AI EYE GUIDE

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Date: [date of final presentation]

Final Approval

This is to certify that we have read the report submitted by ***Usama Ahsan (25279)***, ***Muhammad Hassan (22956), Suleman Amjad (24913)*** for the partial fulfillment of the requirements for the degree of the Bachelors of Science in Computer sceince (BSCS). It is our judgment that this report is of sufficient standard to warrant its acceptance by Riphah International University, Islamabad for the degree of Bachelors of Science in Computer Science (BSCS).

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Declaration

We hereby declare that this document **"AI EYE GUIDE"** neither as a whole nor as a part has been copied out from any source. It is further declared that we have done this project with the accompanied report entirely based on our personal efforts, under the proficient guidance of our teachers especially our supervisor **Lecturer. Ihtesham ullah**. If anypart of the system is proved to be copied out from any source or found to be reproduction of any project from anywhere else, we shall stand by the consequences.

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Usman Ahsan 25279

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Muhammad Hassan 22956

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Dedication

To our parents whom have always been there to ensure that our financial and morale needs have never gone unfulfilled and taught us that even the biggest job can be completed whenit is done in bits. In this project, the name of each individual who made efforts for the completion of this project is dedicated to, especially the name of our supervisor Sir Ihtisham Ullah. This project is particularly dedicated to the teachers who helped us and guided us on how to complete this project work. This Project is also dedicated to our University, Riphah International University.

Acknowledgement

First we are obliged to Allah Almighty the Merciful, the Beneficent and the source of all Knowledge, for granting us the courage and knowledge to complete this Project.

Students will acknowledge here anyone who has helped in the project. It can include Supervisor(s), Teachers, Class mates, Friends and Family

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Abstract

As the world is advancing with the use of technology in daily life, life of people has become very easy as compared to how it was like 4 5 decades before. Almost everyone is taking benefit from the modern technology but a person who is disable and helpless to use it by himself. One of those people are visually impaired person, who are unable to use mobile or modern gadgets easily are unable to make their lives easier by the use of modern technology.

We have developed an app AI EYE GUIDE will make the life of a visually impaired person easier. A visually impaired person has major issues like in guessing an object, recognizing currency and reading some text. Our app will give ease to visually impaired person in their daily life.

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Abstract

As the world is advancing with the use of technology in daily life, life of people has become very easy as compared to how it was like 4 5 decades before. Almost everyone is taking benefit from the modern technology but a person who is disable and helpless to use it by himself. One of those people are visually impaired person, who are unable to use mobile or modern gadgets easily are unable to make their lives easier by the use of modern technology.

We have developed an app AI EYE GUIDE will make the life of a visually impaired person easier. A visually impaired person has major issues like in guessing an object, recognizing currency and reading some text. Our app will give ease to visually impaired person in their daily life.

Chapter1:
Introduction

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AI Eye Guide uses modern technology to help visually impaired person in their daily life by helping them in reducing obstacles in their way. The system uses Yolo algorithm, whichis used to detect objects. When the system will detect objects, it will tell the user in voice note. This also detects the currency and will tell the user about the amount of currency. This will make visually impaired person to detect easily. This app will use machine learning and deep learning techniques to help user by detectingobjects in real time. This app will reduce the risks of people from getting in to trouble in their surroundings.

1.1 Goals and Objectives

1.1.1 Object Detection for Support:

One way is through the use of object detection technology that enhances assisting people suffering with visual deficiencies in their homes as well as in public places. In addition, itmay help in locating objects. Among its features is its suitability to outdoor use where it facilitates visually challenged persons' recognition of landmarks, signals and essential things as they go about their affairs which makes them feel mobile and independent.

1.1.2 Conversion of text into voice:

Translation of print and electronic text into speech allows more people, including the visually impaired, to have open access to information on all sorts of subjects. The technology enables them to retrieve news, books and educational materials swiftly withoutrestriction and thus creates a more liberal learning as well as informed setting.

1.1.3 Currency recognition in financial matters:

The currency recognition technology opens new doors for blind individuals to enjoy financial independence. This technology allows the visually impaired to manage their money themselves by being able to identify the different denominations. Furthermore, support through financial transactions enables them to have a choice for themselves on their finance issues hence enhancing their economic liberation.

1.2 Scope of the Project

1.2.1 Object Detection Module:

Real-Time Navigation: It has a high-end object detection framework that is based upon deep learning where it is possible to identify common objects in real time. **Audible Descriptions:** This allows users to hear audio descriptions of their surroundings, which assists in independent navigation, reducing obstructions within unknown spaces.

1.2.2 Currency Recognition Module:

Financial Independence: This app is fitted with an instant detection system, which correctly detects Pakistani money.

Voice Notes for Amount: Through the app, the app informs users about value in recognized currencies notes.

1.2.3 Text-to-Voice Module:

Access to Printed Information: Printed text from newspapers, books and other reading material is converted into audible speech using a text-to-voice module.

1.2.4 Testing and User Feedback:

Reliability Assurance: The app goes through rigorous testing to ensure its dependabilityin different circumstances and settings.

Continuous Improvement: The app collects active user feedback, which drives thecontinuous improvement to ensure that the app remains responsive to user needs.

Chapter2:

Literature Review

Chapter 2: Literature Review

The first phase is the literature and market survey which is very important in guiding the research process. It provides valuable information on prevailing technologies that target people with visual disabilities. In this survey, an exploration of literature as well as empirical research is conducted and a landscape of the market for assistive technologies. This stage involves analysis of strengths, weaknesses, opportunity, and threatpresented in current solutions in order to determine gaps, trends, and user needs. Such understanding will help in designing a new intelligent mobile application which will not only meet the needs of blind but also satisfy their desires. Therefore, the literature and market survey provides information on the technical and market aspects within which thesuggested solution will take place.

2.1 Introduction

Significantly, over the last few years, a dramatic shift has occurred in addressing problemsof the visually impaired people since time immemorial. This chapter will therefore lay down the foundation upon which a new AI mobile application that caters for the needs and challenges of visually impaired individuals. Firstly, it will look at certain technologies like an object detection system, currency recognition program and text to voice translators. These technologies are useful for the visually impaired people who enjoy their independency, getting the information, orhandling money. This entails studying literature and the market about existing solutions soas to evaluate their strengths and weaknesses. This will help ascertain whether one can develop new innovations or they can be improved. The issues discussed in the previous paragraph will guide the development of a usable and flexible AI product that will significantly change the lifestyle of blind people.

2.2 Background and Problem Elaboration

Nonetheless, programs aimed at enhancing the self-reliance level and quality of life amongvisually impaired people are the most notable recipients. These programs intend to providethem with a chance at improved living and independence. This involves giving them independent lifestyle by giving them resources and techniques for living on their own despite their blindness. Such issues are relating to availability of assistive

technologies, technology accessibility, provision of transportation services, and many more.

What these blind people think or need should be understood as a basic requirement of anyundertaking that they should be satisfied on a one-on-one basis. This means an individual- focused perspective that considers the various encounters and needs of visually challengedpopulation. It ensures any of supported solutions such as the some solutions are developed with participation of people involved to have customized support for them based on their own wishes and to feel like a member of the team, where their rights are respected.

2.3 Detailed Literature Review

Personalized assistive technologies for blind people help in making them more independentand accessible. The next section gives a brief description of some notable technology likeobject detection system, currency recognizing software, and voice to text convertors.

In this section, there are discussions of recent technological breakthroughs in the field of help for visual impairments. Deep learning, real-time identification of objects and the development of navigation technology adapted for blind people.

2.3.1 Deep Learning Applications

Deep learning applications have brought a new revolution in the use of accurate and moreefficient assistive technologies. The studies show that deep learning models can be taughtover time and can help objects see and recognize for actual circumstances.

2.3.2 Real-Time Object Identification

Object identification in real time is critical for supplying current data to visually challenged Persons. Technology has aimed at reducing processing delays and allowing the user to getimmediate information of his environment for him to be able to navigate quickly and intelligibly.

2.3.2 Navigation Technologies

The development of navigation technologies has sought to address issues related to movement. The integration of GPS, indoor mapping, and voice guided navigation technology would empower vision impaired individuals with precise and situational awareness based navigation support.

2.4 Literature Review Summary Table

The columns in the table depend upon your problem and should be specific to your project.

Table 1: History of Computing Devices
The summary of various computing devices invented in the past from 2000 onwards is presented here.

Apps	NoteTaking	Voice-Recorder	Speech-to-Text	AudioBook-Listening	Camera Translation	Accessible Documentssharing
AccessNote	✓	✓	✕	✕	✕	✕
Dragon Dictation	✕	✕	✓	✕	✕	✕
EverNote	✓	✓	✓	✕	✕	✕
Kindle	✓	✓	✕	✓	✕	✕
Google Translate	✕	✕	✓	✓	✕	✕
Money Detector	✓	✕	✓	✕	✓	✕
Object Detection	✕	✕	✕	✕	✓	✕

2.5 Research Gap

This section offers a detailed examination of supportive technologies for the blind. This chapter begins with major assistive technologies such as object detectors, currency recognition programs, and text-to-voice converter.Real time object detection is possible

in this part of object detection system that is based on deep learning. Accurate object recognition is critical to ensure smooth navigation. Literature reveals that visually impaired people are supposed to be economically independent and hence the need for currency recognition software. The other is that it alsobuilds the users confidence that is can detect money. The most important is the link between readable text and hearing understanding, which isrealized by text-to-voice converters. The universities of these technologies must be universal, multilingual and pronounceable correctly.Finally, the literature review identifies the modern technological innovations to help the visually impaired people. Deep learning applications have revolutionized object detectionand recognition and made it possible to continue learning. Real time object identification and navigation technologies have advanced, making it easy to assist the visually impaired.

2.6 Problem Statement

The problem statement for the visually impaired-friendly mobile application can be collectively summarized as follows:

"Developing a mobile application to aid visually impaired individuals by providing real-time object detection, currency recognition, document reading, and user feedback functionalities. The application aims to enhance the independence and accessibility of visually impaired users in navigating their surroundings, managing financial transactions, accessing printed materials, and providing feedback for continual improvement. The project involves addressing technical challenges such as implementing accurate object and currency detection algorithms, integrating text-to-voice functionality, ensuring user-friendly interface design, and adhering to accessibility standards. Additionally, the application requires rigorous testing with visually impaired users to ensure usability and effectiveness."

Chapter 3:
Requirements and Design

Chapter 3: Requirements and Design

Requirement and deign is a crucial stage in developing an AI mobile app for visually impaired people. This is a stage of transition from theory to practice, which involves transformation of the literature findings into concrete requirements. A good developmentalteam must be directed by its “compass”. Requirement Engineering that will ensure the alignment of the aspirations highlighted in the literature review and the functionalities andfeatures needed by the end-users.

3.1 Requirements

3.1.1 Functional Requirements

3.1.1.1 Object Detection System:

Requirement: Develop a real-time system for object detection capable of pinpointing common objects both inside and outside.

Rationale: This attribute allows the users to learn about their surroundings andtherefore enables them to move independently.

3.1.1.2 Currency Recognition Module:

Requirement: Create a currency recognition module that can identify and announce all Pakistani currency notes (and denominations) in real-time.

Rationale: This gives users independence in financial transactions and ensurestheir security.

3.1.1.3 Text-to-Voice Conversion:

Requirement: Develop a multilingual text-to-voice module that faithfully produces oral words from newspaper articles, books, and other printed materials.

Rationale: This makes it possible for the users to have direct access to printedinformation.

3.1.1.4 User-Friendly Mobile Applications:

Requirement: Create intuitive and easy-to-use mobile applications.

Rationale: The interface is easy to navigate, and the visually impaired users canuse the application freely hence increasing the user experience.

3.1.1.5 Audible Descriptions for Objects:

Requirement: Include audible descriptions for identified objects to enable users tonavigate their environment.

Rationale: Providing clear and descriptive feedback makes the user understand their environment better, which increases the overall safety of navigation.

3.1.1.6 Voice Notes for Currency Amounts:

Requirement: Integrate voice notes which inform of recognized currency units'denomination and value in the course of the financial transactions.

Rationale: This helps ensure that users can do this with ease of mind and precision.

3.1.2 Non-Functional Requirements

3.2.2.1 Usability:

Requirement: In such a case, the application should be designed with user-friendlyinterface and should be easy to navigate for the people with visual impairments.

Rationale: Usability is the most important factor to the effectiveness of the application, allowing independent and competent use of the application by users with varied

3.2.2.2 Reliability:

Requirement: Object detection, currency recognition as well as text-to-voice

modules must be accurate and work reliably in diverse environmental conditions.

Rationale: Reliability is a key aspect that enables users to trust the app's information. As a result, an application can be used for critical tasks.

3.2.2.3 Performance:

Requirement: Performance of the application should be optimal, providing real- time feedback and wayfinding guidance, with virtually no latency.

Rationale: User experience is highly dependent on performance, especially where prompt information is imperative for safe navigation.

3.2.2.4 Scalability:

Requirement: The application should be scalable, so that it can handle increasingnumber of users and new features without affecting performance.
Rationale: The application can be scaled to meet the needs of an increasing numberof users and as technological progression continues.

3.2.1.5 Accessibility:

Requirement: The application should be accessible so that it is compatible withscreen readers, braille displays or other assistive devices.

Rationale: Accessibility is fundamental and it ensures the application's usability by persons with different visual impairment levels and different assistive devices to them.

3.2 Proposed Methodology

Our planned methodology goes beyond the conventional structure. It is aimed at ensuring the needs of visually impaired people are adequately met. The process starts with the in-depth research and analysis of users' requirements in order to understand the needs of the clients. Then followed by the planning of the application during the stage of design and architecture. The second stage is implementing modules for recognition of currency samples, objects, and text-to-voice conversion calling on machine learning and deep learning algorithms. Integration and testing model enables

the mode of operation and ease of access of the application, and the users' feedback will intensify gradual development. Deployment and assessment are what constitutes the final stages of a product development process; continuous tracking of whether product is efficient and user-friendly can be considered the most crucial part of it. This approach hopes to deliver a novel solution which would, by itself, allow persons with visual impairment not only to navigate their environment independently but also access information with ease.

3.3 System Architecture

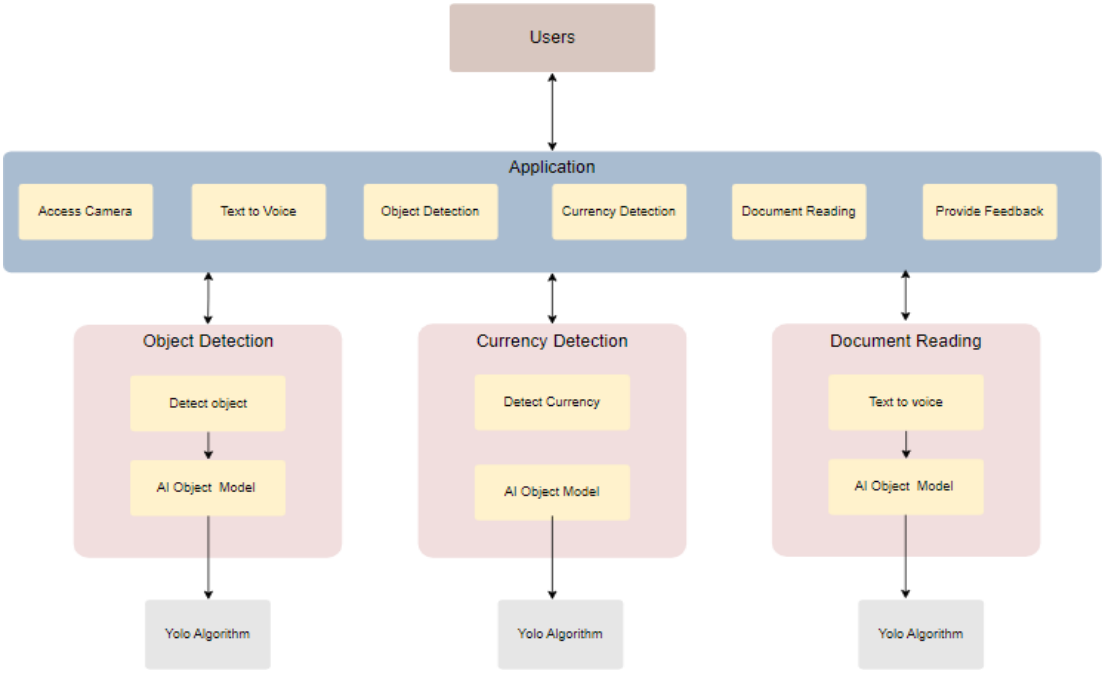

Figure 1

The structural design of the AI Eye Guide project is based on the modularity and scalability principle for it to properly operate as a kind of a friend for visually disabled users. At its core, the architecture consists of four main components: dry goods identification, stalls selling, text-to-voice conversion, and helps human task.

The Object Detection Module is an algorithm, which is able to recognize and classify objects in real-time through the device camera input, through the use of models like YOLO(You Only Look Once). Also, the currency recognition module utilizes creative image processing approaches and mathematical algorithms for sophisticated recognition of currency denominations, and to provide accurate announcement.

The system implements the OCR, such as the Tesseract OCR, technology that transforms the text from the pictures into the spoken language as the main function of

the text-to-voice conversion module. Therefore, users have the notion of lay hands on printed materials through the aid of camera on their device.

On this part of the system, the interface component is designed to be simple but still compatible with the application for seamless interaction with users. These components involve as buttons navigation and feedback form which improve the user experience.

Moreover, the architecture is developed to be versatile so that carrying out updates is made easy and new features can be added if there is a need. It favors accessibility and ease of function, meaning that visually impaired persons will be able to move around easily and retrieve the necessary information without much trouble.

3.4 Use Cases

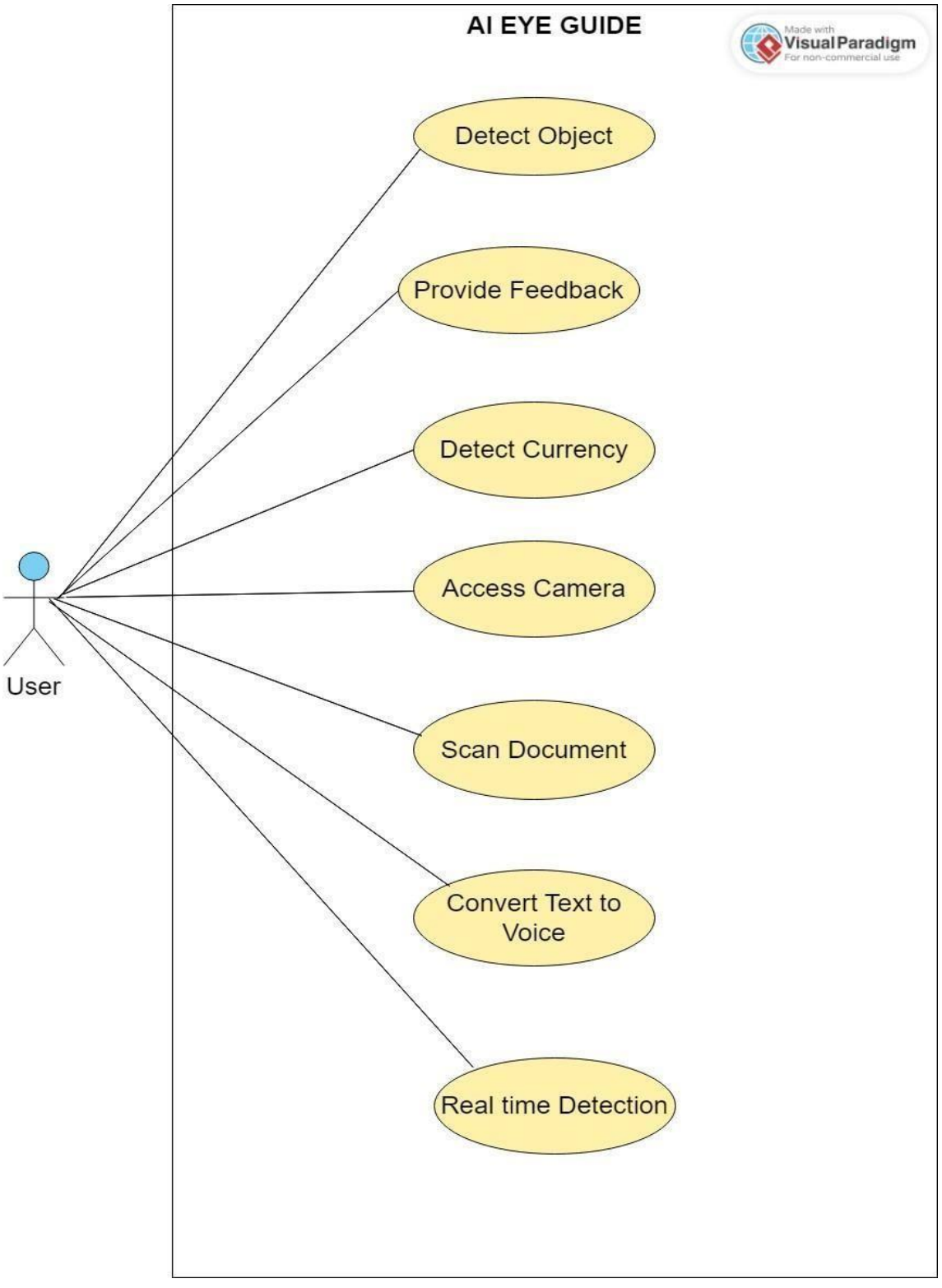

Figure 2

3.4.1 Detailed Use case Description:

3.4.1.1 UC.01 Detect object

Table 2

Section	**Content / Explanation**
Designation	UC_01
Name	Detect Object
Authors	Muhammad Hassan
Priority	High
Criticality	High
Source	Usama ahsan
Person responsible	Suleman amjad
Description	The system detects objects through camera input and displays theidentified objects in real-time.
Actors	User
Pre-conditions	1. Functional camera is connected and operational. 2. System is operational. 3. User have stable internet connection.
Post-conditions	Objects in the camera feed are successfully detected and displayed.
Result	The system successfully identifies and displays objects from thecamera feed.
Main scenario	1. User initiates the object detection process. 2. System activates the camera feed. 3. System starts the object detection algorithm. 4. Detected objects are displayed in the live camera feed. 5. User can interact with the displayed objects for further actions. 6. User requests to end the object detection process.

	7. System stops the camera feed and concludes the objectdetection process.

Alternativ escenarios	4a. No objects detected 4a.1 System displays a message indicating no objects were detected.4a.2 User is informed that no action is required. 4b. Camera not available 4b.1 System displays an error message indicating the camera is notavailable. 4b.2 User is prompted to ensure the camera is properly connected andoperational. 4c. Technical difficulties during detection 4c.1 System displays an error message indicating technical difficultiesin object detection. 4c.2 User is advised to retry or contact technical support.

3.4.1.2 UC.02 Detect Currency:

Table 3

Section	**Content / Explanation**
Designation	UC_02
Name	Detect Currency
Authors	Muhammad Hassan
Priority	High

Criticality	High
Source	Usama Ahsan
Person responsible	Suleman amjad
Description	The system detects and identifies currency from images or live camera feed and provides information about the recognized currency.
Actors	User
Pre-conditions	1. Functional camera is connected and operational. 2. System is operational. 3. User have stable internet connection.
Post-conditions	Currency in the camera feed is successfully detected and information about the recognized currency is provided.

Result	The system successfully identifies and provides information aboutthe detected currency in the camera feed.
Main scenario	1. User initiates the currency detection process. 2. System activates the camera feed or accepts an image input. 3. System starts the currency detection algorithm. 4. Detected currency is displayed along with relevantinformation (e.g., currency type, denomination). 5. User can request additional details about the recognizedcurrency. 6. User requests to end the currency detection process. 7. System stops the camera feed or concludes the image analysisprocess.

Alternati ve scenario s	4a. No currency detected 4a. 1 System displays a message indicating no currency was detected.4a.2 User is informed that no action is required or prompted to reposition the camera. 4b. Camera not available 4b.1 System displays an error message indicating the camera is notavailable. 4b.2 User is prompted to ensure the camera is properly connectedand operational.

3.4.1.3 UC.03 Scan Document:

Table 4

Section	**Content / Explanation**
Designation	UC_03
Name	Scan Document
Authors	Muhammad Hassan
Priority	High
Criticality	High

Source	Usama ahsan
Person responsible	Suleman Amjad
Description	The system allows users to upload a document for scanning, extracting information, and making it digitally accessible.
Actors	User
Pre-conditions	1. System is operational. 2. User have stable internet connection.
Post-conditions	Document is successfully scanned, and relevant information is extracted for digital storage.

Result	The system processes the uploaded document, making it digitallyaccessible for the user.
Main scenario	1. User initiates the document scanning process. 2. User selects a document file for upload. 3. System validates the document format and size. 4. System activates the scanning algorithm to extract informationfrom the document. 5. Extracted information is displayed or made available for userverification. 6. User confirms the accuracy of the extracted information. 7. User submits the document for final processing. 8. System stores the scanned document digitally in the user's account.
Alternative scenarios	3a. Invalid document format 3a.1 System displays an error message indicating an invaliddocument format. 3a.2 User is prompted to upload a document in a supported format(e.g., PDF). 3b. Document size exceeds limit 3b.1. System displays an error message indicating the document sizeexceeds the limit. 3b.2 User is prompted to upload a smaller document within thespecified size limit.

3.4.1.4 UC.04 Convert text to voice:

Table 5

Section	**Content / Explanation**
Designation	UC_04

Name	Convert text to voice
Authors	Muhammad Hassan
Priority	High
Criticality	High
Source	Usama Ahsan
Person responsible	Suleman amjad
Description	The system allows users to upload a document, scan its text content, and convert it into audible speech for enhanced accessibility.
Actors	User
Pre-conditions	1. System is operational. 2. User have stable internet connection.
Post-conditions	Text from the uploaded document is successfully scanned and converted into audible speech.
Result	The system generates an audio file or initiates real-time speechsynthesis based on the document's text content.
Main scenario	1. User initiates the text-to-voice conversion process. 2. User selects a document file for upload. 3. System validates the document format and size. 4. System activates the text scanning algorithm to extract thedocument's text content.

	5. Extracted text is processed for voice synthesis. 6. User is provided with options to customize voice parameters(e.g., language, speed). 7. User confirms the conversion settings. 8. System initiates the text-to-voice conversion process. 9. The system generates an audio file or initiates real-time speechsynthesis. 10. The user can preview the generated audio.
Alternati ve scenarios	3a. Invalid document format 3a.1 System displays an error message indicating an invaliddocument format. 3a.2 User is prompted to upload a document in a supported format(e.g., PDF). 3b. Document size exceeds limit 3b.1. System displays an error message indicating the document sizeexceeds the limit. 3b.2 User is prompted to upload a smaller document within the specified size limit. 6a. Default voice settings 6a.1 If the user does not customize voice parameters, the system usesdefault settings.

3.4.1.5 UC.05 Provide Feedback:

Table 6

Section	**Content / Explanation**
Designation	UC_05
Name	Provide Feedback
Authors	Muhammad Hassan
Priority	Medium
Criticality	Medium
Source	Usama Ahsan
Person responsible	Suleman amjad
Description	The system allows users to provide feedback, helping improve the overall user experience and address concerns.
Actors	User
Pre-conditions	1. System is operational. 2. User have stable internet connection.
Post-conditions	Feedback is successfully submitted and recorded for analysis and

	improvement purposes.
Result	The system receives user feedback for evaluation and potential enhancement.
Main scenario	User initiates the feedback submission process. User navigates to the feedback section in the user interface. System provides options for selecting the type of feedback (e.g.,suggestion, bug report, general comment). User enters detailed feedback in a provided text box. User has the option to attach relevant files or screenshots (if applicable). User confirms the feedback submission. System records the feedback along with relevant metadata (timestamp,user ID). User receives a confirmation message for successful feedback submission.

Alternati ve scenarios	3a. Anonymous Feedback 3a.2 If the user prefers to provide feedback anonymously, the systemallows for an anonymous submission option. 3a 2 User submits feedback without revealing personal information.4a. Minimal Feedback Details 4a.1. If the user provides minimal details, the system accepts thefeedback but encourages more detailed input. 6a. Feedback Attachment Failure 6a.1. If there is an issue with attaching files or screenshots, the systemdisplays an error message. 6a.2. User is advised to retry attaching files or proceed without attachments.

3.5 Class Diagram (*Optional)*

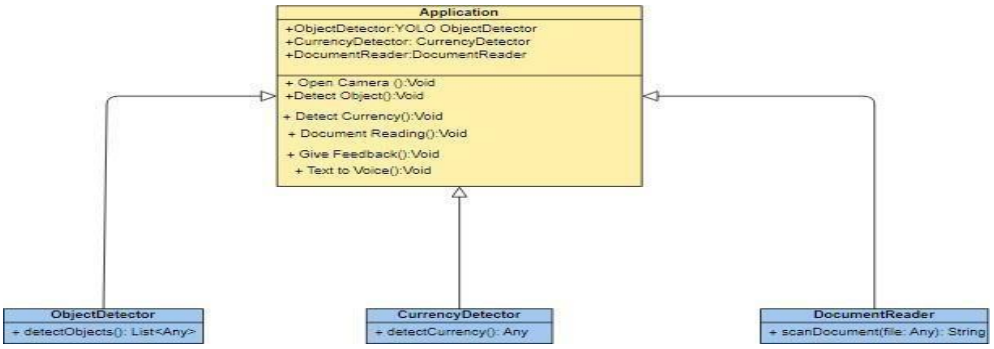

Figure 3

3.6 Sequence diagram *(Optional)*

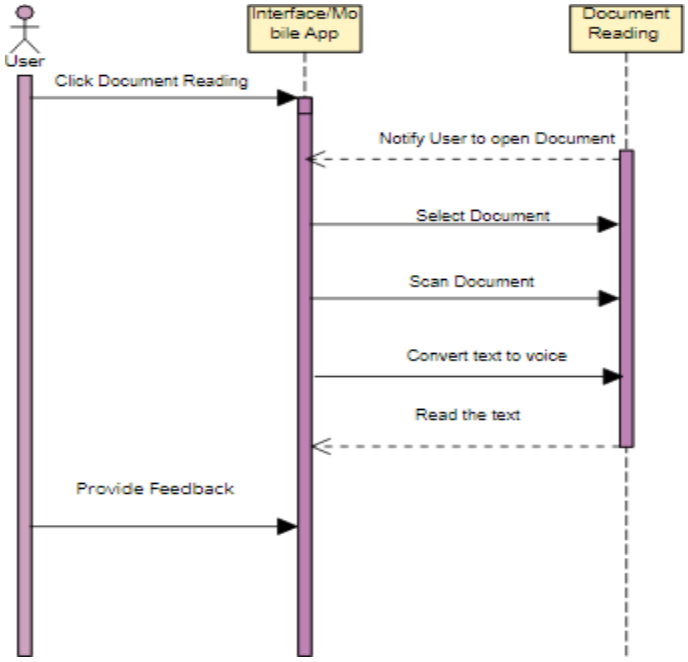

Figure 4

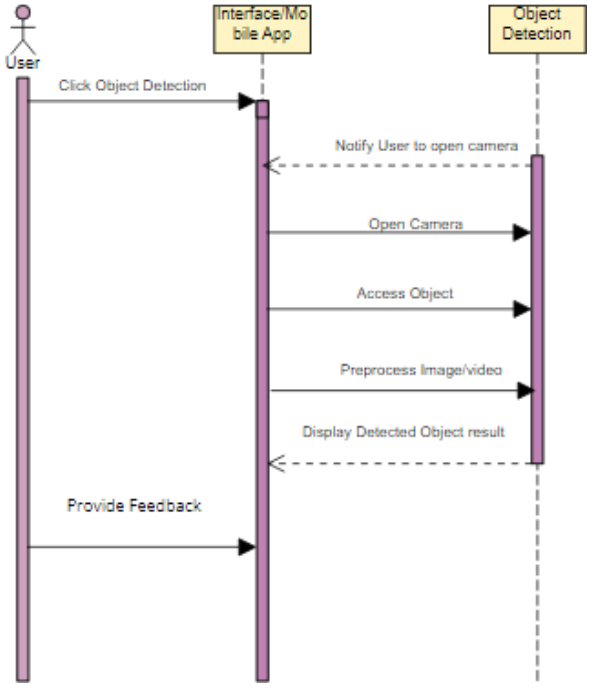

Figure 4

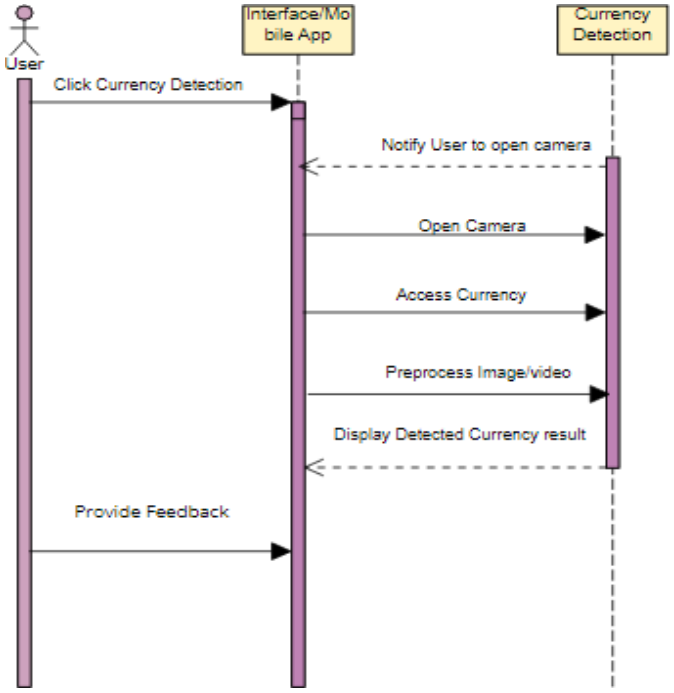

Figure 5

3.7 GUI Graphical User Interfaces (*Optional)*

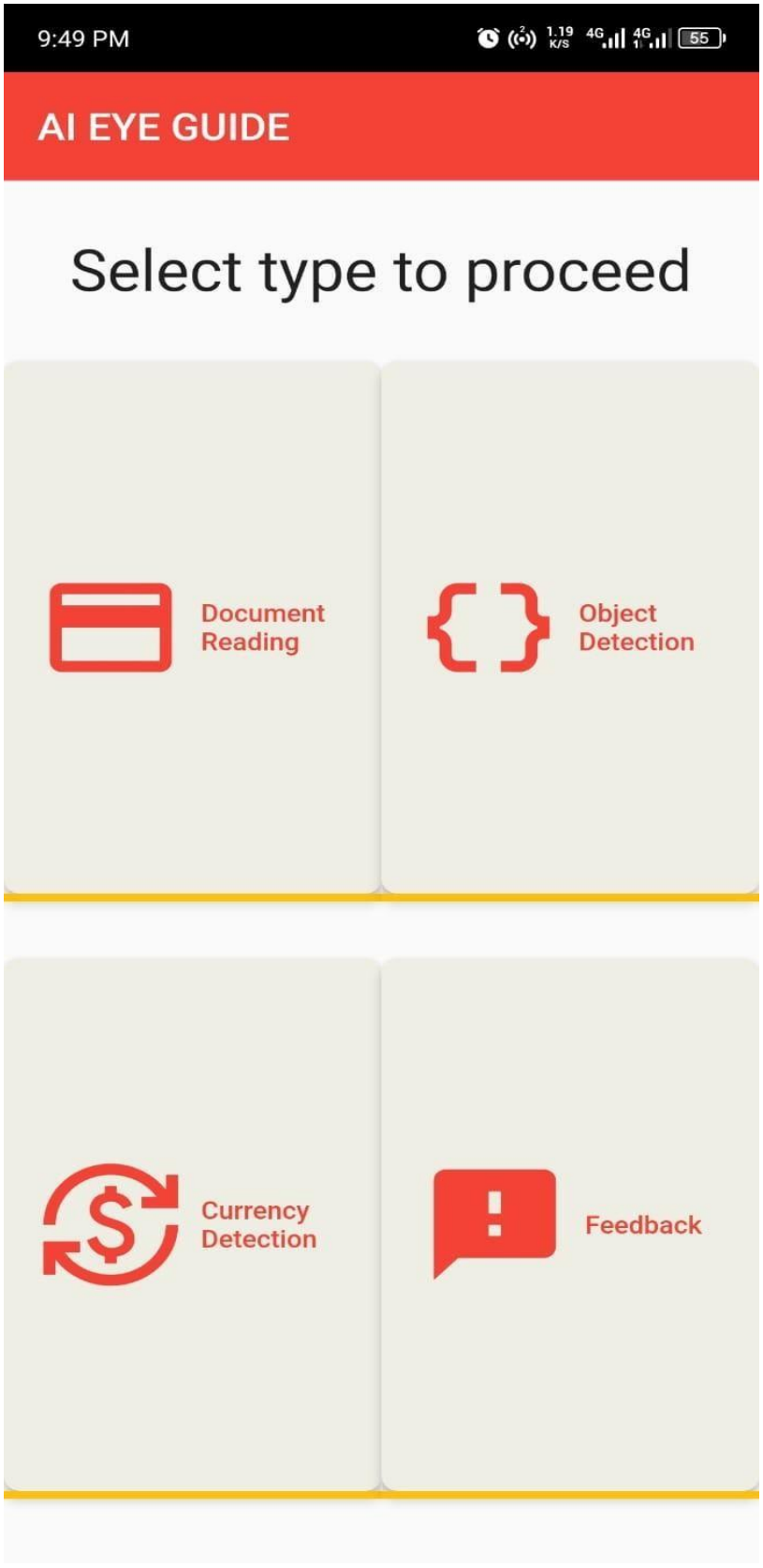

Figure 6

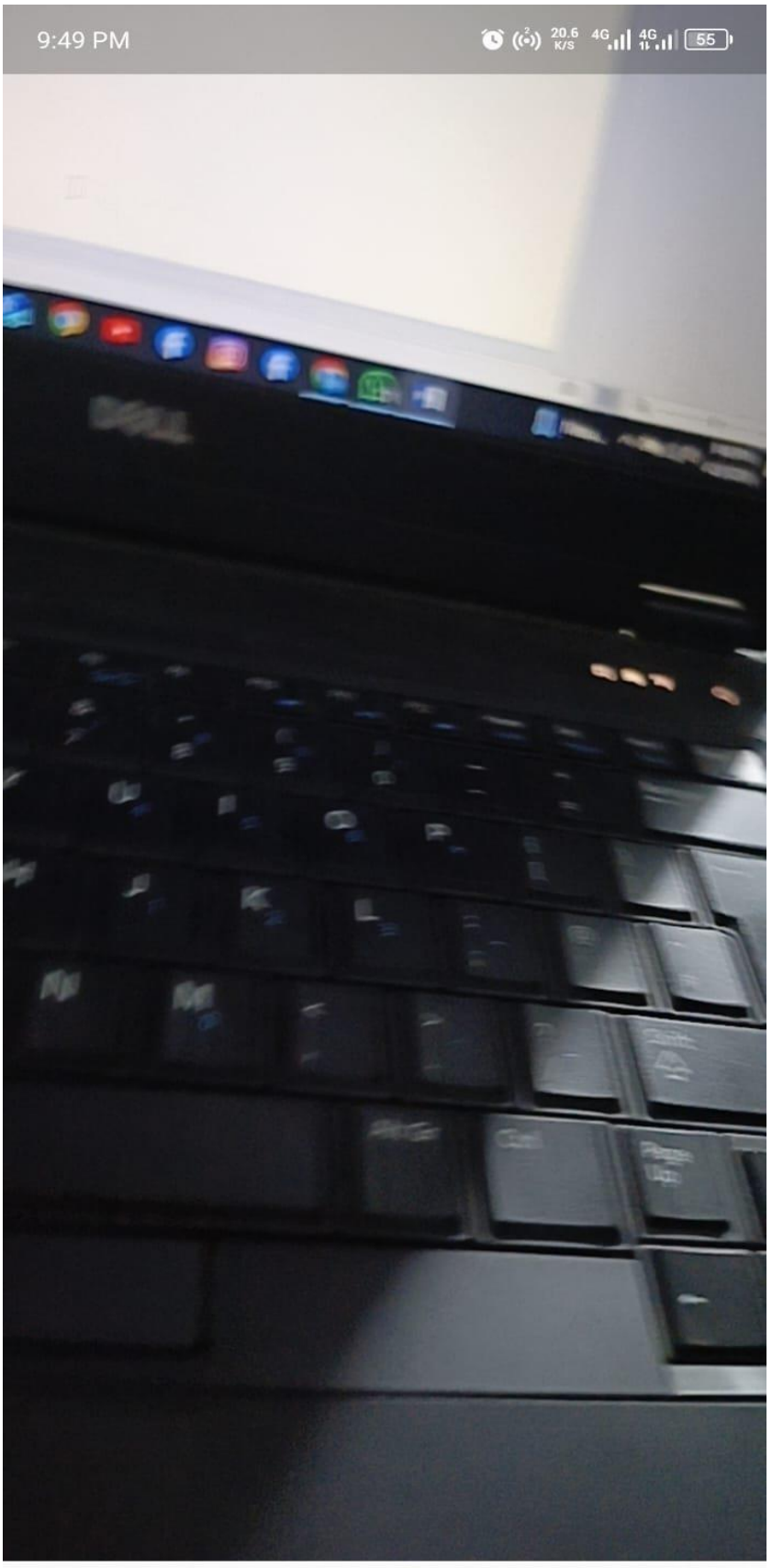

Figure 7

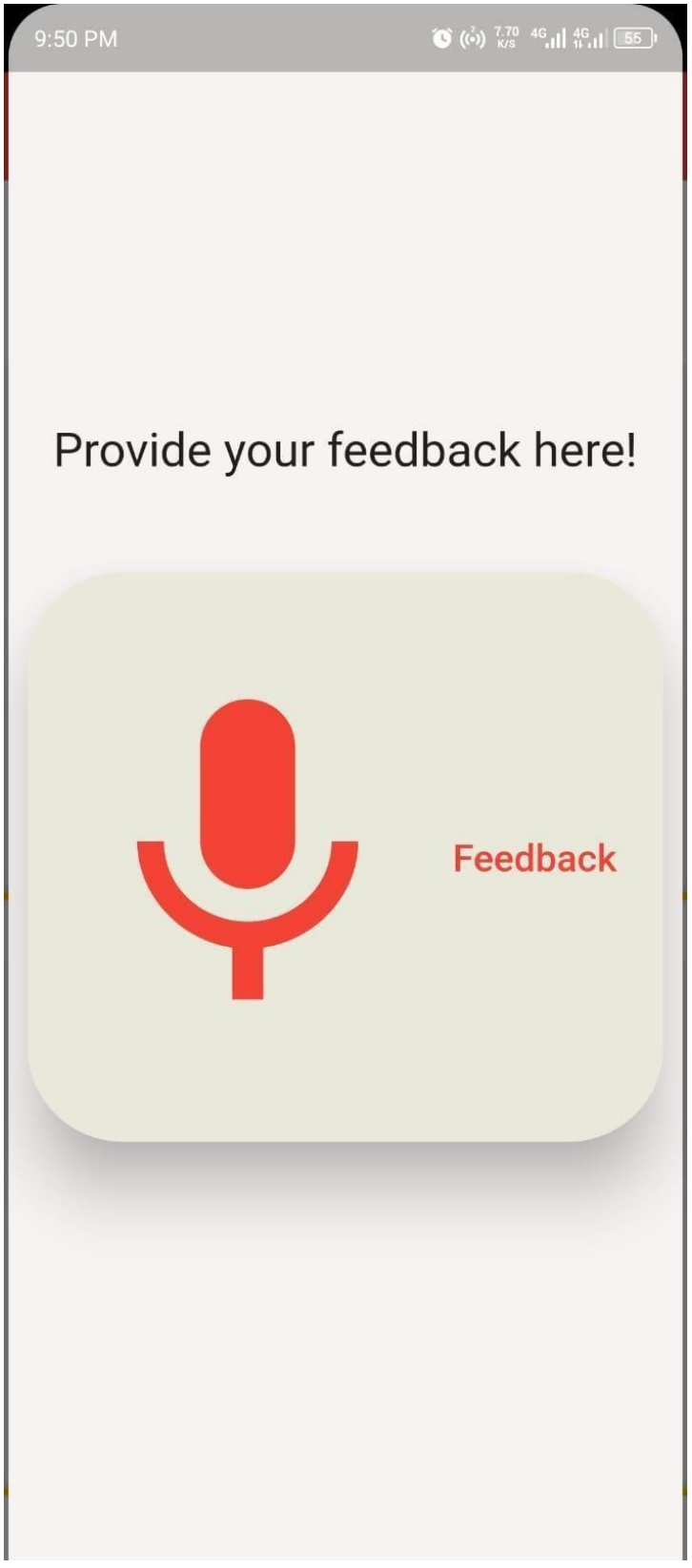

Figure 8

Chapter 4:
Implementation and Test Cases

Chapter 4: Implementation and Test Cases

This visually impaired-friendly mobile app commences with the user opening it and clicking on any one of Object Detection, Currency Detection, Document Reading, or UserFeedback. Pseudo code covering actions such as camera activation, algorithm initiation, and result announcements corresponds to it. Specifically, some of the key components include main screen, a camera module, and specialized detection modules, using libraries such as TensorFlow Lite and Tesseract OCR.

4.1 Implementation

4.1.1 Components, Libraries, Web Services and stubs

4.1.1.1 Mobile Application Components:

4.1.1.1.1 Main Screen:

Main Screen with four buttons Object Detection, Currency Detection, Document Reading,and User Feedback.

4.1.1.1.2 Camera Module:

Manually controls the camera opening feature and taking photo or video.

4.1.1.2 Object Detection Module:

It implements the object detection algorithm to detect objects from camera input. Use an object detection model from a pre-trained YOLO V8 model.

4.1.1.3 Currency Detection Module:

Detects currency denominations from camera input by implementing the currency detection algorithm. Image processing and pattern recognition techniques possible integration with YOLO V8 model.

4.1.1.4 Document Reading Module:

Handles document OCR functions, that is, reading text from documents using OCR technique. Use OCR libraries such as tesseract with platform-specific wrappers.

4.1.1.5 User Feedback Module:

Provides feedback form and submissions management. Submission of feedback, standard UI components and backend integration for storing feedback.

4.1.2 Libraries and Frameworks:

4.1.2.1 TensorFlow Lite (Object Detection):

TensorFlow Lite is a lightweight version of the TensorFlow machine learning frameworkfor mobile applications. Use a pre-trained TensorFlow Lite object detection model.

4.1.1.1 OpenCV (Image Processing):

It is a collection of image processing tools and libraries known as OpenCV. Provide pre-processing for currency imaging as part of the vision-related activities.

4.1.1.2 Tesseract OCR (Document Reading):

Tesseract is a text recognition engine for optical character recognition (for reading textfrom images). Use Tesseract OCR in document reading.

4.1.1.3 Speech Synthesis Library (Announcement):

A library for text-to-speech announcements of the objects detected, currency, anddocuments. Enables users to interact with text output as speech.

4.1.1.4 User Interface (UI) Framework (Flutter):

User interface cross-platform frameworks. Use cross-platform development framework toimplement the main screen and user feedback form.

4.1.1.5 Backend Service (User Feedback Submission):

Backend service for submissions of user feedback. Use a backend service to store andmanage user feedback data.

4.2 IDE, Tools and Technologies

4.2.1 IDE

PyCharm, Google Colab, Android studio

4.2.2 Tools

Github for version control and document

4.2.3 Technologies

Python, Flutter, Dart, YOLO V8 algorithm

4.3 Best Practices / Coding Standards

4.3.1 Accessibility Standards:

1. All the text and control should be screen reader compatible.
2. Use a high contrast and adjustable font size for readability.
3. Alternative text for images and buttons.

4.3.2 Button Labels:

For easy navigation use descriptive labels for each button (e.g., "Object Detection", "Currency Detection", "Document Reading", "User Feedback").

4.3.3 Object Detection:

1. Adopt imaging processing protocols for efficient object identification.
2. Allow users to initiate object detection by incorporating camera functionalities.
3. Clearly identify audio feedback associated with detected objects.

4.3.4 Currency Detection:

1. Introduce a strong currency recognition system.
2. Integrate camera functionality dedicated to currency detection with continuousfeedback.
3. Provide correct audio on the detected currency notes.

4.3.4 Document Reading:

1. Use Optical Character Recognition (OCR) for document reading.
2. Create an easy-to-use interface for document capture using the device camera.
3. Allow the voice assistance to read the document content to the user.

4.3.5 User Feedback:

1. Improve user experience by introducing a dedicated button for user feedback.
2. Give users an option to fill a form, where they can give feedback, suggestions or reportissues.
3. Make audio confirmation upon the successful submission of feedback.

4.3.6 Navigation and UI Design:

1. Keep user-friendly, simple interface with distinct navigation.
2. For smooth navigation consider touch gestures.

4.3.7 Testing and QA;

1. Thoroughly test the application with blind users in order to confirm its usefulness.
2. Frequently improve and change the app to reflect user feedback and the changes inaccessibility standards.

4.3.8 Privacy and Security:

1. Make sure that images and data captured are securely stored and handled.
2. Any personal information should be encrypted using encryption protocols fortransmission.

4.3.9 Documentation:

1. Ensure full documentation on the app functionalities, user guidelines and accessibility.
2. Provide a guide to visually impaired users to help them navigate and use each feature.

4.3.10 Pseudo Code:

```
onButtonSelect(button):
if button == "Object Detection":
openCamera()
startObjectDetection()
announceDetectedObject()
elif button == "Currency Detection":
openCamera()
startCurrencyDetection()
announceCurrency()
elif button == "Document Reading":
openCamera()
startDocumentReading()
announceTextContent()
elif button == "User Feedback":
openFeedbackForm()
getUserFeedbac
```

k()
submitFeedback
()
openCamera():

Opening the
camera.
startObjectD
etection():

Initialize object
detection algorithm.
announceDetectedO
bject():

The code for reporting the detected object to the user.
startCurrencyDetection():

Initializing currency
detection algorithm.”
announceCurrency():

The code to declare the denomination of the identified currency.startDocumentReading():

Initialize document reading function.

announceTextContent():

Code of announcing the document text content to be read.openFeedbackForm():

Display user
feedback form
code.
getUserFeedback(
):

Collect the user feedback, either text input or voice recognition.submitFeedback():

Code to submit the user feedback.

The pseudo code gives a detailed outline on the flow and basic operations of the buttonson the mobile device application. The actual implementation may also incorporate somedetails and more considerations due to the development platform and technologies.

4.4 Test case Design and description

Sample Test case No.1

Object Detection Module			
OD-TC			
Test Case ID:	*TC001*	**Test Date:**	*10,april, 2024*
Test case Version:	*1.0*	**Use Case Reference(s):**	*UC001, UC002*
Revision History:	*NA*		
Objective	*The detection of the object should be accurate and reliable in real-time*		
Product/Ver/Module:	*AI EYE GUIDE/v1.0/Object detection module*		
Environment:	*camera in an android device*		
Assumptions:	*The device and camera are properly working and we connected*		
Pre-Requisite:	*The app is firstly installed properly and working*		

Step No.	**Execution description**	**Procedure result**
1.	*Open application and then select the object detection module*	*The app launches successfully*
2.	*Then point out camera towards the object*	*The object has been captured properly*
3.	*Then verify the object is correctly matched to its actual one*	*The object is detected and verified properly*
4.	*Make an attempt to test from different angles*	*The detection is still properly*
5.	*Record the issues*	*No issues observed*

Comments: So, the app works well and performs its functionality well

☐ *Passed* ☒ *Failed* ☒ *Not Executed*

Sample Test case No.2

Currency Detection Module			
CR-TC			
Test Case ID:	*TC002*	**Test Date:**	*10,march, 2024*
Test case Version:	*1.0*	**Use Case Reference(s):**	*UC003, UC004*
Revision History:	*NA*		
Objective	*The detection of the currency should be accurate and reliable in real-time*		
Product/Ver/Module:	*AI EYE GUIDE/v1.0/Currency detection module*		
Environment:	*camera in an android device*		
Assumptions:	*The device and camera are properly working and we connected*		
Pre-Requisite:	*The app is firstly installed properly and working*		

Step No.	Execution description	Procedure result
1.	*Open application and then select the Currency detection module*	*The app launches successfully*
2.	*Then point out camera towards the various currency notes*	*The currency has been captured properly*
3.	*Then verify the currency is correctly matched to its actual value*	*The currency is detected and verified properly*
4.	*Make an attempt to test from different angles*	*The detection is still properly*
5.	*Record the issues*	*No issues observed*

Comments: So, the app works well and performs its functionality well

☐ *Passed* ☒ *Failed* ☒ *Not Executed*

Sample Test case No.3

.

Document Reading Module			
DOC-TC			
Test Case ID:	*TC003*	**Test Date:**	*18,march, 2024*
Test case Version:	*1.0*	**Use Case Reference(s):**	*UC005, UC006*
Revision History:	*NA*		
Objective	*The accuracy and readability of the document should be accurate and reliable in real-time*		
Product/Ver/Module:	*AI EYE GUIDE/v1.0/Document Reading module*		
Environment:	*camera in an android device*		
Assumptions:	*The device and camera are properly working and we connected*		

Pre-Requisite:	*The app is firstly installed properly and working*	
Step No.	**Execution description**	**Procedure result**
1.	*Open application and then select the Document reading module*	*The app launches successfully*
2.	*Then point out camera towards the document content*	*The document content has been captured properly*
3.	*Then verify the document content is correctly matched to its actual and its audible*	*The currency is detected and verified properly*
4.	*Make an attempt to test from different angles*	*The detection is still properly*
5.	*Record the issues*	*No issues observed*
Comments: So, the app works well and performs its functionality well		
☐ *Passed* ☒ *Failed* ☒ *Not Executed*		

Sample Test case No.4

Feed Back Module			
FB-TC			
Test Case ID:	*TC004*	**Test Date:**	*25,april, 2024*
Test case Version:	*1.0*	**Use Case Reference(s):**	*UC007, UC008*
Revision History:	*NA*		
Objective	*The accuracy of the feedback submission should be accurate and reliable in real-time*		
Product/Ver/Module:	*AI EYE GUIDE/v1.0/Document Reading module*		
Environment:	*camera in an android device*		
Assumptions:	*The device and camera are properly working and we connected*		
Pre-Requisite:	*The app is firstly installed properly and working*		
Step No.	**Execution description**		**Procedure result**
1.	*Open application and then select the feedback module*		*The app launches successfully*
2.	*Fil out the form of submission*		*The form of the feedback displays with no issue*
3.	*Then submit the feedback by clicking on submit*		*The feedback is submitted*
4.	*Make an attempt to test from feedback appears at backend*		*The feedback appears*
5.	*Record the issues*		*No issues observed*
Comments: So, the app works well and performs its functionality well			
☐ *Passed* ☒ *Failed* ☒ *Not Executed*			

4.5 Test Metrics

Summarize here the common ground of attributes of test case metrics.

Sample Test case

Metric:	Purpose
Number of Test Cases:	4
Number of Test Cases Passed:	4
Number of Test Cases Failed:	0
Test Case Defect Density:	(0*100)/4=0
Test Case Effectiveness:	(0*100)/Total number of issues detected=0
Traceability Matrix:	Its given below

Traceability Matrix:

Requirement ID	Implemented features
REQ001	Object detection
REQ002	Currency detection
REQ003	Document reading
REQ004	Feedback submission

Chapter 5:
Experimental Results and Analysis

Chapter 5: Experimental Results and Analysis

5.1 Introduction:

The experimental results and analysis chapter concludes the tests results that are got from testing the AI Eye Guide application components. To ensure the effectiveness and credibility of each module, all of them, including the object detection, currency detection, document reading and user feedback ones, were tested using strict procedures. The current chapter's goal is to provide an in-depth analysis of the experimental outcomes, where the capability of the application in the daily lives of the visually impaired users is shown. Through taking at outcome of the testing process, very good inferences can be reached regarding the performance and user-friendliness of the AI Eye Guide application.

5.2 Experimental Results and Analysis

The outcomes of the experiment prove that the AI Eye Guide application helps visually challenged users and is at the same time dependable and efficient. Below are the main results with appropriate tables for each part.

5.2.1 Currency Detection:

This sorting out module can correctly recognize the currency denominations from captured camera footage. That currency detection test has passed all of its test cases hitting 0 failures during testing phase. Hence, considering the accuracy of currency identification algorithm that makes certified results for visually handicapped people, we may say currency recognition algorithm works properly.

Test case ID	Test Date	Test case version	Result executed
CDTC001	10-3-24	1.0	Passed
CDTC002	20-3-24	1.0	Passed
CDTC003	30-3-24	1.0	Passed
CDTC004	5-4-24	1.0	Passed

5.2.2 Document Reading:

With the help of OCR technology, the software is capable of extracting text from any document. In the same way as currency detection, our document reader test cases passed perfectly fine. This proves that blind persons will have the app reading the text to them precisely.

Test case ID	Test Date	Test case version	Result executed
DRTC001	12-3-24	1.0	Passed
DRTC002	22-3-24	1.0	Passed
DRTC003	28-3-24	1.0	Passed
DRTC004	3-4-24	1.0	Passed

5.2.3 Feedback:

The feedback submission module of which the users may easily provide feedback. Upon testing, all test cases passed for submission of feedback, which shows that the

user is able to send the feedback, suggestions, or even report the issues in order to improve the application in the future.

Test case ID	Test Date	Test case version	Result executed
FBTC001	08-3-24	1.0	Passed
FBTC002	09-3-24	1.0	Passed
FBTC003	14-3-24	1.0	Passed
FBTC004	1-4-24	1.0	Passed

5.2.4 Object Detection:

The main function of the AI Eye Guide app - the "object detection module" - is deep learning algorithm based and enables real time cognition of regular objects used in daily life. The obtained data of the experiment reveals the efficiency of this module in assisting the visually impaired people in overcoming the problem of the navigation.

Test case ID	Test Date	Test case version	Result executed
ODTC001	01-3-24	1.0	Passed
ODTC002	07-3-24	1.0	Passed
ODTC003	19-3-24	1.0	Passed
ODTC004	5-4-24	1.0	Passed

5.3 Summary:

The experimental results and analysis chapter that we wrote shows how useful and accurate the AI Eye Guide app can be in the lives of the people who suffer from visual impairment. Via the comprehension test, it was realized that all modules, e.g. object detection, currency detection, document reading and user feedback worked perfectly well, thus, met their intended purposes. The successful test execution also highlights the reliability of the application which in itself is a sign that the application could greatly improve the lives of visually impaired people specifically in terms of convenience and independence. Heading to the future, the information and findings from these studies may be used as a basis for the continual amendment to the AI Eye Guide functionality and usability, ensuring that the application can continue to effectively meet the needs of the visually impaired community.

Chapter 6:
Conclusions and Future Directions

Chapter 6: Conclusion and Future Directions

6.1 Conclusion:

Our knowledge on the efficiency of AI-based applications for visually challenged people after us joining the creation and review of the AI Eye Guide app is improved. After performing this type of testing, the application was demonstrated to function optimally toward the intended objectives of recognition of objects, currency, document reading, and user feedback. While some bugs have been faced during the design stage in regard to technical complexities and user interface, the project has tremendously succeeded in accommodating the needs of visually impaired users.

6.2 Future Directions:

6.2.1 Algorithm Optimization: In doing so, the underlying techniques used for object detection and currency recognition should be honed to update the algorithms' accuracy and speed, achieving a better app performance.

6.2.2 Feature Expansion: Trying techniques to create novel capabilities like navigation guidance, face recognition, and scenery confabulation to make the gadget useful to more people.

6.2.3 User Experience Enhancements: Consistently ask people for their feedback which will be used to design better user interface and interaction experience so that the application becomes more user-friendly and the usability improves.

6.2.4 Accessibility Improvements: Implementing the following inclusive and accessible product that's in compliance with accessibility standards and guidelines for visually impaired users.

6.2.5 Integration with Assistive Technologies: Looking into ways which the AI Eye Guide application can be integrated with existing assistive technologies and gadgets to pave the way for an uncomplicated user hierarchy.

6.2.6 Community Engagement: Partnering with organizations and communities that concentrate on the visual challenged people so as to share the awareness about the app. In addition, they will help us in getting an input for future app development.

6.2.7 Continuous Learning and Adaptation: Tracking advancements in AI and/or assistive technologies and adding new services/features as needed to keep up-to-date with user needs.

6.2.8 Global Accessibility: Aiming at the development of the multilingual functionality in order to adapt the application to different cultural environments to make it universal and easily accessible.

Through such future directions, the AI Eye Guide application is able to remain as a crucial tool for the visually impaired persons and hence improvement of their lives quality.

References

List all important sources of information which have been consulted for this project

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