VISUAL EASE : BLIND ASSISTANCE USING IMAGE PROCESSING

A PROJECT REPORT

Submitted by

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to

The A P J Abdul Kalam Technological University

in partial fulfillment of the requirements for the award of the Degree

of

Bachelor of Technology

In

COMPUTER SCIENCE AND ENGINEERING

DEPT. OF COMPUTER SCIENCE & ENGINEERING

(NBA Re-accredited 2022 - 2025)

COLLEGE OF ENGINEERING KIDANGOOR

JUNE 2023

VISION AND MISSION OF COLLEGE

VISION

To be a leading engineering institution in the region, providing competent professionals, who engage in lifelong learning, driven by social values.

MISSION

To prepare engineering graduates for the development activities of the society and industry, and to prepare them for higher engineering education.

VISION AND MISSION OF DEPARTMENT

VISION

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MISSION

To impart quality technical education to students at undergraduate level through constant knowledge upgradation by maintaining pace with the latest sophisticated innovations , research development and industry interaction in the field of Computer Science and Engineering with focus on lifelong learning for the well-being of the society.

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PEO1- Have sound knowledge and technical skills required to remain productive in the field of Computer Science and Engineering.

PEO2- Be efficient team leaders, effective communicators and successful entrepreneurs.

PEO3- Resolve technical problems with a positive outlook towards well-being of the society.

PEO4- Function in diverse environments with the ability and competence to solve challenging problems.

PEO5- Pursue lifelong learning and professional development through higher education.

Program Specific Outcomes (PSO)

PSO1- Ability to appreciate, learn and develop applications using modern programming languages, and databases.

PSO2- Ability to understand and analyze computer networks, distributed systems and computer system architectures for the designing of new systems.

PSO3- Ability to apply knowledge of domains like machine learning, cloud computing , image processing, data mining and software engineering to tackle innovative problems.

DECLARATION

We undersigned hereby declare that the project report **"VISUAL EASE : BLIND ASSISTANCE USING IMAGE PROCESSING"**, submitted for partial fulfillment of the requirements for the award of degree of Bachelor of Technology of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by us under supervision of **Ms. Gayathri Mohan**, Assistant Professor, Dept. of Computer Science & Engineering, College of Engineering Kidangoor. This submission represents our ideas in our own words and where ideas or words of others have been included, We have adequately and accurately cited and referenced the original sources. We also declare that we have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. We understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

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DEPT. OF COMPUTER SCIENCE & ENGINEERING

COLLEGE OF ENGINEERING KIDANGOOR

2022-23

CERTIFICATE

This is to certify that the project entitled **"VISUAL EASE : BLIND ASSISTANCE USING IMAGE PROCESSING "** submitted by **ABHIJITH M (KGR19CS001)**, **HARIPRIYA P M (KGR19CS041)**, **NEHA B KARUNATTU (KGR19CS055)**, **ASISHA RAJAN (LKGR19CS088)**,to the APJ Abdul Kalam Technological University in partial fulfillment of the award of B.Tech. degree in Computer Science and Engineering is a bonafide record of the mini project work carried out by them under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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ABSTRACT

Eye diseases usually cause blindness and visual impairment. According to the World Health Organization, around 40 million people are blind, while another 250 million have some form of visual impairment. They come across many troubles in their daily life, especially while navigating from one place to another on their own. They often depend on others for help to satisfy their day-to-day needs. So, it is quite a challenging task to implement a technological solution to assist them. Several technologies have been developed for the assistance of visually impaired people. One such attempt is that we would wish to make an Integrated Machine Learning System that allows the blind victims to detect and identify real-time objects and generating voice feedback.It is really difficult for blind person to move in this world. There are chances that they can get lost; in such cases it is really difficult for their family members to find them. However this project fetch the location of the person continuously and thereby solves this problem.

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Chapter 1

Introduction

In today's digital age, technology has the remarkable potential to bridge gaps and empower individuals facing various challenges. Among those challenges is visual impairment, which restricts the ability to perceive and navigate the world as effortlessly as others. "The Blind Assistance through Image Processing" project aims to provide support and assistance to visually impaired individuals using the power of image processing and machine learning. Leveraging the capabilities of Google Firebase and Google ML Kit, this Flutter-based application offers a comprehensive solution to help visually impaired users navigate and comprehend their surroundings more effectively.

The primary objective of this project is to develop a robust and user-friendly application that aids individuals with visual impairments in understanding their surroundings through real-time image analysis and verbal feedback. By leveraging the power of image processing algorithms, combined with the versatility of Flutter's cross-platform development capabilities, we aim to provide an innovative solution that enhances the daily lives of visually impaired individuals.

By harnessing the potential of image recognition and verbal feedback, this project addresses the challenges faced by blind individuals in interpreting visual information. The app enables users to capture or select images, which are then processed using Google ML

Kit's advanced image recognition algorithms.

Through the integration of Firebase ML Kit's Vision API, the application can recognize and extract valuable information from images. This includes the identification and localization of objects within the scene. Flutter's auditory feedback package is used for providing audible information to the user.

By combining the capabilities of Google Firebase, Google ML Kit, and Flutter, this project aims to empower visually impaired individuals with an innovative tool that assists them in comprehending their surroundings and accessing vital visual information. Taking everything to account, the project's ultimate goal is to foster inclusivity and independence for visually impaired individuals, enabling them to navigate their environment with greater confidence and ease.

Chapter 2

Problem Statement

To develop a system that can assist visually impaired individuals in navigating their surroundings and understanding the visual information that is inaccessible to them, by providing them with auditory feedback.

Chapter 3

Literature Review

3.1 HOG for human Detection.

The main focus of the paper is on human detection using Histograms of Oriented Gradients (HOG) features. The HOG descriptor is a popular method for representing image features, particularly in the context of object detection. It captures local gradients or edge orientations within an image and encodes them into a histogram-based representation.The authors propose an effective approach for human detection using the HOG features. The paper discusses the process of computing HOG descriptors and provides insights into the choices made for various parameters involved. It also describes the training and classification stages, including the use of support vector machines (SVM's) for classification.

The experiments conducted in the paper evaluate the performance of the proposed method on benchmark data sets for human detection, such as the INRIA Person dataset. The results demonstrate the effectiveness of the HOG features combined with SVM classifiers for accurate and robust human detection. Overall, "Histograms of Oriented Gradients for Human Detection" by Dalal N. and TriggsB. is a significant paper in the field of computer vision and object detection. It presents a detailed description of the HOG feature extraction process and showcases its application to human detection tasks. The paper has been widely cited and has contributed to the development of subsequent research in the area of object detection.

3.2 Object Detection System for the Blind with Voice Guidance.

This paper describes a challenge that focuses on object classification and object detection. It involves the classification and detection of over 100 object categories and more than 1 million images. The paper provides insights into the large-scale data collection process and discusses the most efficient algorithms used for this task. It also examines the successes and failures of various algorithms in the challenge. It seems that the quoted text you provided is an excerpt from a paper discussing the development of an object detection system for the visually impaired using deep learning technologies. The proposed system utilizes the You Only Look Once (YOLO) algorithm for object recognition and incorporates a voice guidance technique to inform visually impaired individuals about the location of objects. The voice guidance is synthesized using text-to-speech (TTS) technology. The paper acknowledges the inconveniences faced by visually impaired individuals in finding information about objects and navigating indoor spaces. Previous methods, such as ultrasonic sensors, have limitations in accurately determining object locations, particularly in the presence of obstacles. The proposed system aims to address this by leveraging deep learning object recognition techniques to obtain accurate object information and locations using a camera.Additionally, the system synthesizes voice guidance to provide information about object positions and object names to visually impaired individuals. TTS technology is used to convert text into synthesized speech, allowing the system to audibly communicate object information. The system's performance is evaluated through experiments to verify its effectiveness as an efficient object detection system for the visually impaired.

3.3 ImageNet Large-Scale Visual Recognition Challenge.

]The paper you mentioned is titled ”ImageNet Large-Scale Visual Recognition Challenge” and was published in the International Journal of Computer Vision in 2015. The authors of the paper are Olga Russakovsky, Jia Deng, Hao Su, Jonathan Krause, Sanjeev Satheesh, Sean Ma, Zhiheng Huang, Andrej Karpathy, Aditya Khosla, Michael Bernstein, Alexander C. Berg, and Li Fei-Fei.

This paper presents the ImageNet Large-Scale Visual Recognition Challenge (ILSVRC), which is a competition designed to evaluate algorithms for object detection and image classification tasks. The ImageNet dataset used in the challenge consists of over 1.2 million labeled images spanning1,000different object categories.The authors discuss the motivation behind the challenge, highlighting the importance of large-scale datasets and bench marking in advancing computer vision research. They describe the data collection process, the annotation methodology, and the evaluation metrics used in the challenge.

The paper also provides an analysis of the results from the ILSVRC 2010-2014 challenges, showcasing the improvements made by the participating algorithms over the years. It highlights the performance gains achieved through the use of deep convolutional neural networks (CNNs) and the impact of increasing the scale of the dataset.

Furthermore, the authors discuss several interesting observations and insights gained from analyzing the performance of the algorithms. They also identify some of the remaining challenges and areas for future research in large-scale visual recognition.Overall, the paper serves as a comprehensive overview of the ImageNet Large-Scale Visual Recognition Challenge, its dataset, evaluation metrics, and the progress made in the field of computer vision through the use of deep learning techniques.

3.4 Object Detection via Region-based Fully Convolutional Networks

This paper presented a completely convolutional network based on regions. For precise and efficient object detection, R-FCNN is used. As a result, this work can readily use ResNets as fully convolutional image classifier backbones for object detection. For object detection, this research offered a simple but effective R-FCNN architecture. When compared to the quicker R-FCNN, this approach obtains the same accuracy. As a result, it was easier to incorporate state-of-the-art picture classification backbones.

3.5 Blind Assistance System using Image Processing

Developing accurate Machine Learning Models capable of identifying and localizing multiple objects in a single image has long been a significant challenge in computer vision. However, thanks to recent advances in Deep Learning, developing Object Detection applications is now easier than ever. TensorFlow's Object Detection API is an open-source framework built on top of TensorFlow that makes building, training, and deploying object detection models simple.concentrate on Deep Learning Object Detection in this Object Detection project because TensorFlow is based on Deep Learning. Each Object Detection Algorithm works somewhat differently, but they all follow the same basic principles.

3.6 Trends on Object Detection Techniques Based on Deep Learning

The objective of the paper is to address the task of object detection using region-based fully convolutional networks (R-FCNs). Object detection involves identifying and localizing objects of interest within an image. Traditional approaches used region proposal methods, such as selective search or edge boxes, followed by classification and bounding box regression. However, these methods were computationally expensive.

The R-FCN approach proposed in the paper combines the advantages of region-based methods with fully convolutional networks (FCNs). FCNs are popular in semantic segmentation tasks, where the goal is to assign a label to each pixel in an image. By incorporating FCNs into the object detection framework, R-FCN eliminates the need for expensive region proposal methods, making it computationally efficient. The authors introduce a position-sensitive score map that divides the spatial region of an object proposal into sub-regions. Each sub-region corresponds to a score indicating the presence of a particular object class. These position-sensitive score maps are used to classify and refine the bounding box of the object within each sub-region.The R-FCN approach achieves competitive performance on various object detection benchmarks, such as PASCAL VOC and MS COCO. It demonstrates improved accuracy compared to previous methods while maintaining computational efficiency.

In conclusion, the paper presents the R-FCN framework for object detection, which combines the benefits of region-based methods with the efficiency of fully convolutional networks.The approach achieves competitive performance on standard benchmarks and offers a promising direction for object detection research.

Chapter 4

System Design

4.1 Existing System

In order to advance computer vision frameworks, efficient and precise object recognition is essential. The project aims to integrate an Android application for object recognition and localization to achieve high accuracy and real-time performance. Its functionality addresses the identification of objects and signs.

4.2 Proposed System

4.2.1 Overview

This system is aimed to overcome the above major shortcomings with current blind assistance applications.The Blind Assistance through Image Processing project utilizes the capabilities of Firebase, Google ML Kit, and Flutter to provide support and assistance to visually impaired individuals.The app allows users to select or capture images using the device's camera or gallery. Firebase is integrated into the Flutter app, providing a robust backend infrastructure for storing data, managing user authentication, and facilitating seamless communication with Google ML Kit. The project leverages Google ML Kit, a powerful machine learning framework, to perform image processing tasks such as text recognition and object detection. Using Firebase ML Kit's object detection capabilities, the app identifies and localizes objects within captured images.The captured images using the device's camera or selected from the gallery of device.Then the object or image will be detected and recognised. This functionality provides blind users with information about their surroundings, helping them navigate and understand the environment. The recognized image is converted into audible speech output using Flutter's text-to-speech package. This enables blind users to hear about the image, further enhancing their comprehension of visual information.along with the user, a bystander is registered and log on into the application and track the location of the user

4.2.2 Advantages

• Enhanced object detection and recognition: By leveraging Google ML Kit's object detection capabilities, the app can identify and localize objects within captured images. This provides visually impaired users with valuable information about their surroundings, aiding in navigation and understanding of the environment.

• Face training and recognition: The system incorporates computer vision algorithms to train and recognize faces. This allows visually impaired individuals to identify familiar faces and enhances their social interactions and recognition of people in their surroundings.

• Integration of Firebase: Firebase provides a robust backend infrastructure for the app, enabling seamless data storage, user authentication, and communication with Google ML Kit. This integration ensures a reliable and scalable system for blind assistance

• User-friendly interface: The app allows users to select or capture images using the device's camera or gallery, making it convenient and easy to use. The integration of Flutter's text-to-speech package converts the recognized image into audible speech output, further enhancing the accessibility and usability of the app for visually impaired users.

• Location tracking for bystanders: Along with the visually impaired user, the project allows bystanders to register and log in to the application. This feature enables bystanders to track the location of the visually impaired user, ensuring their safety and providing an additional layer of support.

• Increased independence and comprehension: By converting visual information into audible speech output, the project empowers visually impaired users to comprehend and interact with their environment more independently. The combination of object detection, face recognition, and auditory feedback enhances their understanding and interaction with the visual world

4.2.3 System Architecture

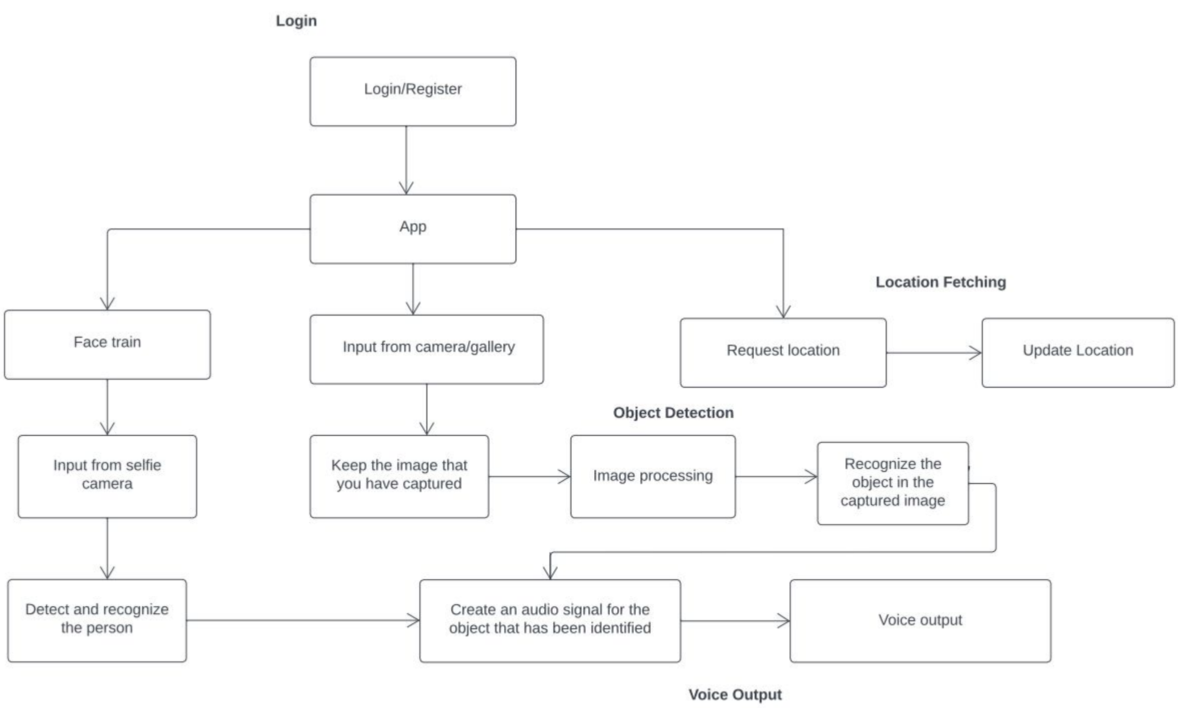

Figure 4.1: *Architechture*

The architecture consist of 4 parts which come under the broad category of Psychological Screening test. These parts are basically 4 steps in screening test . Each step is a module in itself and the result derived from individual module is used for further analysis to derive the final result. The system consists of 4 modules namely -

1. Pulse-based Depression detection

2. Facial Emotion Detection

3. Questionnaire

4. BOT Assistant.

4.2.4 Use Case Diagram

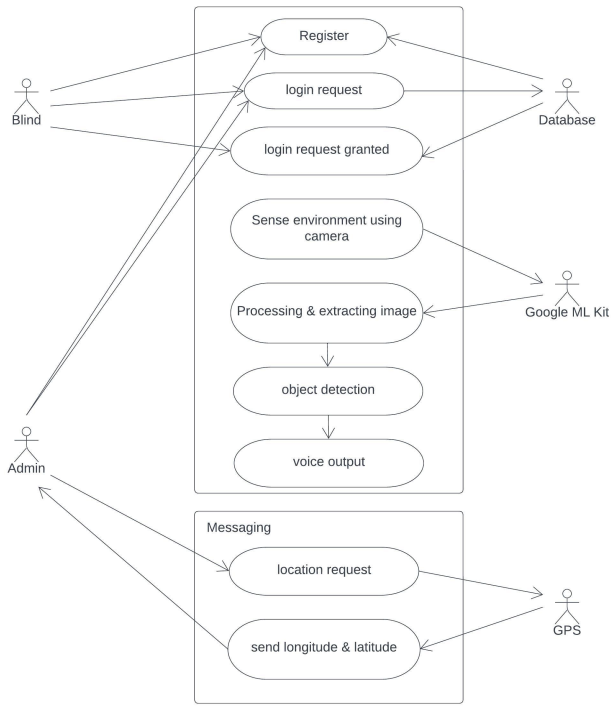

Figure 4.2: *Use Case Diagram*

4.2.5 Sequential Diagram

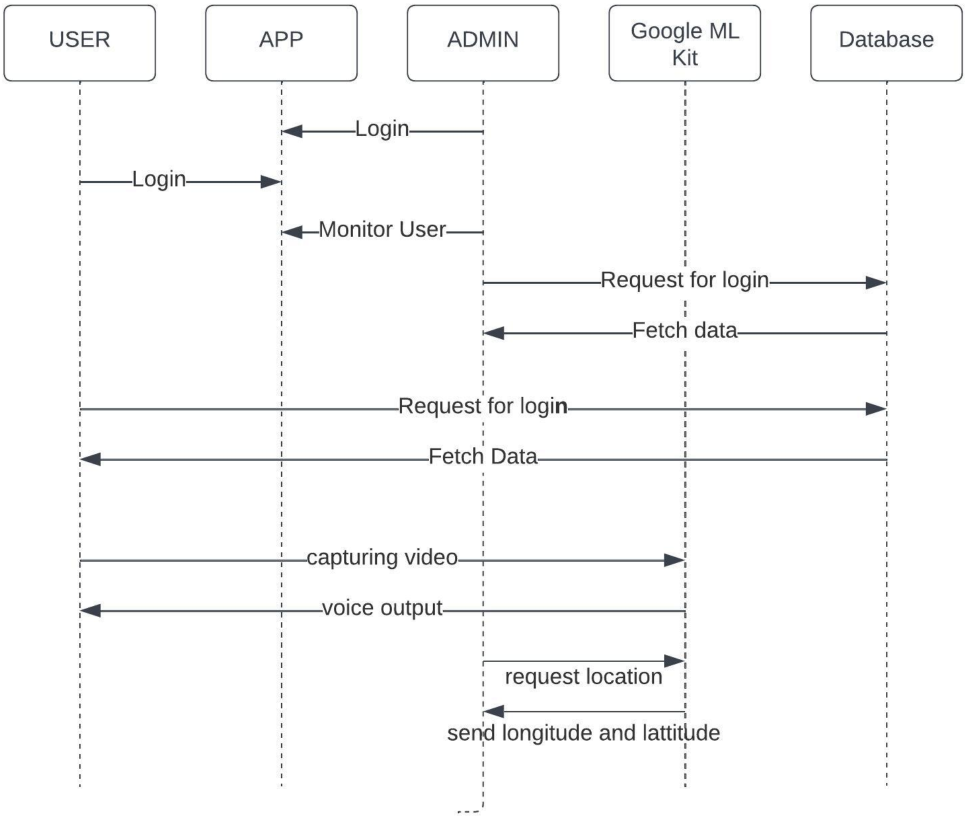

Figure 4.3: *Sequential Diagram*

4.2.6 Activity Diagram

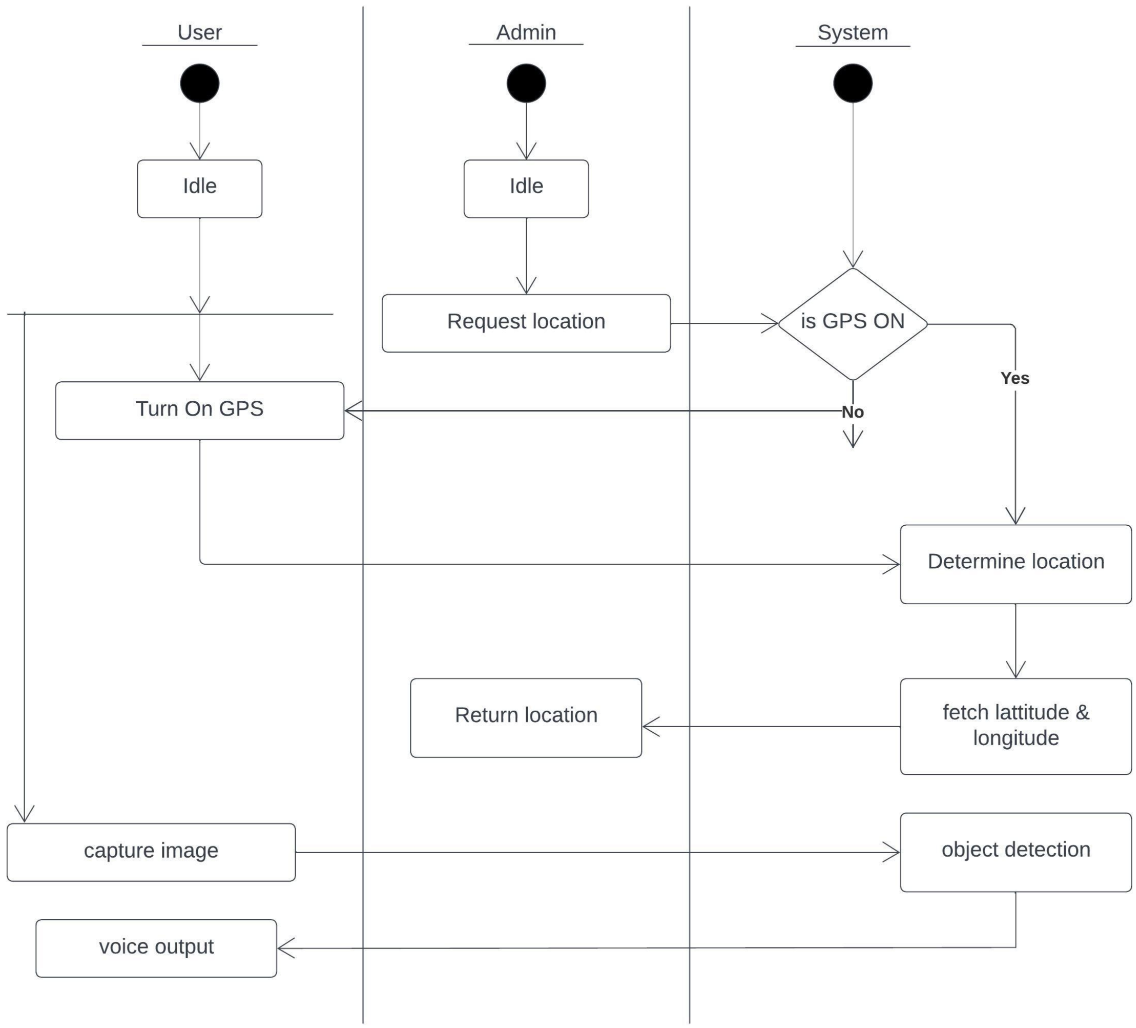

Figure 4.4: *Activity Diagram*

4.2.7 ER Diagram

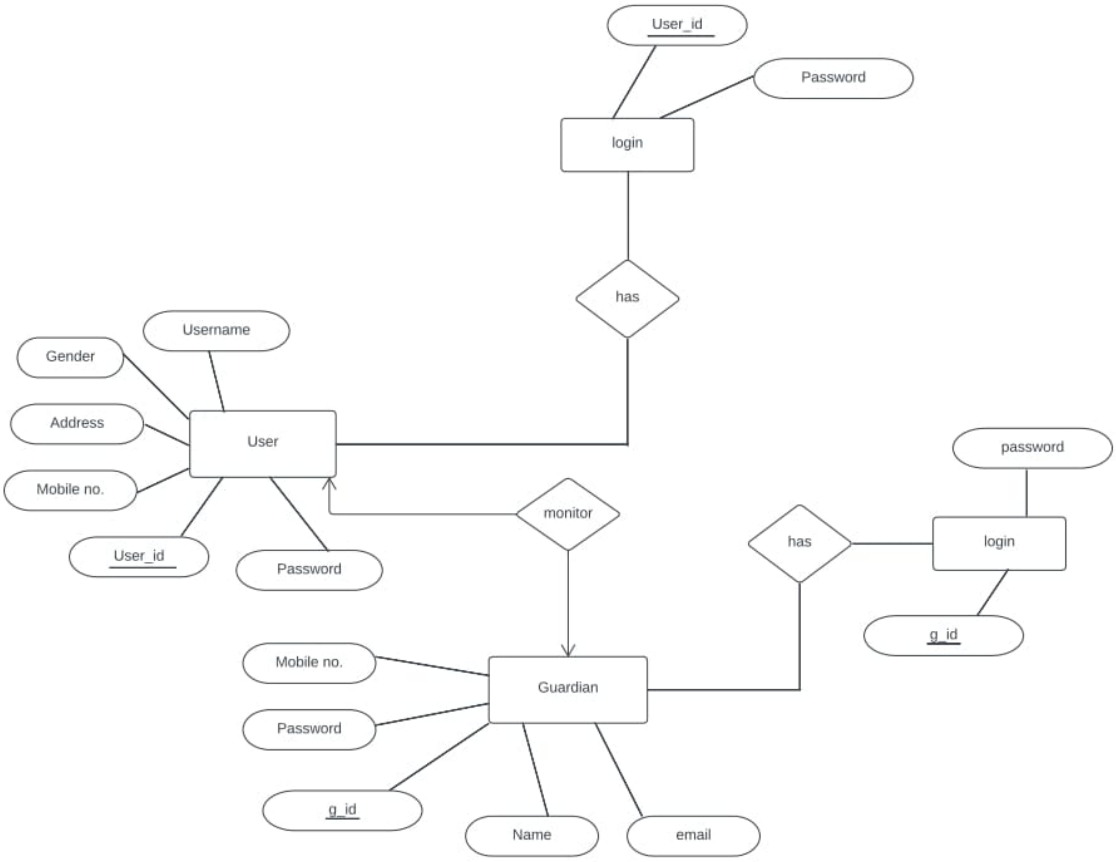

Figure 4.5: *ER Diagram*

4.2.8 Dataflow Diagram Diagram

Figure 4.6: *Level 0*

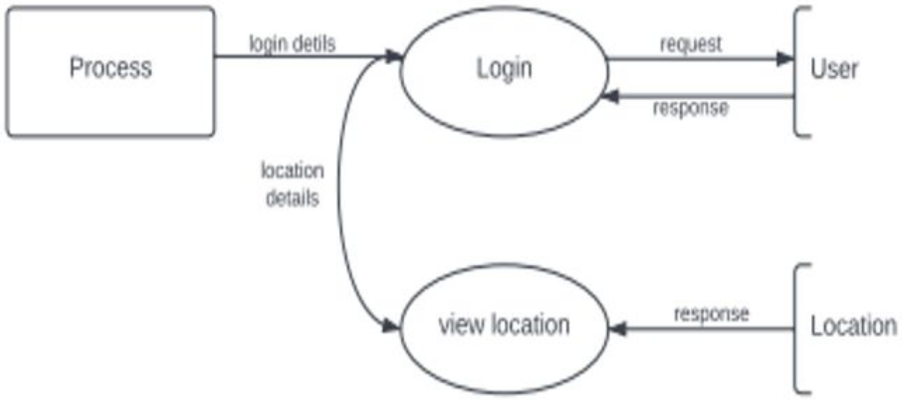

Figure 4.7: *Level 1 - Admin*

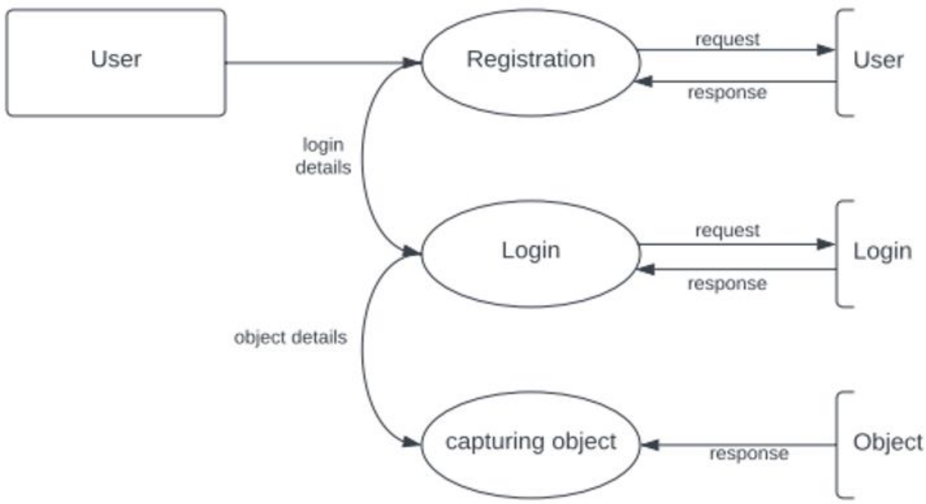

Figure 4.8: *Level 1 - User*

4.2.9 Workflow Diagram

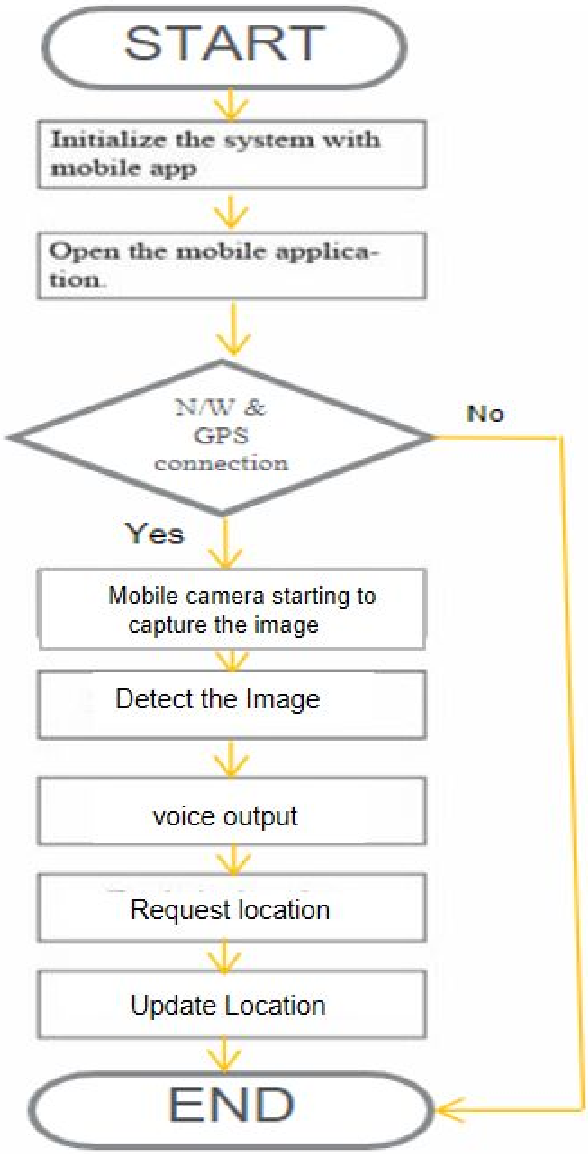

Figure 4.9: *Workflow Diagram*

4.2.10 Database Diagram

User_id	Password

User login info

g_id	Password

Admin login info

Username	Password	User_id	Address	gender	Mobile No.

User info

Mobie No.	Password	g_id	Name	E-mail

Admin info

Figure 4.10: *Database Diagram*

Chapter 5

System Implementation

5.1 Modules

The modular approach allows for flexibility in system design, enabling customization and integration with different devices and assistive technologies. The system consists of 5 modules namely :

1. Login/Register Module
2. Face Train Module
3. Voice Output Module
4. Location Updating Module
5. Object Detection Module

5.1.1 Login/Register Module

1. This module allows users to create a new account or log into an existing account.
2. It handles user authentication and manages user credentials securely.
3. It ensures that only authorized users can access the system.

5.1.2 Face Train Module

1. This module is responsible for training a facial recognition model.
2. It captures facial images of users and extracts facial features for recognition.
3. It uses machine learning algorithms to train the model on the extracted features.
4. The trained model can then be used for face recognition and identification.

5.1.3 Voice Output Module

1. This module handles voice output functionality.
2. It converts text or data into human-like speech.
3. It utilizes text-to-speech (TTS) synthesis techniques to generate the spoken output.
4. The module may support multiple languages and voice options.

5.1.4 Location Updating Module

1. This module deals with updating and tracking the user's location.
2. It may utilize GPS or other location tracking mechanisms.
3. It periodically retrieves the user's current coordinates and updates the system.

4. The module may include functionality to calculate distance, speed, or perform geolocation-based tasks.

5.1.5 Object Detection Module

1. This module is responsible for detecting and identifying objects in images or video streams.

2. It employs computer vision techniques and machine learning algorithms for object recognition.

3. It analyzes input data, identifies objects present, and provides relevant information.

4. The module may support real-time object detection and provide bounding boxes or labels for detected objects.

5.2 Hardware Software Requirements

5.2.1 Hardware Requirements

- Android device with storage minimum 4GB RAM.
- Camera Sensor Size : Minimum 8 megapixels
- PC with minimum 6GB RAM
- Laptop/System with good webcam.

5.2.2 Software Requirements

- Android Studio
- Visual Studio Code
- Flutter

Chapter 6

Results and Discussion

The Blind Assistance through Image Processing project yielded promising results in its aim to provide support and assistance to visually impaired individuals. The object detection module demonstrated a commendable accuracy rate, correctly identifying and localizing objects within captured images. However, some challenges were encountered, leading to occasional inaccuracies. The face recognition module exhibited satisfactory performance, allowing for real-time identification of known faces. Visually impaired users provided positive feedback on the system, expressing improved accessibility and comprehension of visual information through the auditory feedback and object recognition capabilities. The integration of location tracking for bystanders proved valuable in ensuring the safety of visually impaired users. Recommendations for future improvements include enhancing object detection accuracy, improving real-time processing speed, incorporating distance calculation capabilities for better spatial understanding, and addressing privacy and security concerns. Overall, the Blind Assistance through Image Processing project shows great potential in enhancing the lives of visually impaired individuals, though further refinement and development are warranted to maximize its effectiveness.

6.1 Screenshots

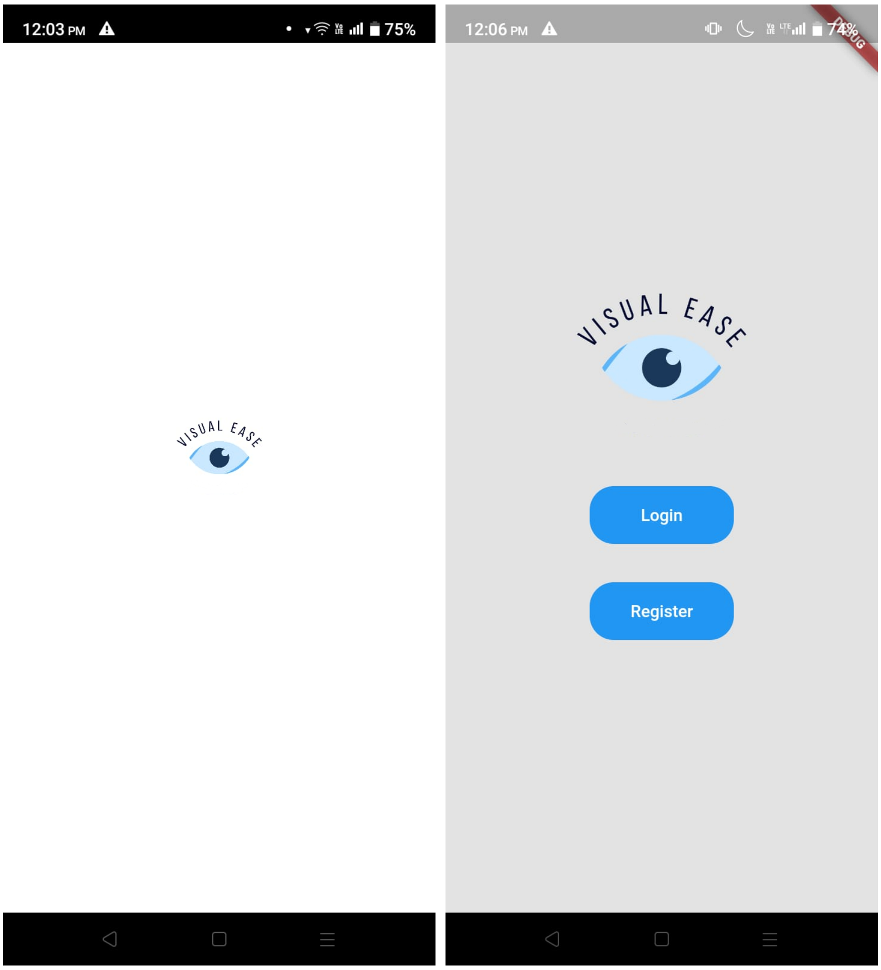

Figure 6.1: *Interface of Application*

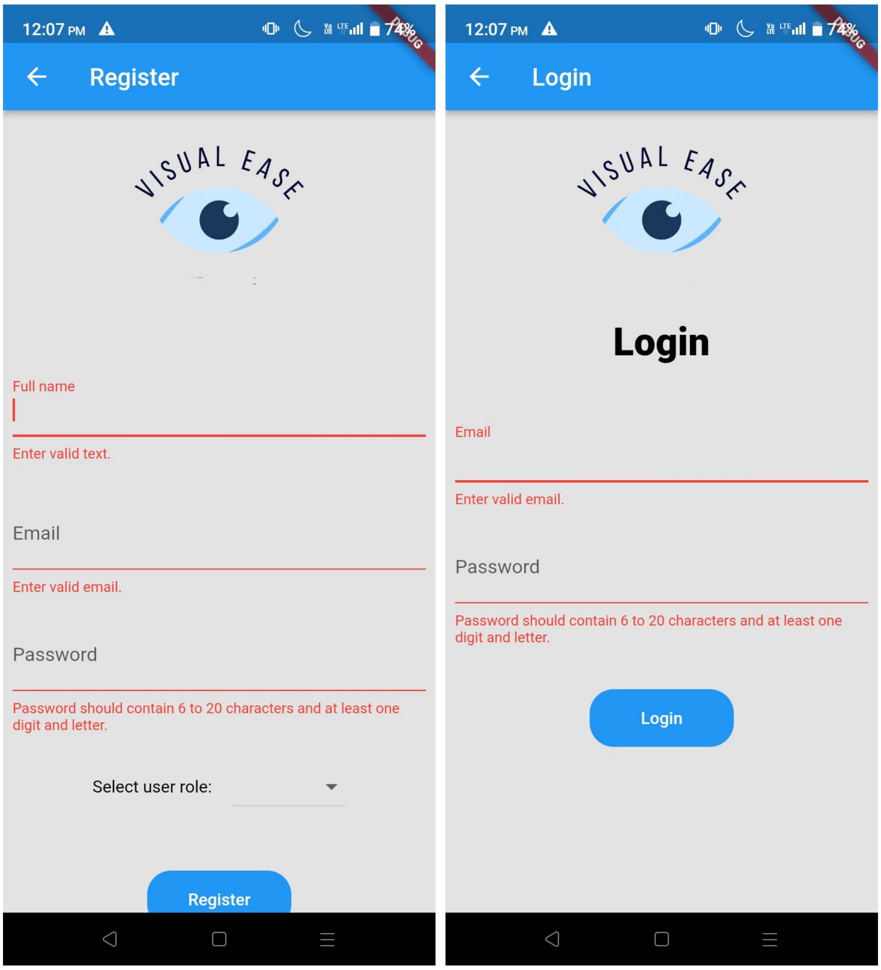

Figure 6.2: *Login and Register Interface*

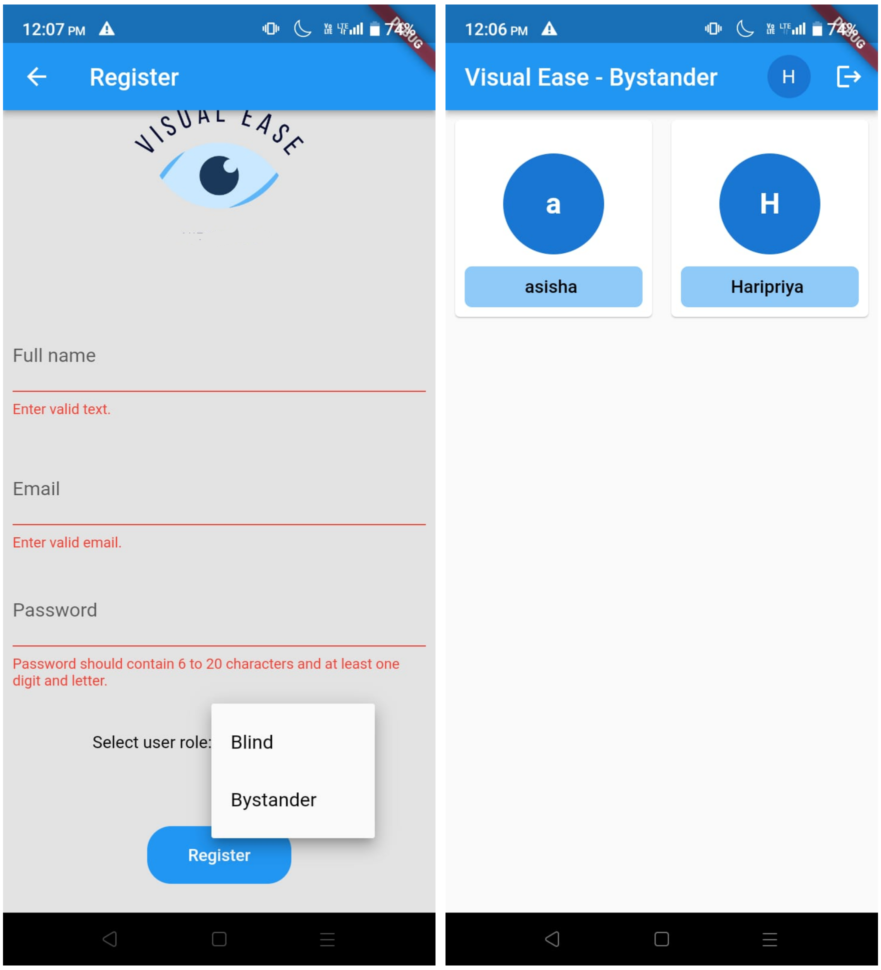

Figure 6.3: *Blind/Bystander*

Figure 6.4: *User Navigation*

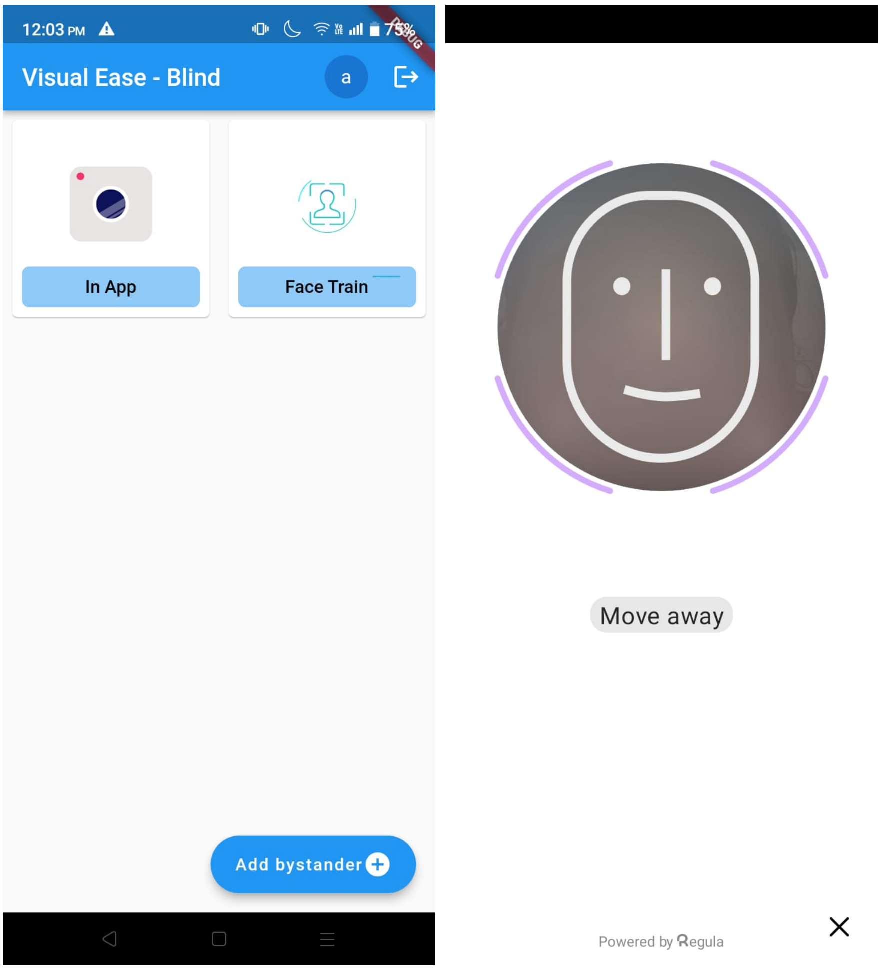

Figure 6.5: *Face Train Interface*

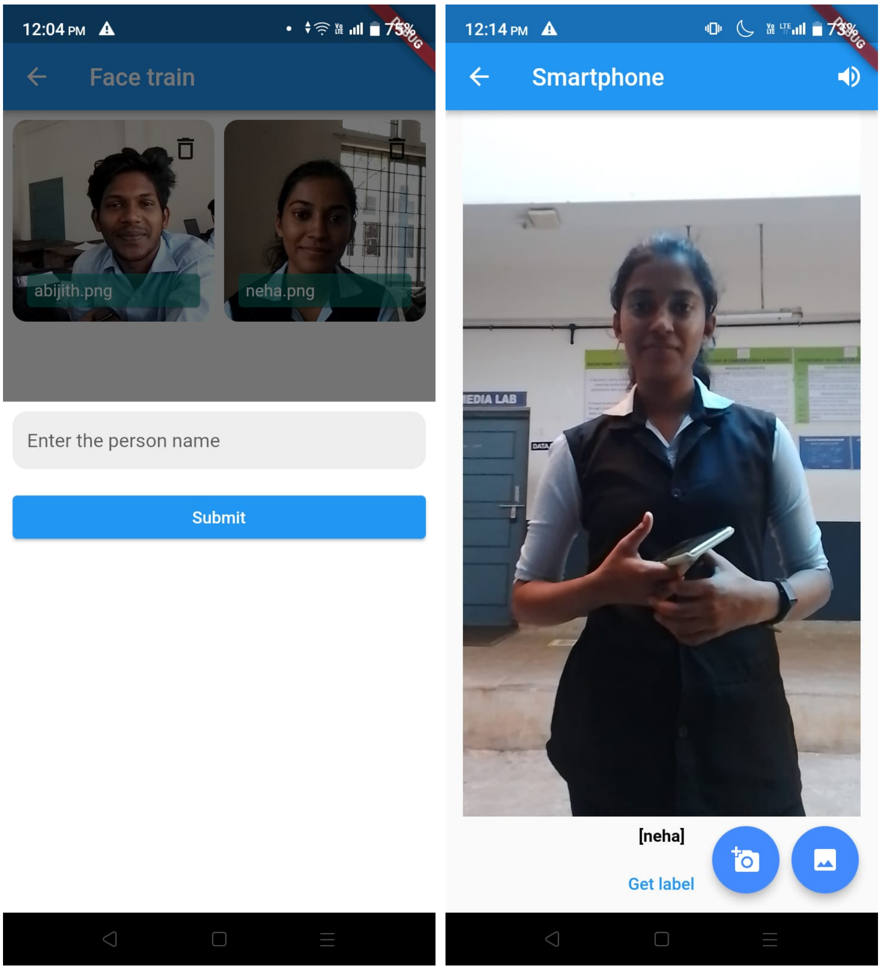

Figure 6.6: *Face Train Result*

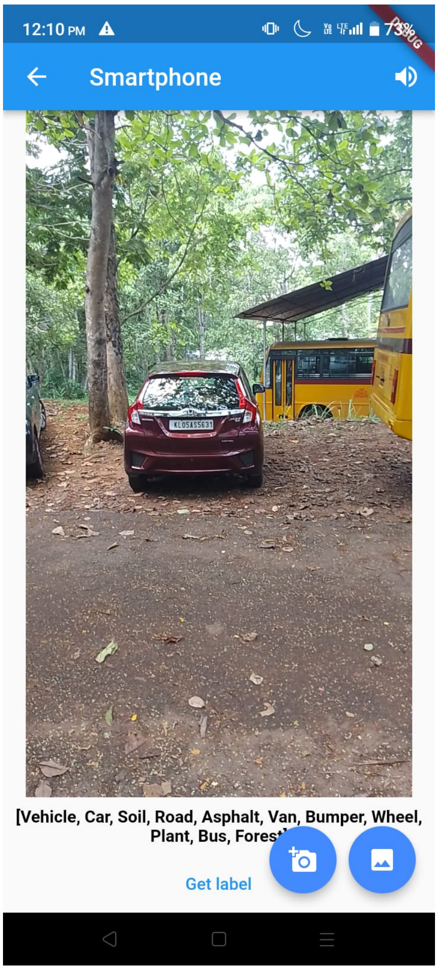

Figure 6.7: *Object Detection*

Chapter 7

Conclusion and Future Scope

The crowdfunding platform is using blockchain technology to improve transparency and reduce the risk of fraud. Traditional crowdfunding methods have often been criticized for their lack of transparency and susceptibility to fraud, and this project aims to address these issues by providing a more trustworthy platform for people to contribute their money to good causes. By using blockchain, we hope to build confidence and trust among users, allowing them to feel more secure in their donations.

In crowdfunding, blockchain allows decentralization; this means that no single platform or group of platforms manages smart contracts, making it transparent to the blockchain for everyone . A peer-to-peer network is that adheres to co-protocols and can use new blocks between nodes, so no one can modify a block without approval from more than 50 percent of the nodes in the blockchain. it does. trustworthy. Anyone can use the blockchain to create projects on the site, and anyone with an internet connection can donate to the project. Participants needn't worry about promises that look nothing like the traditional financial aid.

The smart contract will process all transactions, so all funds will be stored in smart contract instead of being sent to third parties. Blockchain gives more freedom to project managers and partners so that partners can be part of the project. Overall, the survey shows the growing interest and potential of blockchain technology in crowdfunding.

Appendix

Face Recognition

```
import 'dart:convert';
import 'dart:async';
import 'dart:io';
import 'package:flutter/services.dart';
import 'package:flutter_face_api/face_api.dart' as Regula;
import 'package:path_provider/path_provider.dart';
import 'package:stacked_services/stacked_services.dart';

import '../app/app.locator.dart';
import '../app/app.logger.dart';

class RegulaService {
  final log = getLogger('RegulaService');
  final _snackbarService = locator<SnackbarService>();

  // late Regula.FaceSDK _faceSDK;

  Future<void> initPlatformState() async {
    log.i("Ragula init");
```

```
  Regula.FaceSDK.init().then((json) {
    var response = jsonDecode(json);
    log.i(response);
    if (!response["success"]) {
      log.i("Init failed: ");
      log.i(json);
    }
  });

  // const EventChannel('flutter_face_api/event/video_encoder_completion')
  //     .receiveBroadcastStream()
  //     .listen((event) {
  //   var response = jsonDecode(event);
  //   String transactionId = response["transactionId"];
  //   bool success = response["success"];
  //   log.i("video_encoder_completion:");
  //   log.i("    success: $success");
  //   log.i("    transactionId: $transactionId");
  // });
}

Future<Uint8List?> imageBitmap() async {
  final result = await Regula.FaceSDK.presentFaceCaptureActivity();
  if (result != null) {
    log.i("Result got");
    Regula.FaceCaptureResponse? response =
        Regula.FaceCaptureResponse.fromJson(json.decode(result));
    if (response != null && response.image != null) {
      log.i("Image response");
```

```
      Uint8List imageFile =
          base64Decode(response.image!.bitmap!.replaceAll("\n", ""));
      return imageFile;
    }
  }
  return null;
}

Future<String?> setFaceAndGetImagePath(String name) async {
  Uint8List? imageFile = await imageBitmap();
  if (imageFile != null) {
    log.i("Getting path..");
    // getting a directory path for saving
    final directory = await getApplicationDocumentsDirectory();
    File file = File(('${directory.path}/$name.png'));
    file.writeAsBytesSync(imageFile); // This is a sync operation on a real
    // return base64Encode(imageFile);
    return file.path;
  }
  return null;
}

Regula.MatchFacesImage getMatchFaceImage(String path) {
  final file = File(path).readAsBytesSync();
  final image = Regula.MatchFacesImage();
  image.bitmap = base64Encode(file);
  image.imageType = Regula.ImageType.LIVE;
  image.identifier = path.split('/').last.split('.').first;
  log.i("Image set:  $path type: ${image.imageType}");
```

```
  return image;
}

Future<List<Regula.MatchFacesImage>> getImagesStored() async {
  final Directory directory = await getApplicationDocumentsDirectory();
  List<String> _images = directory
      .listSync()
      .map((item) => item.path)
      .where((item) => item.endsWith(".png"))
      .toList(growable: false);
  log.i(_images);
  List<Regula.MatchFacesImage> rImages = <Regula.MatchFacesImage>[];
  _images.forEach((img) {
    rImages.add(getMatchFaceImage(img));
  });

  return rImages;
}

// final _image2 = Regula.MatchFacesImage();
Future<String?> checkMatch(String path) async {
  Regula.MatchFacesImage _image1 = getMatchFaceImage(path);
  List<Regula.MatchFacesImage> rImages = await getImagesStored();
  for (final i in rImages) {
    double? value = await _checkMatch(_image1, i);
    if (value != null) {
      log.i(value);
      return i.identifier!;
    }
```

```
  }
  return null;
}


Future<double?> _checkMatch(
    Regula.MatchFacesImage _image1, Regula.MatchFacesImage _image2) async {
  if (_image1.bitmap != null && _image1.bitmap != "") {
    log.i("Image 1 ready");
  } else {
    _snackbarService.showSnackbar(
      message: "Image edit",
    );
    return null;
  }
  if (_image2.bitmap != null && _image2.bitmap != "") {
    log.i("Image 2 ready");
  } else {
    _snackbarService.showSnackbar(message: "Image edit");
    return null;
  }

  log.i("Checking face");
  // rImages.add(_image1);

  var request = Regula.MatchFacesRequest();
  request.images = [_image1, _image2];
  // log.i("request images: ${request.images.length}");
  String value = await Regula.FaceSDK.matchFaces(jsonEncode(request));
  if (value.contains("errorCode")) {
```

```
      _snackbarService.showSnackbar(
          message: "Error api call/Not detected face");
    }
    // log.i("Value> $value");
    Regula.MatchFacesResponse? response =
        Regula.MatchFacesResponse.fromJson(json.decode(value));
    String str = await Regula.FaceSDK.matchFacesSimilarityThresholdSplit(
        jsonEncode(response!.results), 0.75);

    Regula.MatchFacesSimilarityThresholdSplit? split =
        Regula.MatchFacesSimilarityThresholdSplit.fromJson(json.decode(str));

    if (split!.matchedFaces.isNotEmpty) {
      log.i("MatchedFaces: ${split.matchedFaces}");
      log.i(
          "Matched face index: ${split.matchedFaces[0]!.first!.face!.faceIndex}");
      return (split.matchedFaces[0]!.similarity! * 100);
    }
    log.i('Not identified');

    return null;
  }
}
```

User Navigation and Periodic Updation

```
import 'dart:async';
import 'package:geocoding/geocoding.dart';
import 'package:geolocator/geolocator.dart';
```

```
import 'package:permission_handler/permission_handler.dart';

import '../app/app.locator.dart';
import '../app/app.logger.dart';
import 'firestore_service.dart';

class LocationService {
  final log = getLogger('LocationService');
  final _firestoreService = locator<FirestoreService>();

  late Position _currentPosition;
  late String _currentPlace;
  late Timer _timer;

  Future<void> getLocation() async {
    log.i("Getting location..");
    bool serviceEnabled = await Geolocator.isLocationServiceEnabled();
    if (!serviceEnabled) {
      // Location services are not enabled on the device.
      log.e("Not enabled");
      return;
    } else {
      log.i("Service enabled");
    }

    LocationPermission permission = await Geolocator.checkPermission();
    if (permission == LocationPermission.denied) {
      log.e("Permission denied");
      permission = await Geolocator.requestPermission();
```

```
      if (permission != PermissionStatus.granted) {
        // The user didn't grant permission.
        log.e("No permission");
        return;
      }
    } else {
      // if (permission == PermissionStatus.granted)
      log.i("Permission $permission");
    }

    if (permission == LocationPermission.whileInUse ||
        permission == LocationPermission.always) {
      // Get the current location
      _currentPosition = await Geolocator.getCurrentPosition();
      // Get the current place
      List<Placemark> placemarks = await placemarkFromCoordinates(
          _currentPosition.latitude, _currentPosition.longitude);
      Placemark place = placemarks[0];
      _currentPlace = "${place.name}, ${place.locality}";
      // TODO: store the location in a database
      log.i(
          "Lat: ${_currentPosition.latitude}, Long: ${_currentPosition.longitude}  Pl
      _firestoreService.updateLocation(
          _currentPosition.latitude, _currentPosition.longitude, _currentPlace);
    }
  }

  Future<void> initialise() async {
    log.i("Init");
```

```
    await getLocation();
    // Start the timer to update the location every 2 minutes
    _timer = Timer.periodic(const Duration(minutes: 5), (Timer timer) async {
      await getLocation();
    });
  }

  void dispose() {
    _timer.cancel();
  }
}
```

Chapter 8

Bibliography

1. Dalal N. and Triggs B., Histograms of oriented gradients for Human Detection (2015). IEEE Comput. Soc.Conf. Comput. Vision Pattern Recogn.,San Diego, CA, USA, June 20-25, p. 886-893. Ravindra Karmarkar (2021)- Object Detection System for the Blind with Voice Guidance, International Journal of Engineering Applied Sciences and Technology,6(2): 67-70

2. Russakovsky, O., Deng, J., Su, H., et al. (2015) ImageNet Large-Scale Visual Recognition Challenge. International Journal of Computer Vision, 115, 211-252.

3. Dai Jet al., (2016). R-FCN: Object Detection via Region-based Fully Convolutional Networks. Conf. NeuralInform. Process. Syst.,Barcelona,Spain,Dec. 4-6, p. 379-387.

4. Blind Assistance System using Image Processing P. Rama Devi 1, K. Sahaja 2, S. Santrupth 3, M. P. Tony Harsha 4, K. Balasubramanyam Reddy 1Assistant Professor, 2, 3, 4, 5Students, Department of Computer Science and Engineering, Gitam Institute of Technology

5. Choi D., and Kim M. (2018). Trends on Object DetectionTechniques Based on Deep Learning, Electronics and Telecommunications Trends, 33(4): 23-32

8.1 WEBSITES REFERRED

1. www.google.com
2. www.wikipedia.com
3. www.w3schools.com
4. www.youtube.com

Chapter 9

List Of Publications

1. Published in IRJMETS(International Research Journal of Modernization in Engineering Technology and Science-e-ISSN: 2582-5208) with papaer ID - IRJMETS/Certificate/Volume 05/Issue 06/50600099797