A PROJECT REPORT

ON

"IDENTIFICATION AND RECOGNITION OF TEXT AND FACE USING IMAGE PROCESSING FOR VISUALLY IMPAIRED"

Submitted to

UNIVERSITY OF MUMBAI

In Partial Fulfilment of the Requirement for the Award of

BACHELOR'S DEGREE IN
COMPUTER ENGINEERING

BY

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UNDER THE GUIDANCE OF
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Plot No. 2 3, Sector - 16, Near Thana Naka,
Khandagaon, New Panvel - 410206

2019-2020

AFFILIATED TO

UNIVERSITY OF MUMBAI

A PROJECT II REPORT
ON

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CERTIFICATE

This is certify that the project entitled

"Identification and Recognition of Text and Face using Image Processing for visually Impaired"

submitted by

SHAIKH SAFIYA NAAZ	**16CO14**
ZAMADAR RAMIJRAJA	**16CO60**
SHARMA HARISHKUMAR	**16CO58**

is a record of bonafide work carried out by them, in the partial fulfilment of the requirement for the award of Degree of Bachelor of Engineering (Computer Engineering) at ***Anjuman-I-Islam's Kalsekar Technical Campus, Navi Mumbai*** under the University of MUMBAI. This work is done during year 2019-2020, under our guidance.

Date: / /

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Project Supervisor

(Prof.KALPANA BODKE)
Project Coordinator

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External Examiner

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SHAIKH SAFIYA NAAZ
ZAMADAR RAMIJRAJA
SHARMA HARISHKUMAR

Project I Approval for Bachelor of Engineering

This project entitled ***Ïdentification and Recognition of Text and Face using Image processing for visually impaired¨*** by ***Shaikh Safiya Naaz , Zamadar Ramijraja , Sharma HarishKumar*** is approved for the degree of ***Bachelor of Engineering in Department of Computer Engineering.***

Examiners

1. .....
2. .....

Supervisors

1. .....
2. .....

Chairman

.....

Declaration

I declare that this written submission represents my ideas in my own words and where others ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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ABSTRACT

”Visual Information is the basis for most of the tasks, so visually impaired people are at the disadvantage because necessary information about the surrounding environment is not available.The objective of this project is to guide unsighted people with smart device using an Android Phone.This device is an innovative and cause effective guide system for Visually Impaired People(VIP). This system based on Android technology and designed for trying to solve the impossible situation that afflicts the blind people. This paper presents camera based system which will help blind person for reading text patterns printed on documents. This is the framework to assist visually impaired persons to read text patterns and convert it into the audio output. To obtain the object from the background and extract the text pattern from that object, the system first proposes the method that will capture the image from the camera and object region is detected.The text patterns are localized and binarized using Optical Character Recognition (OCR). The recognized text is converted to an audio output. Therefore, this project deals with analysis of detection and recognition of different text patterns on different documents.

To help the blind people the visual world has to be transformed into the audio world with the potential to inform them about objects.The inability to identify people during group meetings is a disadvantage for blind people in many professional and educational situations. To explore the efficiency of face recognition using smartphones in these settings, we have prototyped and tested a face recognition tool for blind users. The tool utilizes Smartphone technology in conjunction with a wireless network to provide audio feedback of the people in front of the blind user.

Keywords: Android,Visually Impaired,Blind People,Smart device ,Object detection,Text recoginition ,Face Recoginition,Optical Character Recognition (OCR),LBP

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Chapter 1

Introduction

Lack of vision is major problem faced by visually impaired people.People with this kind of problem can't feel the emotion that an individual can feel. This visibility problem is a one of the major problem faced by people Globally. Our aim is to give an optimal solution with the help AI and Computer Vision [4] Globally, 2.2 billion people are affected by poor visuality and one billion of these cases could have been prevented. This is according to a World Health Organization(WHO) report released in advance of World Sight Day on October 10, 2019, India is home to twenty per cent of the world's visually impaired population.

1.1 Purpose

Blindness makes life rather difficult for people , but the use of modern technology can help in some day-to-day tasks. In this context, the present work focuses the development of a text-to-speech application for the blind and visually impaired people. The project is titled as Text and Face Recognition for visually imapired people , and its ultimate purpose is the development of a mobile application that allows a blind user to "read" text (a sheet of paper, a signal, etc.) and to recognize face in front of them. To achieve that, a set of frameworks of Optical Character Recognition (OCR) and Text to Speech Synthesis (TTS) and Facial Features Extraction are integrated, which enables the user, using a smartphone, to take a picture and hear the text that exists in the picture whether its text or a person's name.

1.2 Project Scope

This project is proposed to help those people who are blind or visually impaired using Artificial Intelligence, Machine Learning, Image and Text Recognition.The system allows visually Impaired user to Identify face and recognize Text in documents. The visually impaired user can save the audio file of text document and retrieve the audio file as per his convinience.In future we can add integrated maps (GPS Navigation) for better navigating them to their destination.

1.3 Project Goals and Objectives

1.3.1 Goals

a. Provide a solution that would assist visually impaired users by audio output to recognize text written in documents by Text Recognition system and Human Faces by Facial Recognition feature from thier Mobile Camera.

b. Allowing people with low vision to be as independent as possible.

c. To make Visual impaired people limitless to perform everyday tasks and ability to interact with the surrounding world.

d. Target Large Audience and provide Benefits to them.

1.3.2 Objectives

a. The objective of this project is to show how machine learning can help improve the visually impaired user experience.

b. To study Applications of Machine Learning.

c. To understand the process of Text Recognition and Face recognition.

d. To learn and apply operations and techniques on text like text processing,text detection and recognition.

e. To understand how to apply speech to text and text to speech.

1.4 Organization of Report

The report is organized as follows : The introduction is given in Chapter 1.It describes the fundamental terms used in this project.It describes the Goal,Objectives and scope of this project. The Chapter 2 describes the review of the relevant various techniques in the literature systems. It describes the pros and cons of each technique with how to overcome those cons using new technology.

The project planning includes members and capabilities of this project ,roles and responsibilities of each member,Budget of Project and Project timeline is describe in Chapter 3. The Chapter 4 describes Functional and Nonfunctional Requirements of project.Along with this it also explain features of system and constraints of system.

The Chapter 5 includes Design Information with Class Diagram, Sequence Diagram , Component Diagram and System Architecture. Implementation of each module is explained in Chapter 6. Chapter 7 shows final Test Cases and Test Results. Chapter 8 includes Screenshot of outputs and Conclusion and Future Scope of Project is described in Chapter 9.

Chapter 2

Literature Survey

2.1 Text recognition and face detection aid for visually impaired person using Raspberry PI.

Description:The proposed system is used to help blind person in reading the text present on the text labels, printed notes and products as a camera assistive text reader. The implemented idea involves text recognition and face detection from image taken by camera on spectacle and recognizes text file to voice output by e-speak algorithm.

2.1.1 Advantages of Paper

a. The system is good for portability. The portability allows the user to carry the device anywhere and can use at any time.

b. A power bank of capacity 16,000 mAh is used for making the model portable and it can be recharged.

2.1.2 Disadvantages of Paper

a. No option for saving audio clip of text so that person can hear it as per his convenience.

b. No face recognition of person captured in image only face detection is done.

c. Device has hardware implementation so it can be costly for manufacturers and for consumers.

2.1.3 How to overcome the problems mentioned in Paper

a. Gives option for saving audio clip during text reading for later use.

b. Provides face recognition and storing images in database with name as user's wish.

c. Android device is used so application can be freely available to end users.

2.2 Real Time Text Detection and Recognition on Hand Held Objects to Assist Blind People.

Description: This paper presents camera based system which will help blind person for reading text patterns printed on hand held objects. This is the framework to assist visually impaired persons to read text patterns and convert it into audio output. To obtain the object from background and extract the text pattern from that object, the system first proposes the method that will capture the image from the camera and object region is detected. The speech output is given to the blind user.

2.2.1 Advantages of Paper

a. The problem for the blind persons in reading is solved by this proposed method.

b. The system describes about reading of printed letters on the objects for helping the blind people.

c. ITEM 3

2.2.2 Disadvantages of Paper

a. The scope of the project is limited to text reading on objects.

b. No storing of recognized text on object in database so user has to click as many times as he hold object.

2.2.3 How to overcome the problems mentioned in Paper

a. Provides text recognition and face recognition both to end user.

b. Not only on Objects but Text can be recognized of documents, magazines, books etc.

c. User can store and listen audio of complete document as per their convenience.

2.3 Design of a CNN Face Recognition System Dedicated to Blinds

Description: This paper introduces a novel CNN based face detection, tracking and recognition system designed to improve Users interaction and communication in social encounters. The major contribution consists in a novel weight adaption scheme able to determine.

2.3.1 Advantages of Paper

a. Provides Face Recognition.

2.3.2 Disadvantages of Paper

a. The scope of the project is limited to Face recognition.

b. No Text Recognition provided.

2.3.3 How to overcome the problems mentioned in Paper

a. Not only Face recognition but Text recognition is also provided in audio output.

b. User can save the Human faces and Documents of his choice in database and retrieve as his convenience.

2.4 Technical Review

OCR stands for Optical Character Recognition.It is a widespread technology to recognise text inside images, such as scanned documents and photos.A facial recognition system is a technology capable of identifying or verifying a person from a digital image or a video frame from a video source. For Face recognition, LBP-based face recognition method with Hamming distance constraint is used.

2.4.1 Advantages of Technology

a. OCR technology is used to convert virtually any kind of images containing written text (typed, handwritten or printed) into machine-readable text data.

b. OCR is quick and accurate, ensuring the document's content remains intact while saving time as well.

c. The process of recognizing a face takes a second or less — and this is incredibly beneficial for the visually impaired people.

d. The facial recognition technology is quite easily integrated so it's a perfect choice.

2.4.2 Reasons to use this Technology

a. Optical character recognition (OCR) systems provide people who are blind or visually impaired with the ability to scan printed text and then have it converted into audible speech.

b. Current OCR technology systems provide very good accuracy and formatting capabilities.

c. LBPH is one of the easiest face recognition algorithms.

d. Local Binary Pattern (LBP) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighborhood of each pixel and considers the result as a binary number.

e. LBPH is robust against monotonic gray scale transformations.

Chapter 3

Project Planning

3.1 Members and Capabilities

Table 3.1: Table of Capabilities

SR. No	Name of Member	Capabilities
1	Shaikh Safiya Naaz	Machine Learning, Backend Developer
2	Zamadar Ramijraja	Machine Learning, Python
3	Sharma Harishkumar	Frontend, UI

Work Breakdown Structure

a. All of the members are equally important in developing the project.

b. We work on a different part of the project based on one's capability.

c. Firstly we came up with documentation, And based on the documentation we set our goal and created a blueprint.

d. We then started going hands-on with the project to develop it according to the flow as decided earlier.

3.2 Roles and Responsibilities

Table 3.2: Table of Responsibilities

SR. No	Name of Member	Role	Responsibilities
1	Shaikh Safiya Naaz	Team Leader	Text Recognition module
2	Zamadar Ramijraja	Backend	Face Recognition module
3	Sharma Harishkumar	Embedding System	Frontend Developing, Integrating System

3.3 Assumptions and Constraints

a. People who are using this app are blind/severely sight impaired or having low vision.

b. User of this app should have hearing powers.

c. User of this app can give voice commands.

d. The time taken to convert speech to text is between 5 to 6 secs.

e. The system can detect face upto 1m distance from camera and text upto 1-2m away from camera.

3.4 Project Management Approach

a. Planning of project.

b. Defining the scope of the project.

c. Estimation of time and It's management.

d. Creating Gantt Charts and properly assigning tasks to members.

e. Reporting the progress of project with the guide.

3.5 Ground Rules for the Project

a. Properly planning and gathering relevant information is very important.

b. Developing a Blueprint of the project and work accordingly.

c. All the members should report to the guide whenever required

d. Setting up small goals every week.

e. Achieving the small goal within that span of time.

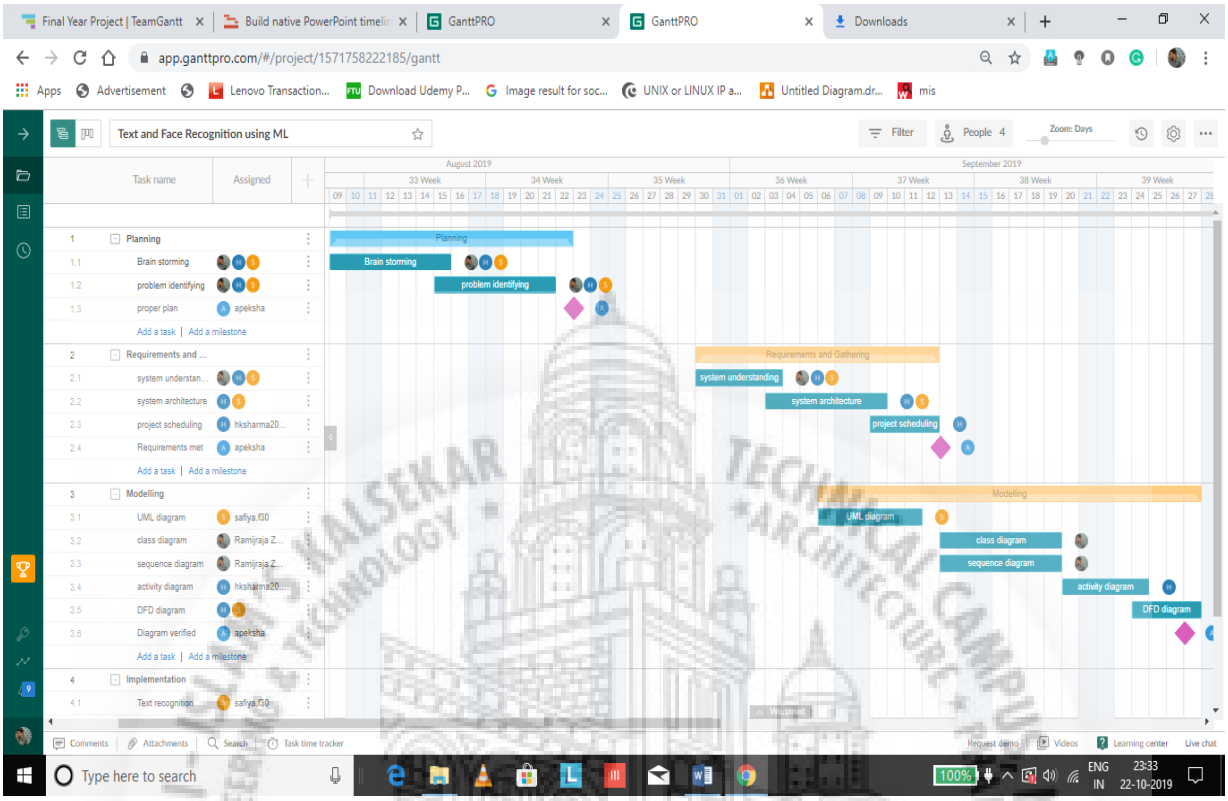
f. Keeping tracks of the progress towards project.

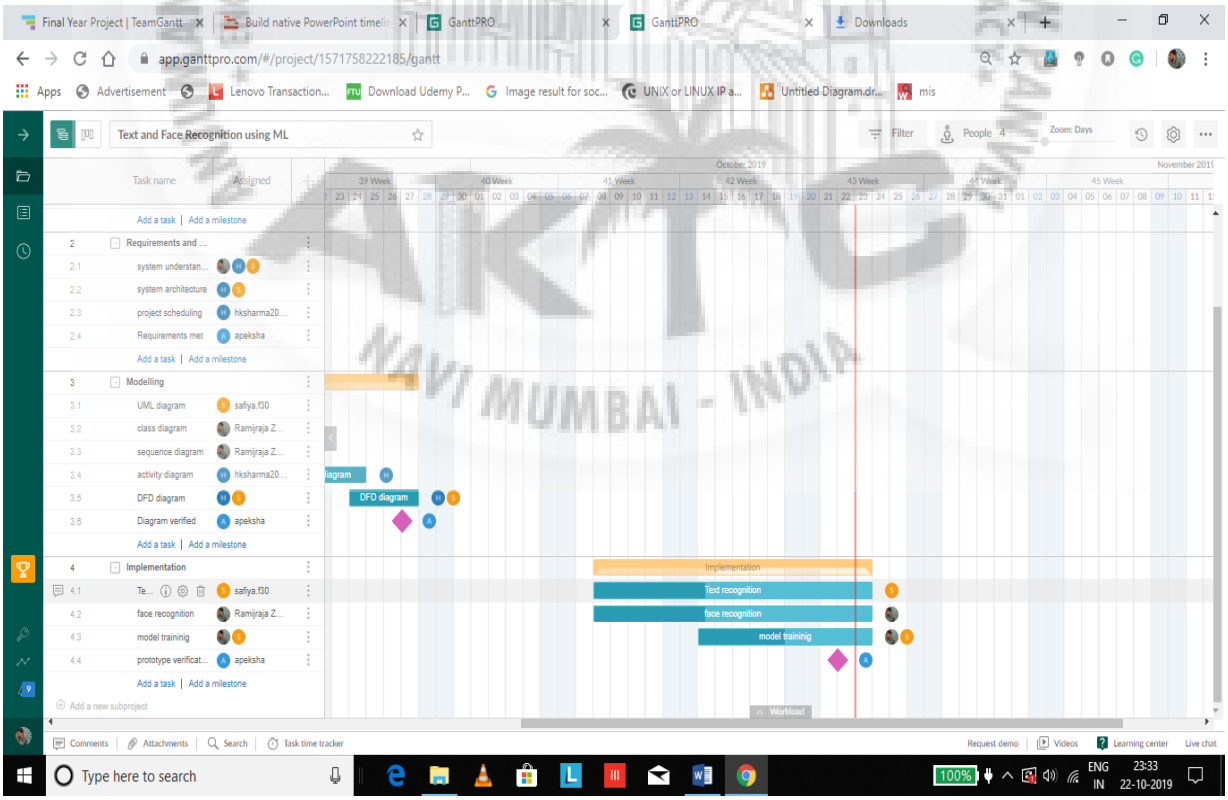
3.6 Project Budget

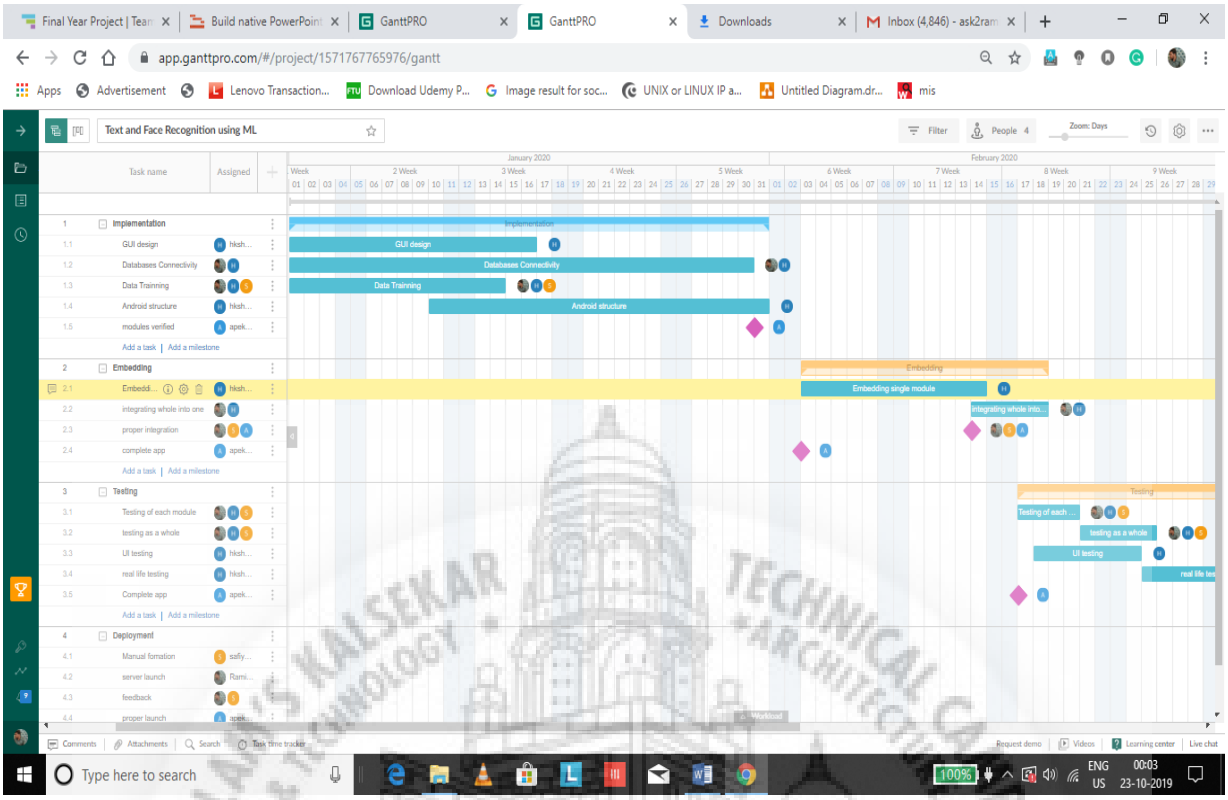
a. It is a light project.

b. Cost of the project is very low and efficient.

3.7 Project Timeline



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Databases Connectivity
Data Trainning
Android structure
modules verified
Embedding
Embedding single module
integrating whole into one
proper integration
complete app
Testing
Testing of each module
testing as a whole
UI testing
real life testing
Complete app
Deployment
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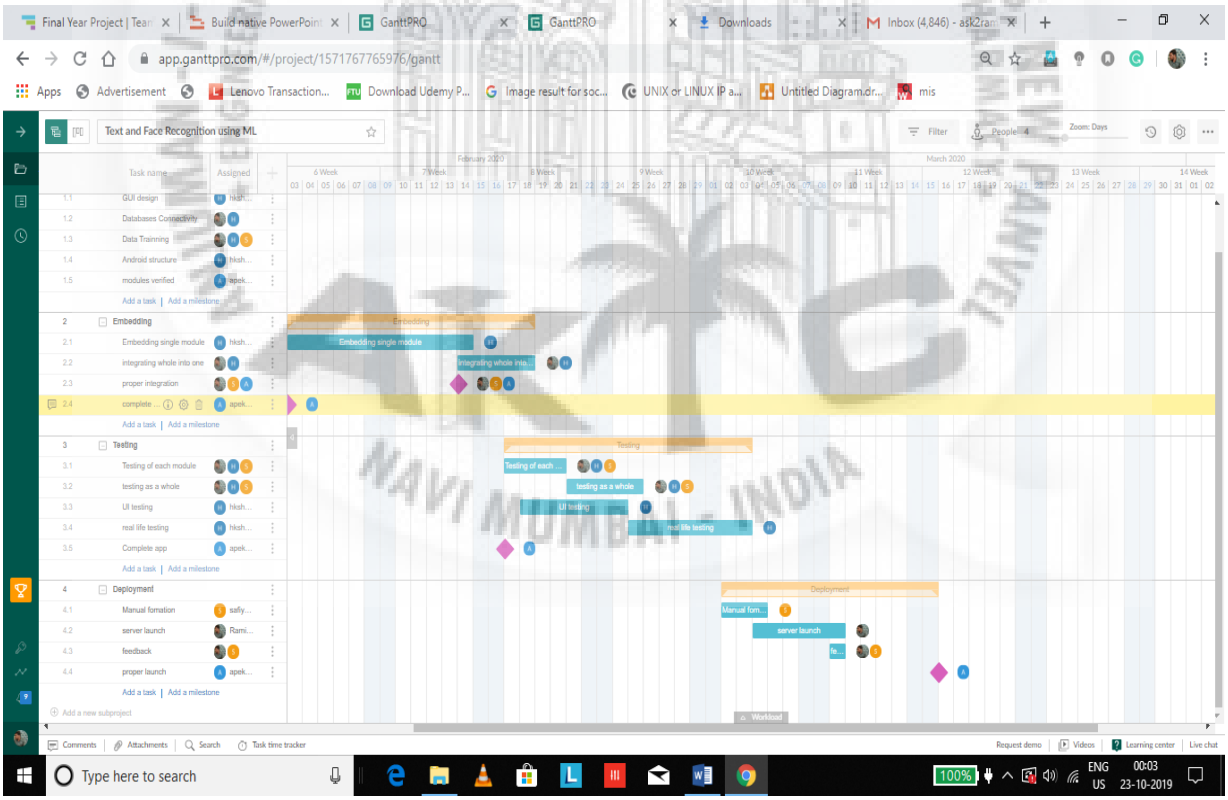
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Assigned
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GUI design
Databases Connectivity
Data Trainning
Android structure
modules verified
Embedding
Embedding single module
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proper integration
complete app
Testing
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testing as a whole
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Chapter 4

Software Requirements Specification

4.1 Overall Description

4.1.1 Product Perspective

The product is an open source. It is a web-app based system implementing client-server model.This web-app provide a service to the visually impaired people. This system is an independent from any other third party system. The main outcome is an audio which help to assist visually impaired people.In Face recognition, faces that are recognized their names are spoken.In case,of an unknown user has an option to save that person to its known person list.This will help them out,by knowing actually who they are interacting with.Storing a texts into audio form is now possible.One can store whole book or a chapter or a module as per their convenience and retrieve it as per their need.

4.1.2 Product Features

There are three major features in this system.
Text Recognition provides an extraction of the text given in an image.It can even detect and recognize very small texts present on an image.
Face Recognition classifies between the known and unknown faces.Also able distinguish among the known faces and gives out the name that are saved in the databases.
Text-to-speech this helps to read out the text and convert it into an audio file.With the help of this feature recognized text are converted into audio file and the names of known faces are spoken out.

4.1.3 User Classes and Characteristics

This is project is a social project.The Users of this system are mostly those who have poor eyesight vision.That is visually impaired people.Also the user can be one who loves to listen the books more than reading it.

4.1.4 Operating Environment

This system can operate on any environment.
Hardware specifications:

a. processor pentium4 or above.

b. Ram:2GB or Above

c. Hard-disk:40GB or Above

Operating System:

a. Windows: 7 or above.

Software:

a. Python: 3.6 or Above

b. OpenCv: 3.3.1 or Above

c. pyttsx3: 2.87

d. Web-browser:chrome,Mozilla,Internet Explorer

4.1.5 Design and Implementation Constraints

This system focuses one of the features at time. It is not able to provide two or more services at a time.At any instant only one of the services is accessible.Suppose, While using face recognition one cannot use text recognition or vice-versa.

4.2 System Features

Text Recognition provides an extraction of the text given in an image.It can even detect and recognize very small texts present on an image.
Face Recognition classifies between the known and unknown faces.Also able distinguish among the known faces and gives out the name that are saved in the databases.
Text-to-speech this helps to read out the text and convert it into an audio file.With the help of this feature recognized text are converted into audio file and the names of known faces are spoken out
Speech-to-text this helps to convert speech into text.

4.2.1 System Feature

Text recognition provides detection and recognition of texts that are present on any background.

Description and Priority

This is one of the main feature of the system .This helps in extraction of text from the background. It firstly, detect the text from background.Then it recognize it eventually and convert them into text output.And pass it onto Text-to-speech module.

Stimulus/Response Sequences

Stimulus:User clicks the image of text.
Response:Image is clicked and saved.
Stimulus:Clicks on submit button.
Response:A window appear with an option to either save or listen.
Stimulus:User clicks on listen audio.
Response:Audio of extracted texts is played on an default player of a user.
Stimulus:User clicks on save.
Response:Audio saved alert appear.

Functional Requirements

REQ-1: Authorization from external camera module
REQ-2: Access to the Disk for saving the resources like image, audio.

4.2.2 System Feature

Face recognition provides detection and recognition of faces of people around.

Description and Priority

This is one of the main feature of the system .This helps in detection of face. It firstly, detect the face from background.Then it recognize and compare with the known faces.Accordingly it classifies it and give a text output as name of a person or NO match.And pass it onto Text-to-speech module.

Stimulus/Response Sequences

Stimulus:User clicks the image of a person.
Response:Image is clicked and saved.
Stimulus:Clicks on submit button.
Response:Gets an audio output.
Stimulus:If unknown face,Enter the name of person.
Response:Audio as ”data has been saved” is given out .

Functional Requirements

REQ-1: Authorization from external camera module
REQ-2: Access to the Disk for saving the resources like image, audio
REQ-3: Access to database.

4.3 External Interface Requirements

4.3.1 User Interfaces

It is very light web-app, so the GUI is very simple.Home pages provides two button to provide two different services to the users. The first button is of text recognition and second button is of face recognition.This button connects to a new window with respective services. Those windows consist of field taking image as an input and performing task on that and giving result.

4.3.2 Hardware Interfaces

This web-app requires permission of some of the hardware commodities. One need to give camera access in-order to capture the pic. One should also give storage access to save the images and the audio files. Microphone access should also given to talk back with system.

4.3.3 Software Interfaces

This software uses different libraries.Numpy library is use to compute and evaluate the images. Opencv is used to deal with the computer vision part. pyttsx3 is used to recognize text. speech_recognition is used to interact with system. Database(SQL) is maintained to store the images of known person faces. And also use it to match while performing the task.OS support also needed to manage the audio files.

4.3.4 Communications Interfaces

Since this is a light web-app, there is no such large communication in the system. Only Databases access, that also done locally.Also https standard is used in-order to gain the access the camera from the server.

4.4 Nonfunctional Requirements

4.4.1 Performance Requirements

Performance of overall system is very efficient and well optimize. From the time taken to capture and process it everything is well organized.While processing an

image it take same time for other operations.Speech-to-text require 3-5 seconds to convert.

4.4.2 Safety Requirements

This system does not contain any critical data. Still it provide. The databases that are accessed are locally executed.In case of any updates in libraries used can lead to the failure in systems.

4.4.3 Security Requirements

Images of known persons are well compressed before storing.None of them are given access to database.All the libraries used are certified and standard.Also camera access is until the process is done completely.After that is released.

Chapter 5

System Design

5.1 System Requirements Definition

5.1.1 Functional requirements

The basic functions that the system must provide and focus on the needs and goals of the end users are :-

a. Voice command - User must be able to give voice commands or the instructions the application should perform.

b. Capture Image - Application should be able to capture image as per user instruction.

c. Switch Mode - Application should be able to switch mode between Text recognition and Face recognition.

d. Audio Output - User must get instructions about application as speech output.

e. Text Recognition - Application must be able to recognize text in an captured Image.

f. Save Recognized Text - User can save the recognized text in audio format with the name of audio he wants.

g. Retrieve Saved Audio - User must be able to retrieve and listen audio he saved as per his convinience

h. Recognize Face - Application must be able to recognize face if the face is already stored in database.

i. Save Unknown Face - User can save any human face with the name of a person he/she wants.

Use-case Diagram

A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved.In our system User will interact with use cases like Capture Image,Audio Input,Save text,Retrieve Text,Audio output.

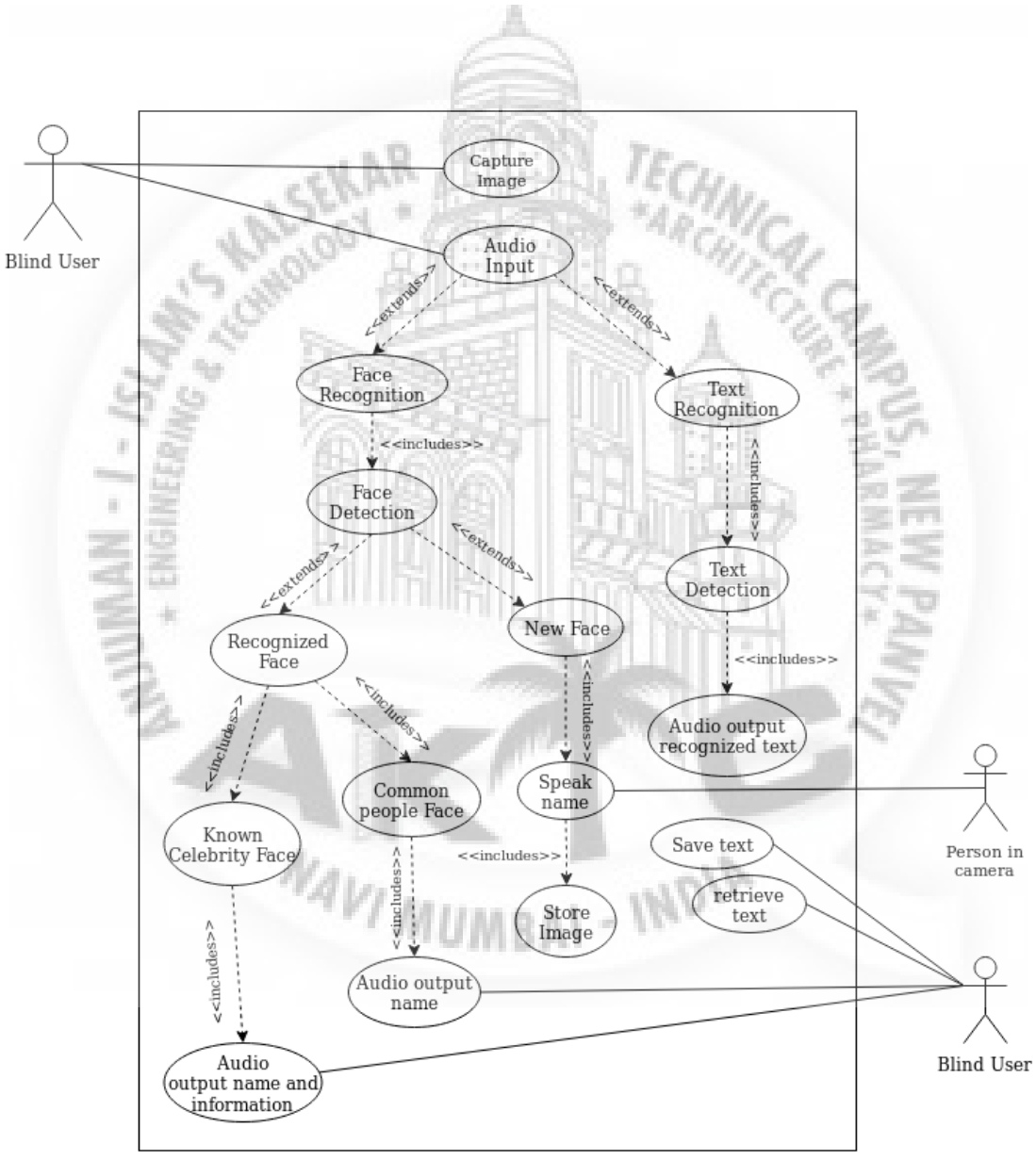


Figure 5.1: Use Case Diagram

Data-flow Diagram

A data-flow diagram is a way of representing a flow of a data of a process or a system. The DFD also provides information about the outputs and inputs of each entity and the process itself.Given below is Level 0 Level 1 and Level 2 DFD of system.

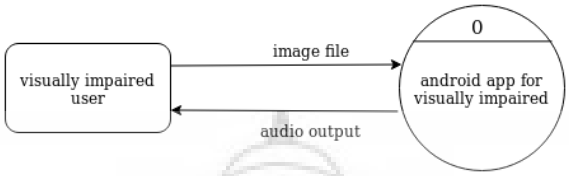


Figure 5.2: DFD level 0

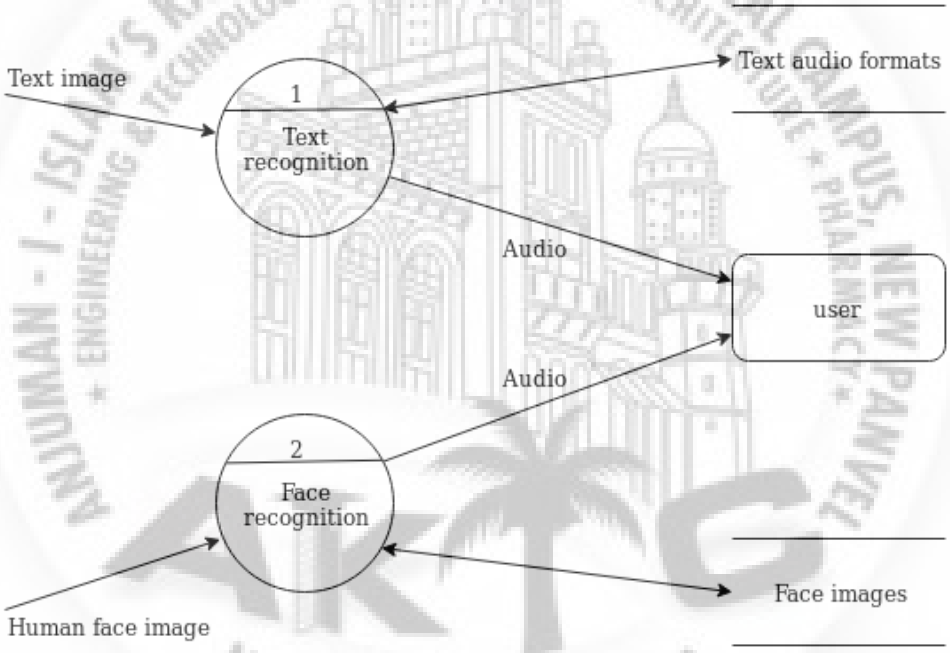


Figure 5.3: DFD level 1

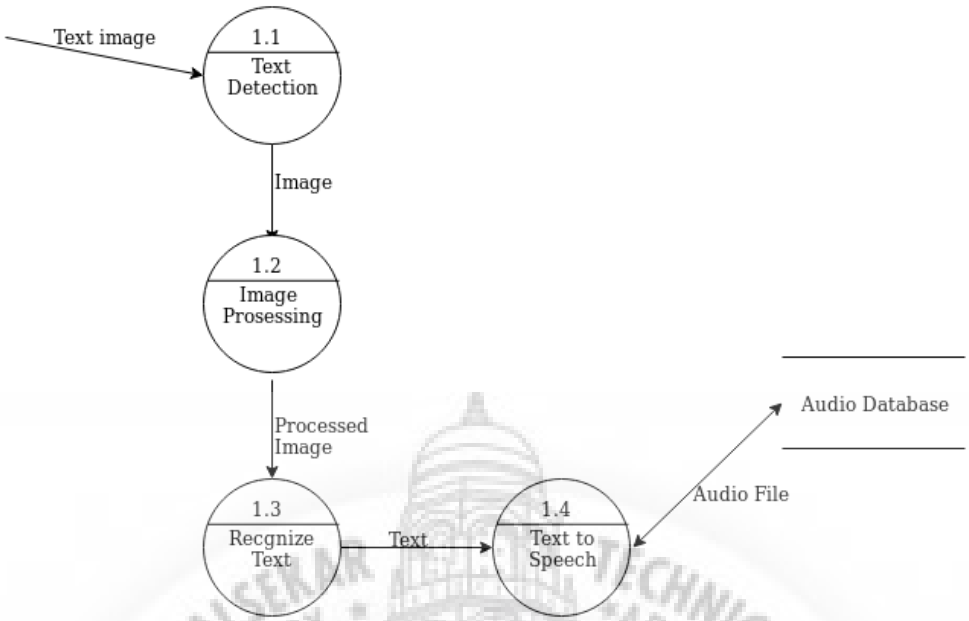


Figure 5.4: DFD level 2 for Text Recognition

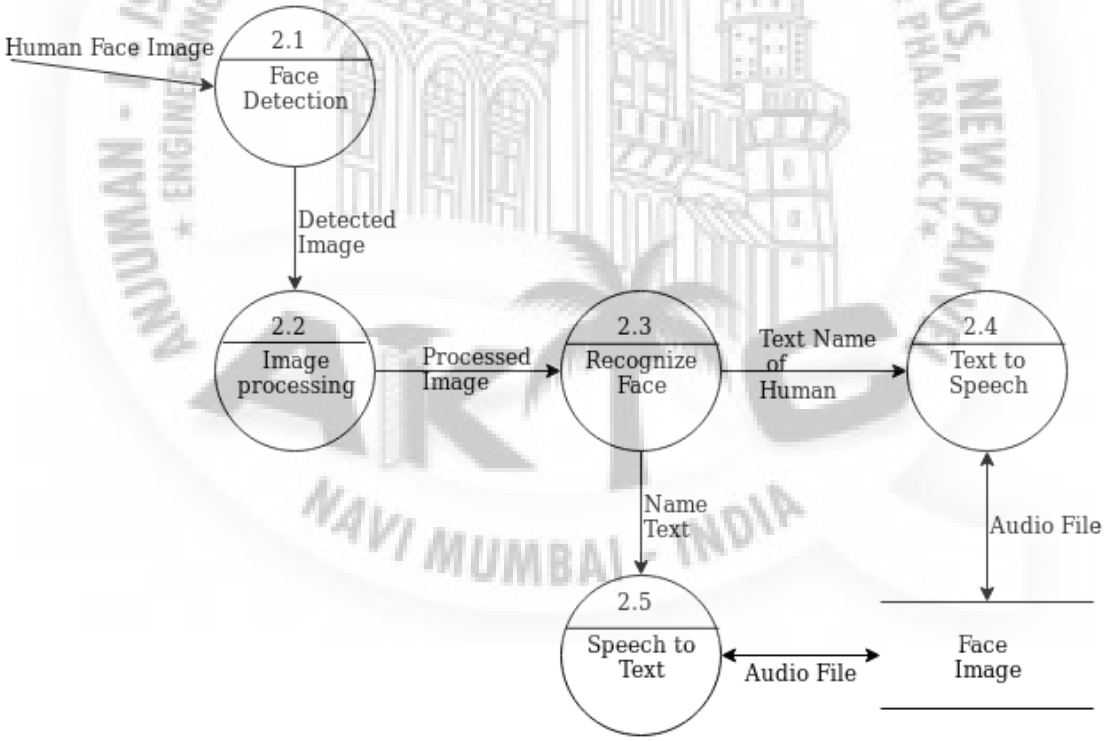


Figure 5.5: DFD level 2 for Face Recognition

5.1.2 System requirements (non-functional requirements)

These are non-functional system properties such as availability, performance and safety etc. They define functions of a system, services and operational constraints in detail.

a. Usability - Application implementation is feasible using technologies that are accessible to the end-users.

b. Portability - The interfaces are compatible with Android.

c. Space Efficiency -Saved audio is of relatively small in size.Also the images are well compressed.

d. Performance Efficiency -Application is able to perform well in a proper time constraint.

e. Multi User System -Application is able to consider the presence of more than one user in the same environment. All the features of the system operates properly for all users and provides proper transparency.

f. Time Efficiency - Time taken for the executing of system is less.

5.2 System Architecture Design

A system architecture is the conceptual model that defines the structure, behavior, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system.

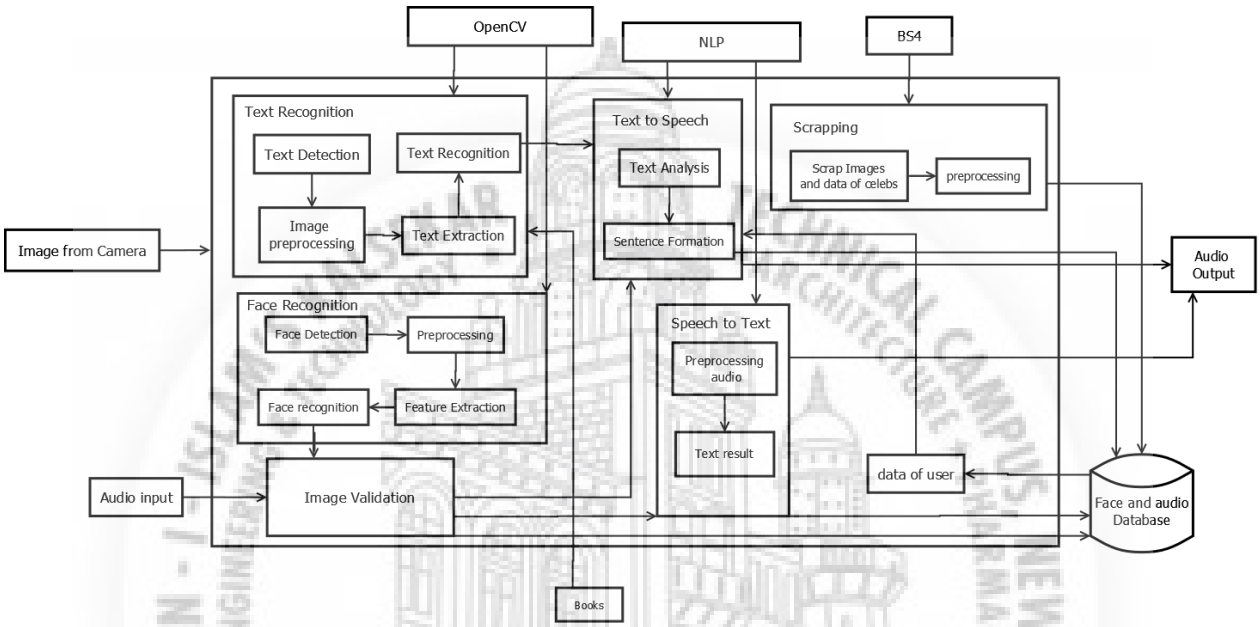


Figure 5.6: System Architecture

5.3 Sub-system Development

This system consist of two modules Text recognition and Face recognition.The input to the Text recognition module is an image from camera containing text and the output will be text converted into audio file.The next module i.e Face recognition module takes human face image as an input and provides name of the human as an audio output if the face is in database or else it gives the option of saving a new face with a name as a label.

5.3.1 Text Recognition

Reading is essential in day to day life. Printed text is present every wherein the form of documents like reports, receipts, statements, restaurant menus, product packages etc. The ability of people who are visually poor to read printed text and product packages will enhance independent living.For Text recognition we'll use OpenCV OCR. First, we'll apply OpenCV's EAST text detector to detect the presence of text in an image. The EAST stands for Efficient and Accurate Scene Text Detection pipeline. The EAST text detector will give us the bounding boxes coordinates of text ROI (Region of interest). We'll extract each of these ROIs and then pass them into tessaract deep learning text recognition algorithm. The EAST pipeline is capable of predicting words and lines of text at arbitrary orientations images.

Text Recognition Flow Diagram

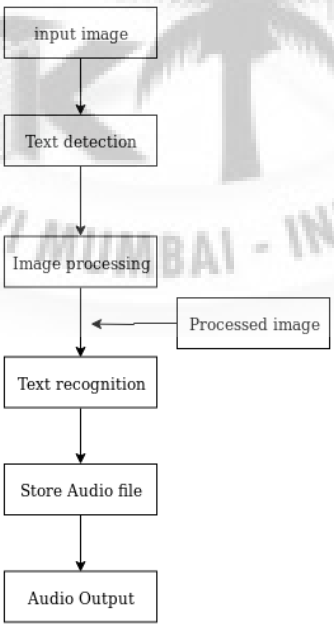


Figure 5.7: Flowchart for Text Recognition

5.3.2 Face Recognition

For Face recognition, LBP-based face recognition method with Hamming distance constraint is used. It is based on thresholding neighbourhood pixel values against the centre pixel in a circular order to form a binary pattern. Then these patterns of different pixels are assorted and concatenated into a histogram so that each pattern corresponds to one bin. This histogram is used to represent the original image for later classification purpose.Below Flowchart explains the flow of this module.Input is an human face image then face detection is performed.The detected face goes for preprocessing and the preprocessed image goes for recognition.During Recognition the processed image is matched with all the images in the database.If the match is found the audio output of name of a person is given else the user is asked with a name to store new image in a database.

Face Recognition Flow Diagram

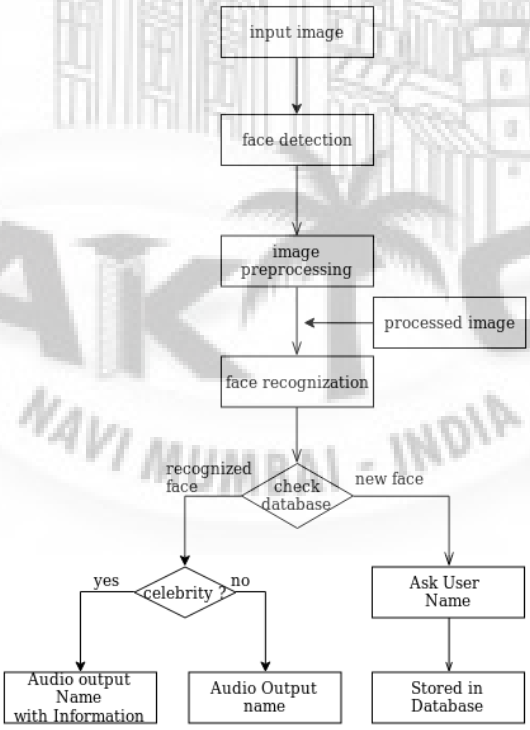


Figure 5.8: Flow Chart for Face Recognition

5.4 Systems Integration

System integration (SI) is an engineering process or phase concerned with joining different subsystems or components as one large system. It ensures that each integrated subsystem functions as required. SI is also used to add value to a system through new functionalities provided by connecting functions of different systems.

5.4.1 Class Diagram

In software engineering, a class diagram in the Unified Modeling Language is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations, and the relationships among objects.Our System consist of four Classes Image,Face,Text and Text to Speech.

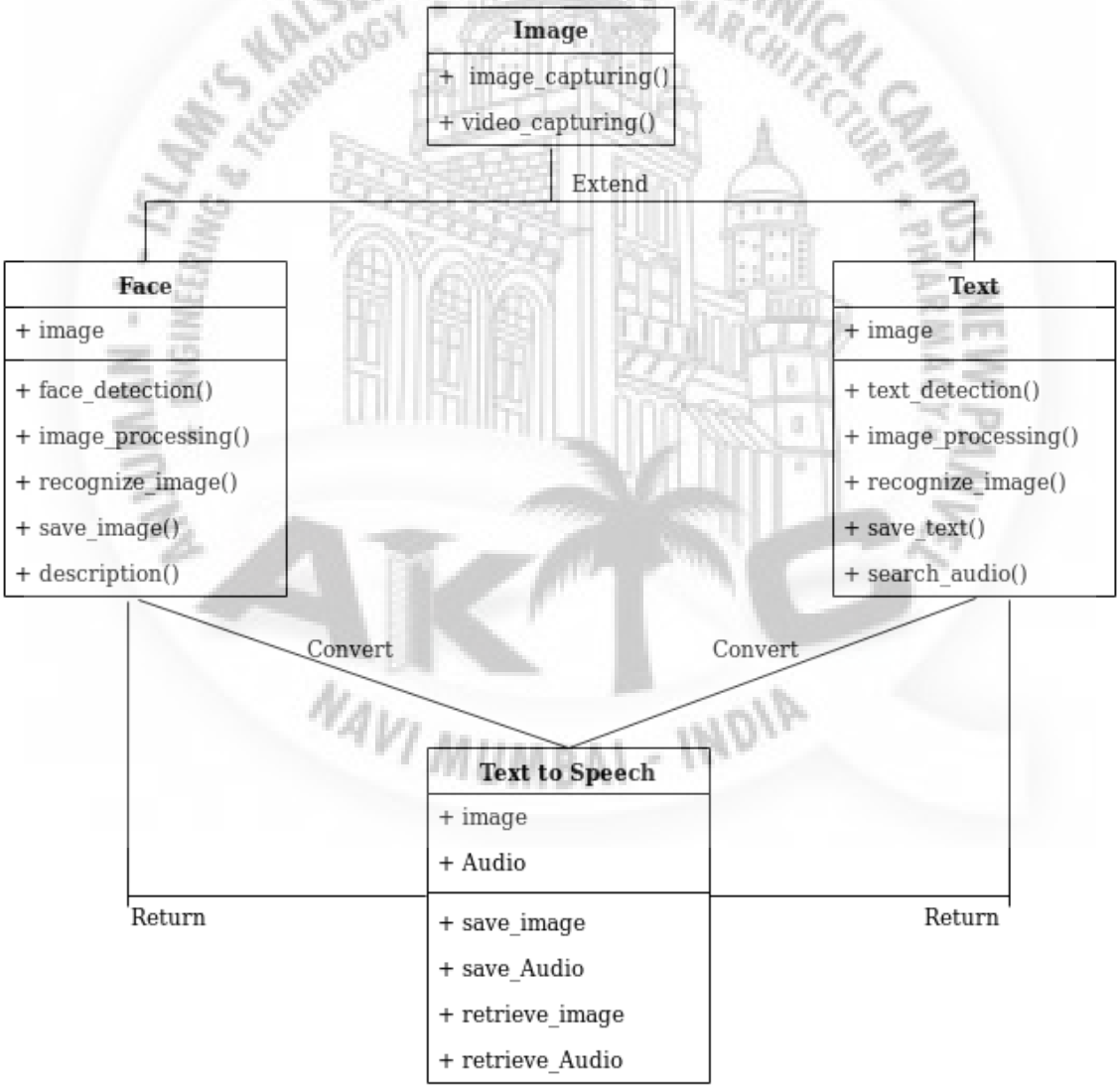


Figure 5.9: Class Diagram

5.4.2 Sequence Diagram

A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario.

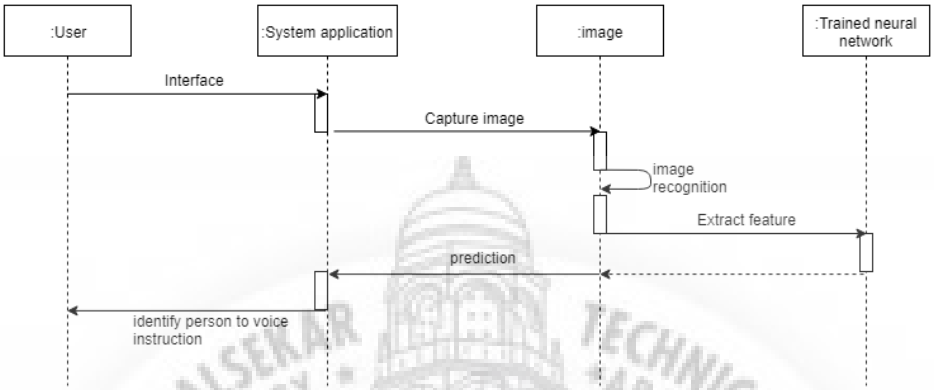


Figure 5.10: Sequence Diagram for Face Recognition

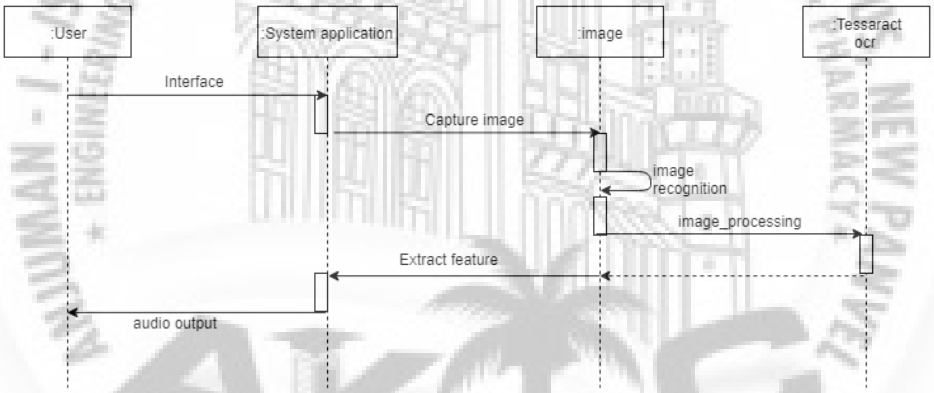


Figure 5.11: Sequence Diagram for Text Recognition

Chapter 6

Implementation

6.1 Text Recognition Module

This module is implemented using Python programming language and Flask framework.Following are the python packages used : Flask , pandas , numpy , base64 , PIL , io , pytesseract , gtts , speech_recognition,pyttsx3.

This module takes an input image from camera using java script getuserMedia api.The input image is in the form of base64 using base64 library of python it is decoded and saved in the png format.That saved image further goes for text detection and recognition using google cloud vision api and the recognize text is converted into speech using google text to speech library of python.

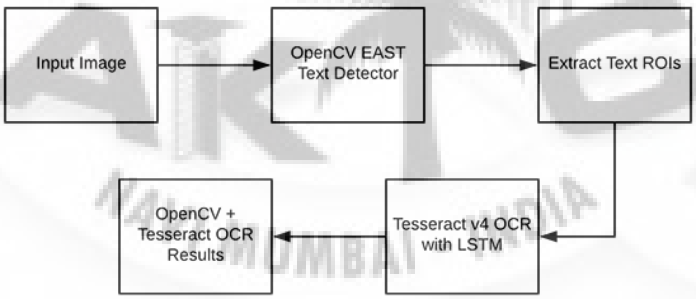


Figure 6.1: Text Recognition

app.py

```
from flask import Flask,render_template,url_for,request
import pandas as pd‘
import numpy as np
import base64
from PIL import Image
from io import BytesIO
import re
import pytesseract
from gtts import gTTS
from flask import jsonify
import speech_recognition as sr
import os
import time
import pyttsx3
from flask_assets import Bundle, Environment
import os,io
from google.cloud import vision
from google.cloud.vision import types
import pythoncom

app = Flask(__name__)


@app.route('/')
def index():
  pythoncom.CoInitialize()

  engine = pyttsx3.init()
  rate = engine.getProperty('rate')   # getting details of current speaking rate
  engine.setProperty('rate', 125)
  volume = engine.getProperty('volume')
  engine.setProperty('volume',1.0)
  voices = engine.getProperty('voices')
  engine.say("Welcome to the app for Visually Impaired People Please Speak
      Retrieve or Click")
  engine.runAndWait()
  engine.stop()
  r2=sr.Recognizer()
  with sr.Microphone() as source:
    print('Speak retrieve or click')
    speak=r2.listen(source)
    start=r2.recognize_google(speak)
    print(start)
  if "retrieve" in start:
    engine.say("Speak the name of audio file you want to retrieve")
    engine.runAndWait()
    #os.system(r"audiosproject\retrieve.wav")
    r3=sr.Recognizer()
    with sr.Microphone() as source:
      print("Speak audio name")
      audio_name_retrieve=r3.listen(source)
      name=r3.recognize_google(audio_name_retrieve)
      audioo="{0}.wav".format(name)
      list_files =os.listdir(".")
      if audioo in list_files:
        os.system(audioo)
      else:
        engine.say("Sorry No such audio Found")
        engine.runAndWait()
  elif "click" in start:
```

```
    print('Click Picture')
  return render_template('index.html')


@app.route('/predict',methods=['GET', 'POST'])

def predict():
  pythoncom.CoInitialize()
  engine = pyttsx3.init()
  rate = engine.getProperty('rate')   # getting details of current speaking rate
  engine.setProperty('rate', 125)
  volume = engine.getProperty('volume')
  engine.setProperty('volume',1.0)
  voices = engine.getProperty('voices')

  os.environ['GOOGLE_APPLICATION_CREDENTIALS'] = r'ramizkey.json'
  client = vision.ImageAnnotatorClient()
  if request.method=='POST':
    input1= request.form.get("input1") if request.form.get("input1") else None
    base64_data = re.sub('^', '',input1)
    im = Image.open(BytesIO(base64.b64decode(base64_data)))
    im.save('image.png', 'PNG')
    print('image saved')
  file= "image.png"
  imagename = "demo"
  with io.open(file,'rb') as image:
    content = image.read()
  image=vision.types.Image(content=content)
  response = client.text_detection(image=image)
  texts = response.text_annotations
  df = pd.DataFrame(columns=['locale','description'])
  for text in texts:
    mytext=text.description
    print(text.description)
    break


  f = open("{0}.txt".format(imagename), 'w')
  f.write(mytext)
  f.close()
  f = open('{0}.txt'.format(imagename))
  x = f.read()

  language = 'en'
  audio = gTTS(text = x , lang = language , slow = False)

  r1=sr.Recognizer()
  #os.system(r"audiosproject\audio_name.wav")
  engine.say("Please Speak the name in which you want to save your audio file")
  engine.runAndWait()

  with sr.Microphone() as source:
    print('Speak now')
    audio_name=r1.listen(source)
    text_audio_name=r1.recognize_google(audio_name)
    text_audio_name=text_audio_name.replace(" ","")
    print(text_audio_name)
    engine.say("Your audio is saved as {0}.We are processing your audio Please
        Wait".format(text_audio_name))
    engine.runAndWait()
      text_audio_name = 'test'
```

```
        audio.save("{0}.wav".format(text_audio_name))
        os.system("{0}.wav".format(text_audio_name))
        print('saved audio')

    return render_template('result.html',text=mytext)


if __name__ == '__main__':
    app.run(debug=True)
```

text.js

```
'use strict';

// Put variables in global scope to make them available to the browser console.
const video = document.querySelector('video');
const canvas = window.canvas = document.querySelector('canvas');
canvas.width = 480;
canvas.height = 360;

const button = document.querySelector('button');
button.onclick = function() {
  canvas.width = video.videoWidth;
  canvas.height = video.videoHeight;
  canvas.getContext('2d').drawImage(video, 0, 0, canvas.width, canvas.height);
  var data=canvas.toDataURL();
  alert(data);
  document.getElementById('myimage').value=data;

};

const constraints = {
  audio: false,
  video: { facingMode: "environment"}
};

function handleSuccess(stream) {
  window.stream = stream; // make stream available to browser console
  video.srcObject = stream;
}

function handleError(error) {
  console.log('navigator.MediaDevices.getUserMedia error: ', error.message,
      error.name);
}

navigator.mediaDevices.getUserMedia(constraints).then(handleSuccess).catch(
    handleError);
```

index.html

```
<!DOCTYPE html>
<!--
 *  Copyright (c) 2015 The WebRTC project authors. All Rights Reserved.
 *
 *  Use of this source code is governed by a BSD-style license
 *  that can be found in the LICENSE file in the root of the source
 *  tree.
-->
```

```
<html>
<head>

    <meta charset="utf-8">
    <meta name="description" content="WebRTC code samples">
    <meta name="viewport" content="width=device-width, user-scalable=yes,
        initial-scale=1, maximum-scale=1">
    <meta itemprop="description" content="Client-side WebRTC code samples">
    <meta itemprop="image" content="../../../images/webrtc-icon-192x192.png">
    <meta itemprop="name" content="WebRTC code samples">
    <meta name="mobile-web-app-capable" content="yes">
    <meta id="theme-color" name="theme-color" content="#ffffff">

    <base target="_blank">

    <title>getUserMedia to canvas</title>


</head>

<body>
<video id="video" width="640" height="480" autoplay capture="camera "></video>
<button id="snap">Snap Photo</button>
<canvas></canvas>

<form action="{{ url_for('predict')}}" method="POST">
<input id="myimage"  name="input1" value="" type="text"></input>

<input type="submit" name="submit">

</form>


<script src="https://webrtc.github.io/adapter/adapter-latest.js"></script>
<script  src = "{{ url_for('static', filename = 'text.js') }}" ></script>

</body>
</html>
```

result.html

```
<head>
<title> Text Recognition</title>
<style>
h1{
   color:black;
   text-align: center;
   font-size: 40px;
}
div{
   border:1px solid black;
   border-width: 2px;
   padding: 20px;
   width: 700px;
   text-align: center;
   margin-left: 550px;
   margin-right: 500px;
   margin-top:200px;
   font-size: 30px;
}
```

```
</style>
</head>

<body>

<div class="results">
  <h1>Recognized Text</h1>
  <h4>{{text}}</h4>


</div>
</body>
</html>
```

6.2 Face Recognition Module

This module is implemented using Python programming language and Flask framework.Following are the python packages used : Flask, pandas, numpy, base64, PIL, io, pytesseract, gtts, speech_recognition, pyttsx3, opencv, LBPH.

This module takes an input image from camera using java script getuserMedia api.The input image is in the form of base64 using base64 library of python it is decoded and saved in the png format.That saved image further goes for face detection and recognition using LBPH face recognizer and the recognize text is converted into speech using google text to speech library of python.

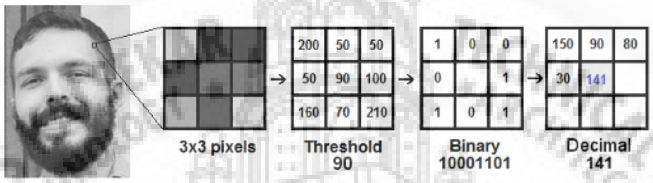


Figure 6.2: Face Recognition

create_database.py

```
  import sqlite3
conn = sqlite3.connect('face.db')
c = conn.cursor()
sql = """
DROP TABLE IF EXISTS users;

CREATE TABLE users (
            id integer unique primary key autoincrement,
            name text
);
"""
c.executescript(sql)
conn.commit()
conn.close()
```

record_face.py

```
  # -*- coding: utf-8 -*-
"""
Created on Thu Jan  2 17:34:55 2020

@author: Lenovo
"""

import cv2
import numpy as np
import sqlite3
import os
import pyttsx3
engine =pyttsx3.init()
rate = engine.getProperty('rate')   # getting details of current speaking rate
```

```
engine.setProperty('rate', 125)     # setting up new voice rate
"""VOLUME"""
volume = engine.getProperty('volume')   #getting to know current volume level (
    min=0 and max=1
#printing current volume level
engine.setProperty('volume',1.0)    # setting up volume level  between 0 and 1
"""VOICE"""
voices = engine.getProperty('voices')

conn = sqlite3.connect('face.db')
if not os.path.exists('./dataset'):
    os.makedirs('./dataset')
c = conn.cursor()
face_cascade = cv2.CascadeClassifier('haarcascade_frontalface_default.xml')
cap = cv2.VideoCapture(0)
engine.say("Enter Name of The Person")
engine.runAndWait()
engine.stop()
uname = input("Enter your name: ")
c.execute('INSERT INTO users (name) VALUES (?)', (uname,))
uid = c.lastrowid
sampleNum = 0
while True:
  ret, img = cap.read()
  gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
  cv2.imshow('pic', gray)
  faces = face_cascade.detectMultiScale(gray, 1.3, 5)
  for (x,y,w,h) in faces:
    sampleNum = sampleNum+1
    cv2.imwrite("dataset/User."+str(uid)+"."+str(sampleNum)+".jpg",gray[y:y+h,x:
        x+w])
    cv2.rectangle(img, (x,y), (x+w, y+h), (255,0,0), 2)
    cv2.waitKey(100)
  cv2.waitKey(1);
  if sampleNum > 100:
    break
cap.release()
conn.commit()
conn.close()
cv2.destroyAllWindows()
```

trainer.py

```
  # -*- coding: utf-8 -*-
"""
Created on Thu Jan  2 19:40:56 2020
@author: Lenovo
"""


import os
import cv2
import numpy as np
from PIL import Image
import pyttsx3
engine = pyttsx3.init()
rate = engine.getProperty('rate')   # getting details of current speaking rate
engine.setProperty('rate', 125)     # setting up new voice rate
"""VOLUME"""
volume = engine.getProperty('volume')   #getting to know current volume level (
```

```
    min=0 and max=1
#printing current volume level
engine.setProperty('volume',1.0)    # setting up volume level  between 0 and 1
"""VOICE"""
voices = engine.getProperty('voices')

recognizer = cv2.face.LBPHFaceRecognizer_create()
path = './dataset'
if not os.path.exists('./recognizer'):
    os.makedirs('./recognizer')
def getImagesWithID(path):
  imagePaths = [os.path.join(path,f) for f in os.listdir(path)]
  faces = []
  IDs = []
  for imagePath in imagePaths:
    faceImg = Image.open(imagePath).convert('L')
    faceNp = np.array(faceImg,'uint8')
    ID = int(os.path.split(imagePath)[-1].split('.')[1])
    faces.append(faceNp)
    IDs.append(ID)
  return np.array(IDs), faces
engine.say("Data Has been Saved Successfully")
engine.runAndWait()
engine.stop()

Ids, faces = getImagesWithID(path)
recognizer.train(faces,Ids)
recognizer.write('recognizer/trainedData.yml')
cv2.destroyAllWindows()
```

detector.py

```
  # -*- coding: utf-8 -*-
"""
Created on Wed Jan  2 18:28:40 2020

@author: ask2ramiz
"""

import cv2
import numpy as np
import sqlite3
import os
import pyttsx3

engine =pyttsx3.init()
rate = engine.getProperty('rate')   # getting details of current speaking rate
engine.setProperty('rate', 140)     # setting up new voice rate
"""VOLUME"""
volume = engine.getProperty('volume')   #getting to know current volume level (
    min=0 and max=1
#printing current volume level
engine.setProperty('volume',1.0)    # setting up volume level  between 0 and 1
"""VOICE"""
voices = engine.getProperty('voices')


conn = sqlite3.connect('face.db')
c = conn.cursor()
fname = "recognizer/trainedData.yml"
```

```
if not os.path.isfile(fname):
  print("Please train the data first")
  exit(0)
face_cascade = cv2.CascadeClassifier('haarcascade_frontalface_default.xml')
cap = cv2.VideoCapture(0)
recognizer = cv2.face.LBPHFaceRecognizer_create()
recognizer.read(fname)
while True:
  img = file
  gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
  faces = face_cascade.detectMultiScale(gray, 1.3, 5)
  for (x,y,w,h) in faces:
    cv2.rectangle(img,(x,y),(x+w,y+h),(0,255,0),3)
    ids,conf = recognizer.predict(gray[y:y+h,x:x+w])
    c.execute("select name from users where id = (?);", (ids,))
    result = c.fetchall()
    name = result[0][0]
    if conf < 50:
      cv2.putText(img, name, (x+2,y+h-5), cv2.FONT_HERSHEY_SIMPLEX, 1,
          (150,255,0),2)
      flag=0
    else:
      cv2.putText(img, 'No Match', (x+2,y+h-5), cv2.FONT_HERSHEY_SIMPLEX, 1,
          (0,0,255),2)
      flag=1
  cv2.imshow('Face Recognizer',img)
  k = cv2.waitKey(30) & 0xff
  if k == 27:
    break
cap.release()
cv2.destroyAllWindows()

if flag ==0:
    engine.say(name)
    engine.say('is in front of you')
    engine.runAndWait()
    engine.stop()
else:
    engine.say('No Match')
    engine.runAndWait()
    engine.stop()
if flag == 1:
    os.system("python record_face.py 1")
    os.system("python trainer.py 1")
```

Chapter 7

System Testing

System testing is a level of software testing where a complete and integrated software is tested. The purpose of this test is to evaluate the system's compliance with the specified requirements.

7.1 Test Cases and Test Results

Test ID	Test Case Title	Test Condition	System Behavior	Expected Result
T01	Recognize Text	Input Text Image	Text Recognized Successfully	Text Output of the recognized text
T02	Recognize Face	Input Face image	Face are recognized	multiple faces should recognize
T03	Save Unknown Face	Input Face image with label	Faces were trained as per the model	Label the unknown faces
T04	Listen Recognize Text	Input Text image	Text was converted into audio	Audio output of recognized text
T05	Unknown Labelled faces should be recognized	Input Face image	Faces were recognized	Unknown labelled faces should be recognize.

7.2 Test Cases

Title: Recognize Text
Description: A System should be able to successfully recognize text.

Precondition: the user must provide an input image with text. *Assumption:* a supported browser or android mobile is being used.

Test Steps:

1. Open an application
2. Provide instruction to an app to switch to text recognition mode.
3. Provide instruction to click an image
4. Recognize Text.
5. Convert Recognize text into audio.

Expected Result: A application that captures the image and recognize text.
Actual Result: Recognize text successfully.

Title: Recognize Face
Description: A visually impaired user should be able to successfully listen the name of a person whose face is recognized as an audio output.

Precondition: the user must provide an input image with human face.

Assumption: a supported browser or android mobile is being used.

Test Steps:

1. Open an application
2. Provide instruction to an app to switch to face recognition mode.
3. Provide instruction to click an image.
4. System will check if the same face is present in the data base.

5. If Yes , System will speak the name of a person as an audio output.

Expected Result: A application that captures the image and recognize face and converts name of a person with text to speech module and provide speech output to user.
Actual Result: Recognized known face and its name is played as an audio output sucessfully.

Title: Save Unknown Face.
Description: A visually impaired user should be able to successfully save the name and image of a person whose face is not recognized by the application.

Precondition: the user must provide an input image with human face and name of a person as a label to an image.

Assumption: a supported browser or android mobile is being used.

Test Steps:

1. Open an application
2. Provide instruction to an app to switch to face recognition mode.
3. Provide instruction to click an image.
4. System will check if the same face is present in the data base.
5. If Yes , System will speak the name of a person as an audio output.
6. If no , System will ask user to speak the name with which user wants to save image in database.
7. User will provide name as a speech input.
8. Image will be saved an will be recognized next time.

Expected Result: A application that captures the image and takes speech input of name of a person and saves the image in the database with name as a label.
Actual Result: Saved Unknown face in the database with name taken as speech input from user.

Title: Listen Recognize Text
Description: A visually impaired user should be able to successfully listen the recognize text as an audio file.

Precondition: the user must provide an input image with text. *Assumption:* a supported browser or android mobile is being used.

Test Steps:

1. Open an application
2. Provide instruction to an app to switch to text recognition mode.
3. Provide instruction to click an image
4. Save an text audio clip with a audio file name.
5. Play Recognize Text.

Expected Result: A application that captures the image and recognize text and converts text to speech and provide speech output to user.
Actual Result: Recognize text audio file is saved and played successfully.

Title: Unknown Labelled faces should be recognized
Description: A visually impaired user should be able to successfully recognize the face saved previously as an audio file.

Precondition: the user must provide an input image with face. *Assumption:* a supported browser or android mobile is being used.

Test Steps:

1. Open an application
2. Provide instruction to an app to switch to face recognition mode.
3. Provide instruction to click an image.
4. Recognize face as an known face with person name as an audio output.

Expected Result: A application that captures the image and recognize face and converts text to speech and provide speech output to user which was previously saved by user.
Actual Result: Recognize face as an known face and audio file of a person name is played successfully.

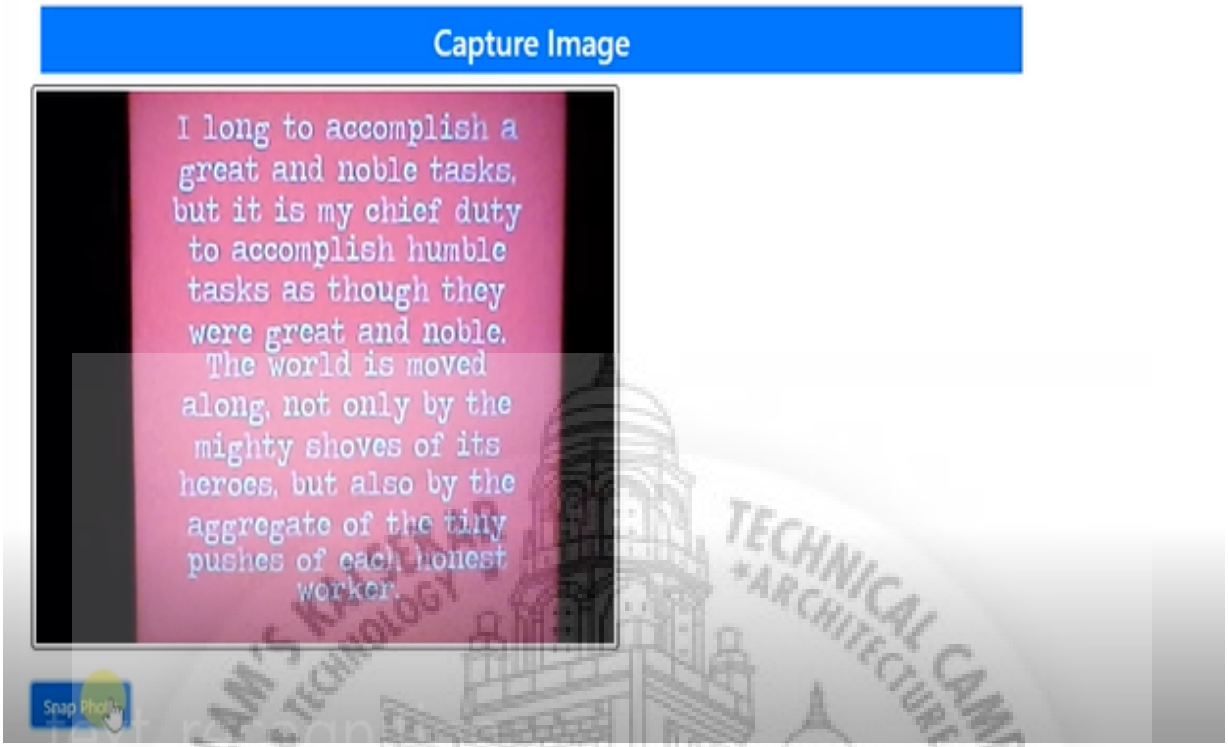
7.2.1 Software Quality Attributes

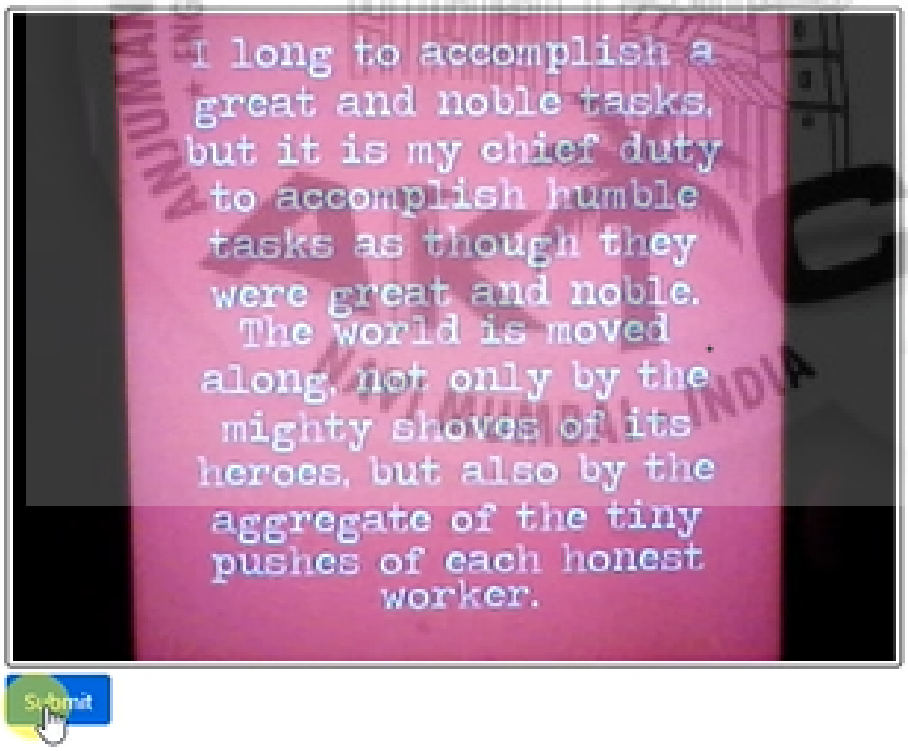
Availability-1 : The system shall be available to users all the time.
Availability-2 : The system shall always have something to function and always pop up error messages in case of component failure.
Efficiency-1 : The system shall generate the correct text audio with an accuracy of 80% above.
Efficiency-2 : The system shall provide the right tools to support all its features.

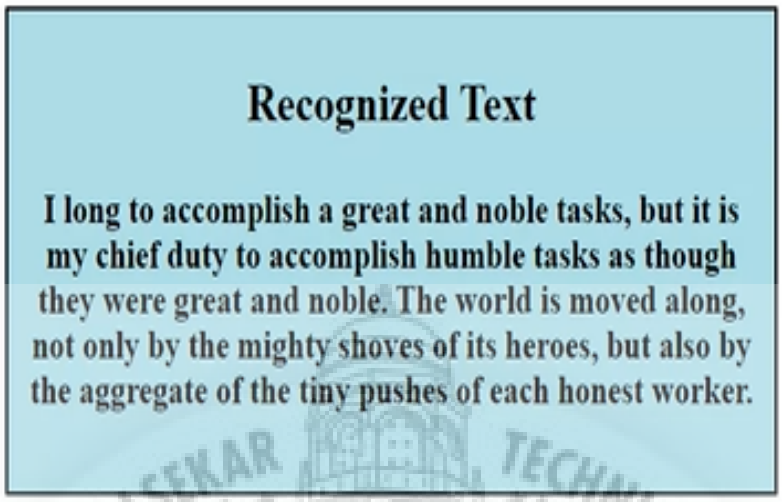
Chapter 8

Screenshots of Project

8.1 Text Recognition


Capture Image
I long to accomplish a great and noble tasks, but it is my chief duty to accomplish humble tasks as though they were great and noble. The world is moved along, not only by the mighty shoves of its heroes, but also by the aggregate of the tiny pushes of each honest worker.
Snap Photo


I long to accomplish a great and noble tasks, but it is my chief duty to accomplish humble tasks as though they were great and noble. The world is moved along, not only by the mighty shoves of its heroes, but also by the aggregate of the tiny pushes of each honest worker.
Submit



8.2 Face Recognition

Chapter 9

Conclusion and Future Scope

9.1 Conclusion

This project introduces an application predicated on face recognition and Text recognition designed to ameliorate visually impaired users interaction and communication in convivial encounters.The accuracy of Text Recognition is 85% till now and its providing the audio output efficiently.Development of Text Recognition and Face Recognition is in progress and our aim is to achieve 90% average accuracy of both so that user can get good experience by providing interaction between system and user in speech.The problem for the visually impaired persons in reading is solved by this proposed method. This system will distinguish the object from the captured image and detect and recognized Faces from the image.

9.2 Future Scope

- Tracking location,Object detection can be added in our proposed system to improve our system.Indicating Location to blind people where they are ,colour reader and much more can be added.
- GPS addition will be another advantage that will enable user to get directions and it could give information regarding their present location.
- Panic Button can also be implemented by adding GSM module so that in case if the visually impaired user is in trouble they can make use of that panic button to seek help by sending their location to some stored mobile numbers.
- This will help us to increase the safety of the blind people.If training is provided to blind peoples regarding this device it could result in better performance.
- In future object detection will help them to recognize currencies, surrounding obstacles.Traffic signals,landmarks and sign boards Identification could be helpful while travelling.

References

[1] *"Design of a CNN Face Recognition System Dedicated to Blinds"*; Bogdan MOCANU,Ruxandra TAPU, TITUS ZAHARIA, 2018

[2] *"TEXT RECOGNITION AND FACE DETECTION AID FOR VISUALLY IMPAIRED PERSON USING RASPBERRY PI"*; Mr.Rajesh M,Ms. Bindhu K. Rajan, International Conference on circuits Power and Computing Technologies [ICCPCT] , 2017

[3] *"Real Time Text Detection and Recognition on Hand Held Objects to Assist Blind People."*;Samruddhi Deshpande,Ms.Revati Shriram, International Conference on Automatic Control and Dynamic Optimization Techniques (ICACDOT),2016

[4] *"Reading Aid for Visually Impaired People"*;S. Muralidharan,D. Venkatesh,J. P. Pritmen,Purushothaman R,S. Jeya Anusuya,V. Saravanaperumal, 2018

[5] *"Face Recognition Using Local Binary Pattern Histogram for Visually Impaired People"*;Vestiana Aza,Indrabayu,Intan Sari Areni, 2019

[6] *"A Smart Personal AI Assistant for Visually Impaired People"*;Shubham Melvin Felix, Sumer Kumar, and A. Veeramuthu, 2018

[7] *"Evaluation of LBP-based face recogni-tion techniques"*;Siti Anis Amirah Mohd Faudzi ,Norashikin Yahya, 2014

[8] *"An Assistive Mobile Application i-AIM App with Accessible UI Implementation for Visually-Impaired and Aging Users""*;Ph.D Kan C.W. Russ, 2017

Achievements

1. Conferences

   (a) *Identification and Recognition of Text and Face using Image Processing for Visually Impaired*;Shaikh Safiya Naaz , Zamadar Ramijraja ,Sharma Harishkumar, "INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN COMPUTATIONAL TECHNIQUES: IC-RACT 2020" , 26th June 2020 (Venue : Amity mumbai)


AMITY UNIVERSITY MUMBAI

AMITY SCHOOL OF ENGINEERING & TECHNOLOGY

International Conference on Recent Advances in Computational Techniques (e-IC-RACT 2020)

26th and 27th June, 2020

CERTIFICATE

This is to certify that

Safiya Naaz Shaikh

has presented a paper entitled

Identification and Recognition of Text and Face using Image Processing for Visually Impaired

in the e-IC-RACT 2020 organized Amity School of Engineering and Technology, Amity University Mumbai.

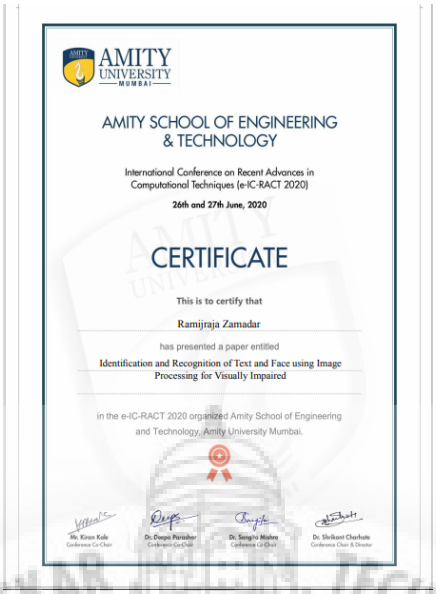
Dr. Kiran Kale, Conference Co-Chair

Dr. Deepa Parashar, Conference Co-Chair

Dr. Sangita Mishra, Conference Co-Chair

Dr. Shrikant Charhate, Conference Chair & Director

Figure 9.1: Certificate


AMITY UNIVERSITY MUMBAI

AMITY SCHOOL OF ENGINEERING & TECHNOLOGY

International Conference on Recent Advances in Computational Techniques (e-IC-RACT 2020)

26th and 27th June, 2020

CERTIFICATE

This is to certify that

Ramijraja Zamadar

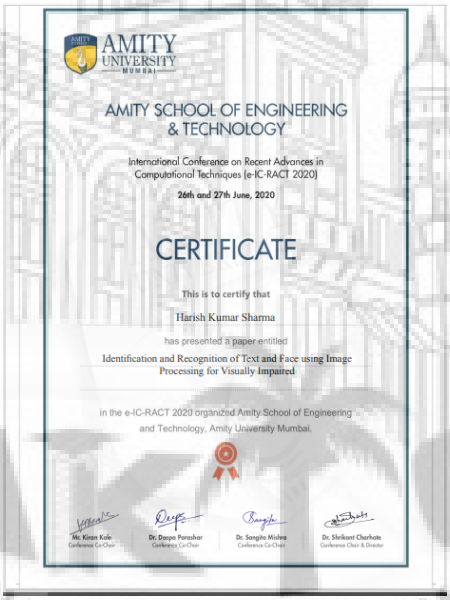
has presented a paper entitled

Identification and Recognition of Text and Face using Image Processing for Visually Impaired

in the e-IC-RACT 2020 organized Amity School of Engineering and Technology, Amity University Mumbai.

Mr. Kiran Kale, Conference Co-Chair | Dr. Deepa Parashar, Conference Co-Chair | Dr. Sangita Mishra, Conference Co-Chair | Dr. Shrikant Charhate, Conference Chair & Director

Figure 9.2: Certificate


AMITY UNIVERSITY MUMBAI

AMITY SCHOOL OF ENGINEERING & TECHNOLOGY

International Conference on Recent Advances in Computational Techniques (e-IC-RACT 2020)

26th and 27th June, 2020

CERTIFICATE

This is to certify that

Harish Kumar Sharma

has presented a paper entitled

Identification and Recognition of Text and Face using Image Processing for Visually Impaired

in the e-IC-RACT 2020 organized Amity School of Engineering and Technology, Amity University Mumbai.

Mr. Kiran Kale, Conference Co-Chair | Dr. Deepa Parashar, Conference Co-Chair | Dr. Sangita Mishra, Conference Co-Chair | Dr. Shrikant Charhate, Conference Chair & Director

Figure 9.3: Certificate

2. Project Competitions

   (a) *Identification and Recognition of Text and Face using Image Processing for Visually Impaired*;Shaikh Safiya Naaz , Zamadar Ramijraja ,Sharma Harishkumar, 4th National Level Tech Fest Connect-2020 , 22nd January 2020 (Venue : Jamia Institute of Engineering , Akkalkuwa)