
- Press submit button

CHAPTER 3

CURRENCY DETECTION

3.1 Overview

As mentioned in the problem statement currency detection in this report is one of the major problem faced by blind people in our society.To overcome that problem an innovative idea which is cheap and cost efficient. In this project mobile phone camera is used for getting the input, where the inputs are pictures of currency, and then with the help of web application which is build by using Django interface sends these pictures on to the Django server.

A currency dataset is created and trained by convolution neural network model through machine learning algorithms. Trained model is already uploaded on to the Django server and camera of the device will take the input image and compare it with the trained dataset.

If the image features matches with the dataset features then it will give a audio file (using TTS technology in python code) to the Django interface and then the user will get to now the currency.

Figure 3.1: Blind person struggling to detect currency

3.2 Block Diagram

The Block Diagram of Currency Detection is shown in Figure 3.2.

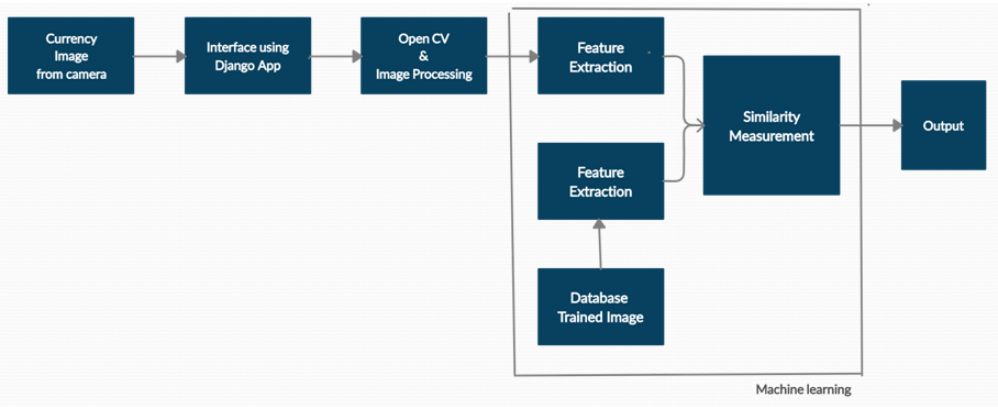


Figure 3.2: Block diagram

3.3 Working

Currency image is taken using the Mobile camera. Web application id created using Django interface and once the image is taken using the mobile phone then it is send to the local web server as an input. Image processing is used to extract necessary information. Open CV is used to threshold image, colour shifting, scanning and cropping, setting grey level, and to extract contours. On the other hand an dataset is created for different types currency like **10, 20, 50, 100, 200, 500** each having atleast 800 images. Then training of CNN model is done with logistic classification so that the model will extract the features of different currency available in database.

Further, the trained model is uploaded on to local server [Django server] where this model will take the input image and extract its features and if the features of the input image matches with the predefined dataset features,then it will give a audio file (using TTS) to the Django interface and tell the user for which currency he/she is facing trouble. [8]

3.4 Methodology

1) Image acquisition:

The image is captured through a simple digital Camera using the mobile phone.

2) Image preprocessing:

It involves the operations required prior to data analysis and information extraction. Here image pixels are extracted then cropping, scaling, conversion of image into grey level,finding counters is done.

3) Gray scale conversion and edge detection:

The acquired image is obtained as RGB image which is now converted into gray scale image as shown in Figure 3.3. since it carries intensity information. This image is further processed and edges of gray scale images are detected.

4) Image segmentation:

Figure 3.3: Gray scale image

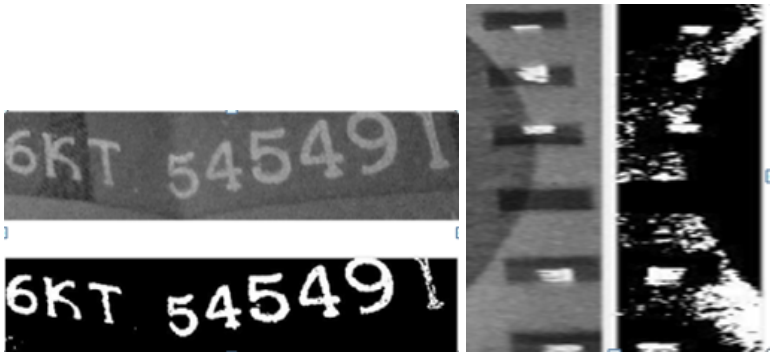
It's the process of dividing image into multiple parts by cropping it. As it is shown in Figure 3.4. (a) in which the identification mark is segmented.

5) Feature extraction:

Now the features are extracted using edge based segmentation technique as shown in Figure 3.4. (b), Figure 3.5. (a),Figure 3.5. (b) [9]

(a) (b)

Figure 3.4: (a) Identification mark (b) Edge segmentation of Mahatma Gandhi portrait.



(a) (b)

Figure 3.5: (a) Edge based segmentation of serial number(b)Edge based segmentation of security thread.

6) Now the process of calculation of intensity of each extracted feature is done using **CNN model**.If the calculated intensity of the input image is greater than the threshold of 75 percent of a particular currency,then it is classified as original note of that currency otherwise it is considered as a fake one.

7)The final decision depends upon the intensities of all extracted features.

CNN Model

Started with an input image on which it will apply multiple different feature detectors which are also called as filters to create these feature maps and these feature maps together creates our convolution layer as shown in Figure 3.6. Then on the convolution layer **RELU** is applied to remove the increased linearity in our image.

Then pooling layer is applied to the convolution layer so that from every feature map

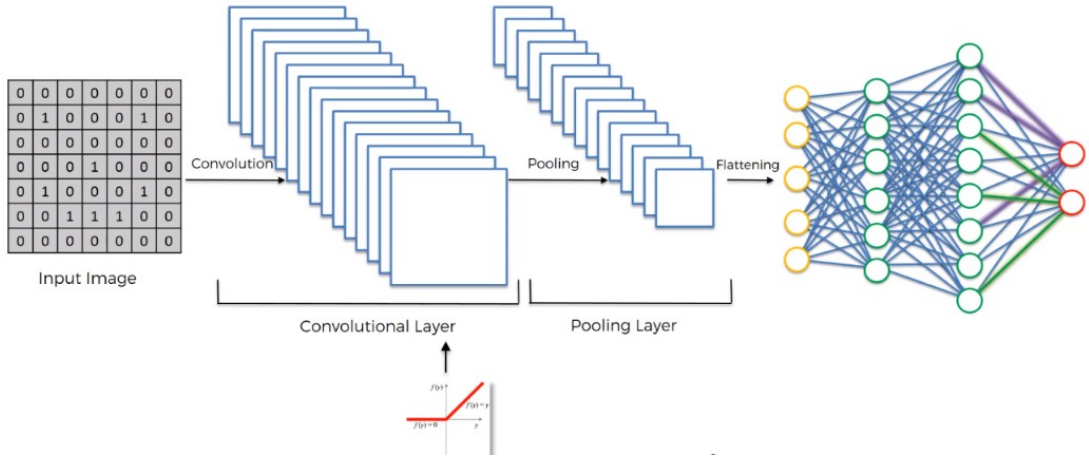


Figure 3.6: CNN Model

it will create a pool feature map, so that it reduces the size of the image and also preserves its features. There are different types of pooling, here the **MAX POOLING** technique is considered.Flattering took place where all the pooled images values are flatten into one array column of all the values.Now,this column is considered as an input for artificial neural network where two fully connected layers or the hidden layers are formed.These hidden layer are formed from neurons. Here all the features of the images are processed through the network and then the hidden or fully-connected layer performs voting based on different features towards different classes which where formed and then the probability will be determined using the softmax function. Softmax usually turns numbers to probability and based on the probability the correct class is identified. [5]

Data Acquisition

The dataset is the most important part of a neural network-based project. It is very important to select a dataset that contains a variety of images. These images should be in different backgrounds or backdrops and preferably should images with different exposure and contrasts too.it is preferable to have a dataset of labelled images classified into different categories. The dataset with a higher number of images is preferred to train the neural network as it helps improve the generalization of the system.

In this project dataset for six different currencies are made as shown in Figure 3.7. and each dataset of currency with approx **800 images** .

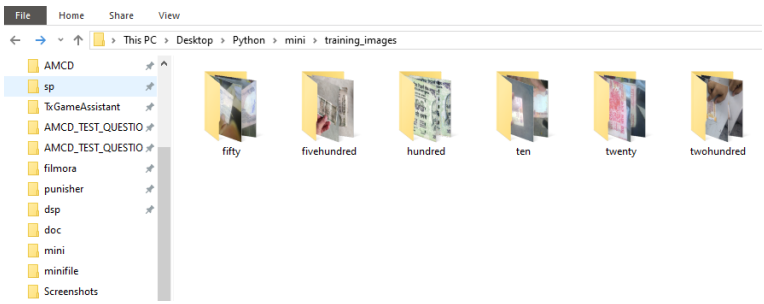


Figure 3.7: Dataset for currency detection

Dataset of each currency is created with the images of that currency in all conditions(poor light,bright light) and from all angles such that if a person will show the currency from any angle to the camera then the model is able to recognize the currency with good accuracy.

The below figure 3.8 shows the dataset of currencies taken in folded condition so that if a person try to recognize the currency in folded condition then the model will be able to determine the currency with high accuracy.

(a) (b)

Figure 3.8: Dataset of currency image taken in folded condition

(a) (b)

Figure 3.9: Dataset of currency image taken from front side and in good light condition

The above figure 3.9. shows the dataset of currencies taken from front position and in good lighting condition

(a) (b)

Figure 3.10: Dataset of currency image taken in poor light condition

The above figure 3.10. shows the dataset of currency images taken in bad light condition so that if a person try to recognize the currency in poor light condition then the model will be able to determine the currency with high accuracy.

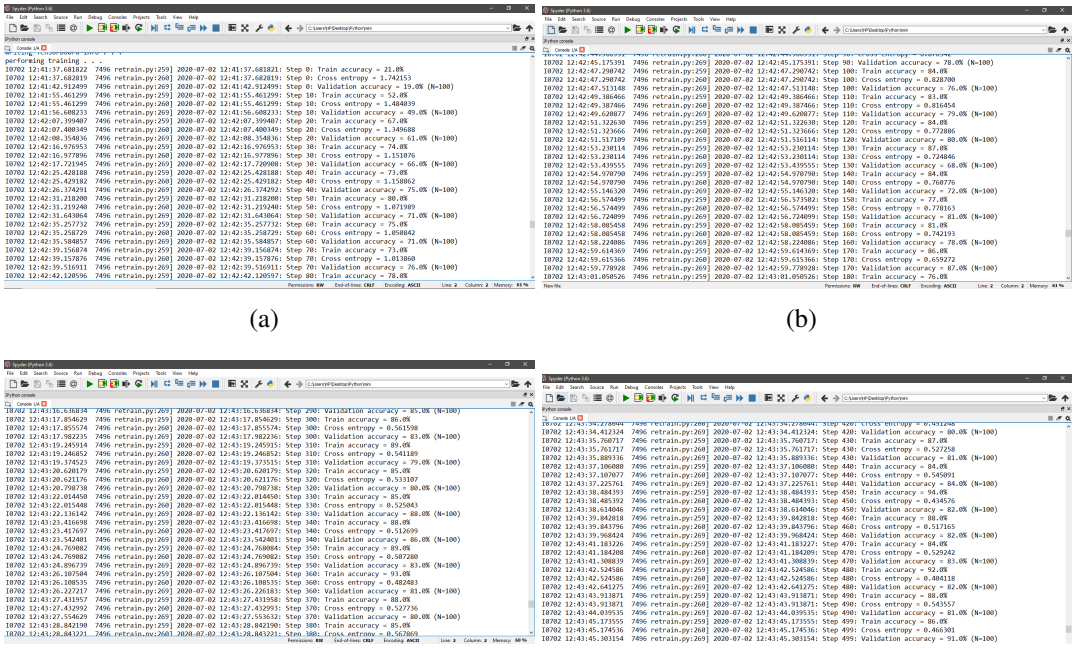
(a) (b)

Figure 3.11: Dataset of currency image taken from back side of currency note

The above figure 3.11 shows the dataset of currency image taken from back side so that the CNN model is able to determine the currency from back side also.
Thus by taking the photo of the currency from all direction and in all condition the accuracy of the dataset will increase.

Training of Data

The below Figure 3.12. (a), (b), (c) and (d) are the screenshots of training the model with different dataset.



(a) (b)

(c) (d)

Figure 3.12: Screenshot of training the CNN model

3.5 Flowchart

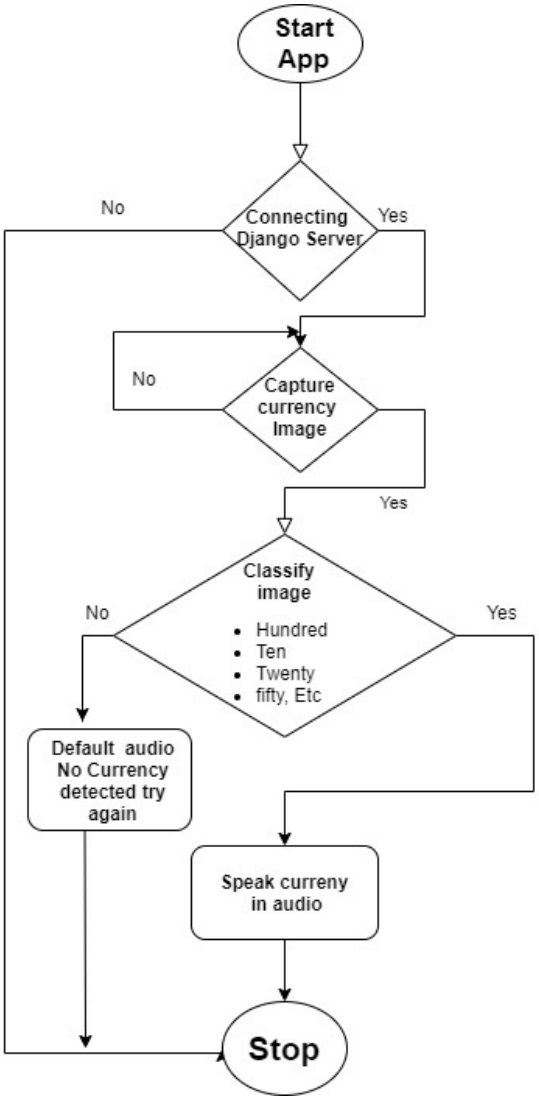


Figure 3.13: Flow chart of currency detection

The above flowchart shown in Figure 3.13. represents the currency detection using camera of a device with the help of web app created by Django.

- First, It will try to connect with Django server and if successfully get connected then move to the next task else it will terminate their itself.
- Once the connection has been done it will capture the currency image and upload it to the Django server.
- Now, from the captured image it will try to classify the image from predefined dataset.
- Further, if it is able to classify the image then it will develop a text to speech algorithm and speaks the currency value in audio.
- If it fails to classify the image then a default audio of no currency detected please try again will be given as output,

3.6 Simulations

(a) (b)

(c) (d)

Figure 3.14: Result of image classification by the Neural Network for 500,100

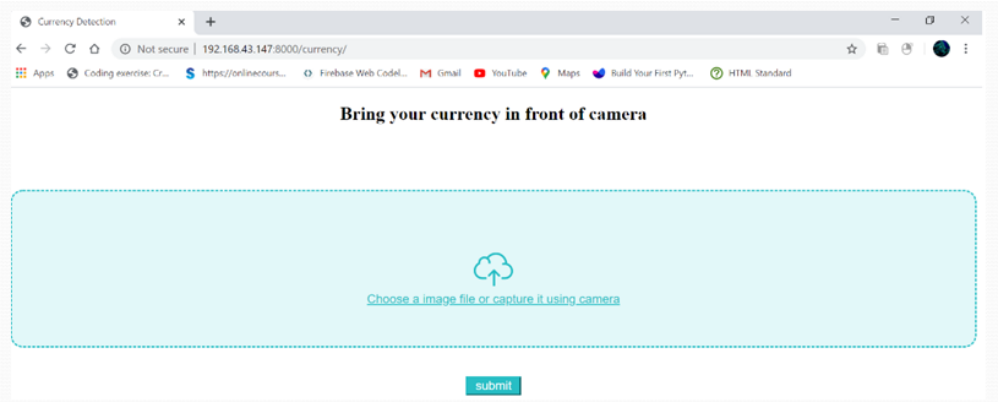


Figure 3.15: Django interface to capture currency image on browser

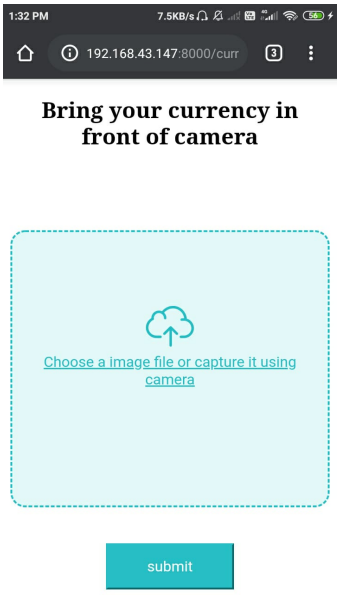


Figure 3.16: Django interface to capture currency image on mobile phone

The above Figure 3.14. (a), (b), (c) and (d) are the simulations for different currency images with accuracy between 85-95 percent using the image clssification by neural network algorithm.

The above figure 3.15. and Figure 3.16. shows the interface for currency detection web app developed using Django interface.

(a) (b)

(c) (d)

Figure 3.17: Result of image classification by the Neural Network for 20,50,10

The above Figure 3.17. (a), (b), (c) and (d) are the simulation for accuracy of different currencies.

The accuracy of fake currency is shown below in Figure 3.16 here the threshold cut-off for accuracy is fixed at **75** percent so if any accuracy of any currency come less than threshold cutoff then the system will declare it as fake currency.

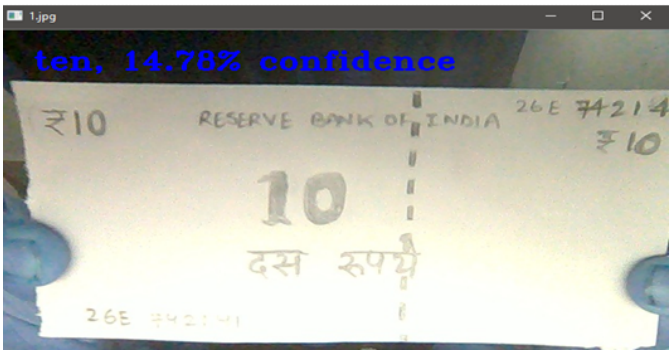


Figure 3.18: Result of accuracy for fake currency

CHAPTER 4

MEDICINE DETECTION

4.1 Overview

As mentioned earlier about the medicine detection in the starting of this report where a blind persons and old age persons are facing difficulties in finding the name of the medicine.

In this project camera of an device is used to get the input as image, where the input is a picture of medicine with the name of the medicine.

These images can be manipulated using image processing and OpenCV tools in python. Once the pre-processed image is obtained then it will cropped and thresholded to get the accurate and better result from the image taken by the blind person and old age person. In the next stage it will extract the name of medicine from the cover of the medicine image taken by the user, then it will convert that text into speech using TTS technology. In Figure 4.1. an example of an medicine image is shown with the name ***Hydrocotisone*** and other text written on its cover. Here in this project aim is to extract the name of medicine from all other informations.

Figure 4.1: Medicine image with name of the medicine

4.2 Block Diagram

The Block Diagram of medicine detection is shown in Figure 4.2.

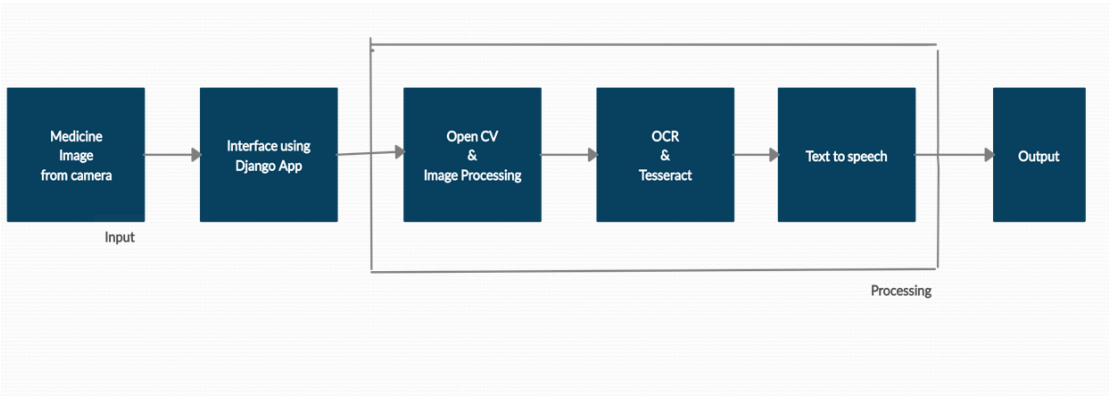


Figure 4.2: Block diagram of medicine detection

4.3 Working

First medicine image is taken from the camera of the device using Django interface and then saved it onto the Django server inside the test image folder by HTTPS POST method.

Later, Image processing is used to extract the information on the image such as name of the medicine along with texts written on the image from the saved image inside the test image folder on Django server.

Further, OpenCV tool in python is used to thresholding the image by converting RGB to Gray Scale, Color shifting, Cropping the ROI of an input image basically enhancement of the image to get accurate and proper results.

OCR is used to recognize the the characters from the image and Tesseract is an engine which uses OCR techniques to identify the texts using AI.[3]

4.4 Algorithm

- It will match word by word in both the files, where file one is the where all the test extracted from the image of the medicine get stored and file two is the list of all the medicine names for the particular person for whom model is designed or trained.
- The word is matched in both the files using strip line method in python by using brute force algorithm (nested for loop)
- The word that get matched is medicine name for which person has given the input as a image from camera of his/her phone. [4]

4.5 Flowchart

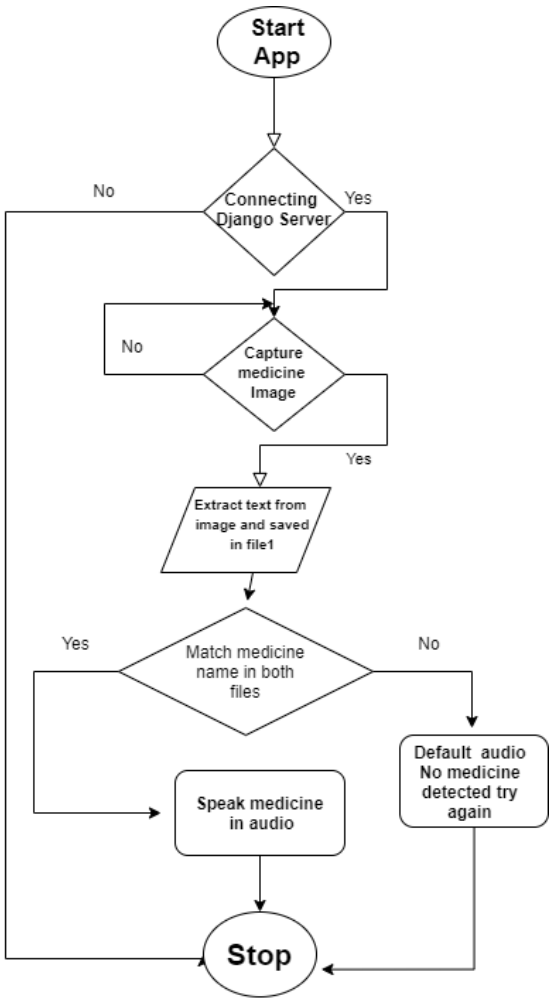


Figure 4.3: Flow chart of medicine detection

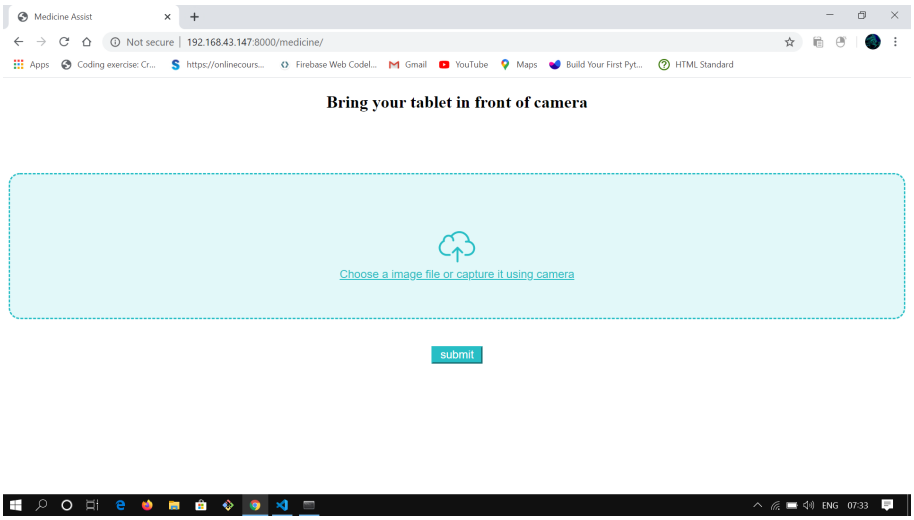
The above flowchart shown in Figure 4.3. represents the medicine detection using camera of a device with the help of web app created by Django.

- First, It will try to connect with Django server and if successfully get connected then move to the next task else it will terminate their itself.
- Once the connection has be done it will capture the medicine image and upload it to the Django server.
- Now, from the captured image it will extract the texts written on it and saved it into the txt file.
- Further, from the extracted texts information it will start matching the medicine name from both the txt files. If matches found name of the medicine is converted into speech using TTS technology or else a default audio of no medicine name detected will come from the speaker of the device.
- Finally after successful execution the process stop.

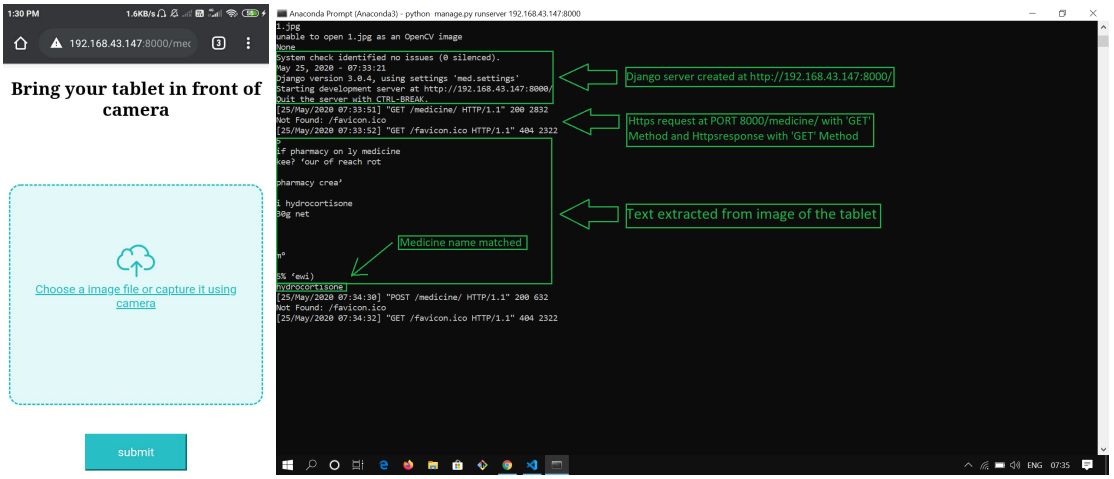
4.6 Simulations

The below Figure 4.4. (a) and Figure 4.4. (b) is the interface for our web app created using basic HTML, CSS and JS code. The idea behind of making the blue box bigger as much as possible because when person will tap on it more likely he/she will touch that blue box. Blue box where blind person need to tap on it to open the camera of the device to capture the image of the medicine for which he want to detect the name of the medicine with doses.

Js code is written for the submit button if the blind person is not able to find the submit button it will automatically submit the capture image after fixed duration.



(a)



(b) (c)

Figure 4.4: (a) and (b) Django interface to capture the medicine image on browser and mobile. (c) Anaconda prompt.

The above figure 4.4. (c) is the backend prompt view of medicine detection part of this project. First it will connect to the Django server by running python runserver command with the IP an port number. Once the server is connected it will acknowledge by HTTPS 'POST' and 'GET' method just to ensure the connection between interface and python source file.

In the figure, inside the bigger green box the text is extracted from the medicine image which shown above in this report at figure 4.1. Once all the text get extracted from the the captured image then all of them is get converted into lowercase so that comparison is easy and less time consuming.

Inside the lower small green box is the name of the medicine and according the name of the medicine it will return audio file containing name of the medicine and prescribed doses by the doctor to the Django interface so that blind person can listen the audio and took the medicine with his/her comfort.

CHAPTER 5

RESULTS

The **EYE FOR BLIND** can help the blind person in detection of currency note and medicine name. By this the blind person would take care of himself without the help of any care takers. This would make their life easier and simpler. The talkback feature used would help them to access the application easily without any complications.

- This project would help blind person to detect the proper currency that they have received or which they need to to give without being cheated for receiving wrong currency or by avoiding giving wrong currency. This would make them economically stable and strong
- Not only in currency detection but also this project would help blind person to recognise the name of the tablet and also help them to know that how much dosages they need to take as per the name of the tablet.

This project would help the blind persons both in economical way and in perspective of health. This would make their life easier and make them confident.

GitHub Repository of this project : Eye for blind .

CHAPTER 6

APPLICATIONS, ADVANTAGES and DISADVANTAGES

6.1 Applications

- Blind persons will be able to recognise the correct currency without getting cheated in any type of money transaction.
- Blind persons always need not to be dependent on others to know which medicines they need to take a particular time.

6.2 Advantages

- This project will work on mobile phones only no need to buy any extra things.
- This work is implemented using TalkBack for android and Voiceover for iOS that means blind person can easily access the application.
- Easy to setup.
- Open source tools were used for this project.
- Accessible to all the device irrespective of the OS.
- Cheap and cost efficient.

6.3 Disadvantages

- It is very difficult to determine the currency as a fake one when it is an exact copy of the real currency.
- For medicine part the image should be taken from any side where name of the medicine is written.

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

7.1 Conclusion

This work shows how visually impaired person (blind person) can protect themselves by getting cheated in terms of money transaction and also how to reduce the dependency on other people to take right amount of medicine at right time

Whenever the blind person takes the image using his phone camera the image will be compared with the data set which is created. After comparing the image if it gets the accuracy above the threshold value then it will gives the spoken feedback to the person by saying the value of the currency

Similarly in case of medicine detection extract the name of the medicine and gives the spoken feedback as how many times that person need to take the medicine, thus making this work as one of the assistant for blind person.

7.2 Future Scope

- Include the the data set of a photos that containing a persons images it can also be used to detect the person who have the blind person meets.
- It can also be used to to track the the blind person using GPS

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