Text Face And Object Detection Smart Lens App

A Major Project Report

Submitted in partial fulfillment

for the award of the degree

of

Bachelor of Engineering

in

Computer Science & Engineering

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Session 2018-2022

DECLARATION BY THE CANDIDATES

We the undersigned solemnly declare that the report of the project work entitled **"SMART LENS"** is based on our own work carried out during the course of our study under the supervision of Asst. Prof. **Sonia Wadhwa**. We assert that the statements made and conclusions drawn are an outcome of the project work.

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

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Text, Face & Object Detection using Machine Learning is an application which offers users to apply machine learning-based functionalities in the real-life event. This application will give the users to recognize text and translate the text as well as facial recognition, detecting objects and barcode scanning by using their smart phone camera. The purpose of this project is to develop a user-friendly android mobile application that will help to understand and interact

Smart Lens is a set of vision-based computing capabilities that can understand what you are looking at and use that information to copy or translate text, identify plants and animals, explore locales or menus, discover products, find visually similar images, and take other useful actions. Smart lens is an image recognition technology, designed to bring up relevant information related to objects it identifies using visual analysis based on a neural network.

Smart lens is best described as a search engine for the real world. It uses artificial intelligence to identify text and objects both within images and in a live view from your phones camera, and it then lets you learn about and interact with those elements in all sorts of interesting ways. Cloud vision allows to easily vision detection features within applications, including image labeling, face and landmark detection, optical character recognition(OCR), and tagging of explicit content. It can detect text in images, text in files, handwriting in images and detect faces. Languages like Android Studio, Machine learning kit, java, etc.

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CHAPTER 1

INTRODUCTION

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Introduction

Smart phones are more advanced than ever. They're filled with plenty of features, like the front- and rear-facing cameras, pulse rate monitors, fingerprint screen lock, and access to apps galore.

There's no denying it, from the minute we get up to the minute we head to sleep, we're altogether stuck to our cell phones. Another work messages. Another Facebook notification. The weather application discloses to us a tempest is headed. There's constantly another motivation uplift our smart phones since they do as such much.

Motivation

The smart phone is the most widely used mobile technology right now. We can't think of life without a smart phone. It became a part of our day to day life. We do a lot of day to day activities with our smart phone. We all have one in our pocket and that has cameras. Typically, with a camera all we do is take photos, videos or make video calls With that thought why don't make a mobile application that can perform smart action with the help of our smart phone camera?

Objective

The objective of our project is to develop a user-friendly android mobile application that will help to understand and interact with what's in our camera's viewfinder such as.

Text Recognition

Identifying the content from a picture. It very well may be utilized for photographs of signs, names, labels, etc. It can be useful for many cases like detecting text from an image and make a copy of that Text.

Translate Text

- Translate text from English to Bengali. It can translate a sentence or also word by word like a dictionary.

Image Labeling

- Taking a picture, and identifying substances it contains, for example, objects, creatures, natural products, exercises and that's just the beginning.

Face Detection

- Not to be mistaken for face acknowledgment, which can perceive who is the individual in the picture, or realizing that we see a similar individual on numerous photographs. This is about detecting face features, whether the personis smiling or not or eyes is open or not.

Barcode Scanning

- Peruse information encoded utilizing most standard standardized tag groups.
- React astutely when a client examines a standardized tag.

Language Identification

- Identify a language based on the user input.

Expected Outcome

To design and develop a smart user-friendly application that will help a user to recognize text from an image, copy that text & translate the text into any language. Identifying objects from an image. Identify key facial features. Getting encoded data from barcodes by scanning using most standard barcode formats.

Machine Learning has started to reshape how we live, everything around us nowadays has a touch of ML in it, so has mobile applications. Google has re-presented Firebase with the help of some prepared to utilize machine learning models like-Text recognition, Face detection, Image labeling, and more and backing to actualize custom models utilizing Tensor Flow Lite for iOS, Android and Web applications.

In our application Firebase ml kit is the core part. ML Kit accompanies a lot of prepared to-utilize APIs for basic mobile use cases: recognizing text, detecting faces, recognizing tourist spots, checking standardized tags, marking pictures, and recognizing the language of the text.

Related Work

Our developed application is based on Google's own firebase machine learning kit which was first introduced in Google I/O 2018. After researching about related work, we found on "**Smart Lens**" which matches with our developed application.

Smart Lens is one of the most up to date increments to the universe of ML and AI reasoning administrations. Smart Lens is a picture acknowledgment versatile application that can educate you regarding an article, milestone, or item by examining it through a perspective.

Comparative Studies

Our developed application is lite, so simple and easy to use. In the above "Related Work" section we discussed Smart Lens which can work only when the device has an internet connection but in our developed application it can work without an internet connection, everything is on the device. Besides that, we implemented a feature like a face detection, Language identification which isn't available on the Smart lens as the time of writing this.

CHAPTER 2
LITERATURE REVIEW

2. LITERATURE REVIEW

Scope of Problem

As we wanted to make an application by which a user can interact with what's in our mobile device cameras viewfinder. Our developed application working principle is dependent on the device camera. Considering that these are the problems we faced while developing this application.

Camera hardware of the device may cause problems. As our application is fully dependent on the device camera so if the camera of the user's device isnot capable to capture a good quality image then it may not deliver expectedaccurate outcome.

Requirements

While working on a project selecting the appropriate properties for building the project is important. In this chapter, we will discuss the requirements that followed for our application.

Android Platform

When it boils down to smart phone application advancement stages, it is essentially about the conflict of two major tech factions – Android (fueled by Google) and iOS (designed by Apple).

Apple and Google both have altogether various methods for running the platforms anddiffer extraordinarily from one another as far as confinements, expenses, and usefulness. Be that as it may, the piece of the overall industry insights gigantically supports Android application improvement.

There is no precluding that the network from securing Android engineers is entrenched. Android has in excess of 300 carriers, programming, and equipment accomplices, who can enable you to construct your application easily and push it in the correct business bearing. In contrast to a different platform, Android application developers regularly cooperate on an open stage and offer their application advancement information, experience and abilities

with one another during the application improvement process. An open platform like Android is in every case better in light of the fact that any software engineer can take a shot at it, regardless of their specialized skill.

Better Scalability

Despite the fact that Firebase's Real time Database is fit for scaling, things will begin toget insane when your application turns out to be extremely well known or if your database turns out to be extremely enormous. Cloud Firebase depends on Googles Cloud framework. This enables it to scale significantly more effectively and to a more noteworthy limit than the Real time Database.

Machine Learning

Machine learning is:

- Considered as a sub-field of Artificial insight
- Involves learning models which allow the program to make predictions ondata.
- More than just a list of instructions which clearly defines what the algorithmic should do.
- Closely linked to computational statistics, which uses computers to makepredictions

The third option here probably needs some explaining. A key contrast between a normal calculation and an ML algorithm is the "learning" model which enables the calculation to gain from the information and settle on its own choices. This enables machines to perform errands which are generally are inconceivable for it to perform. Such assignments can be as straightforward as perceiving human penmanship or as intricate as self-driving autos! For example, say an algorithm is supposed to correctly identify afacial landmark.

Unidentified data

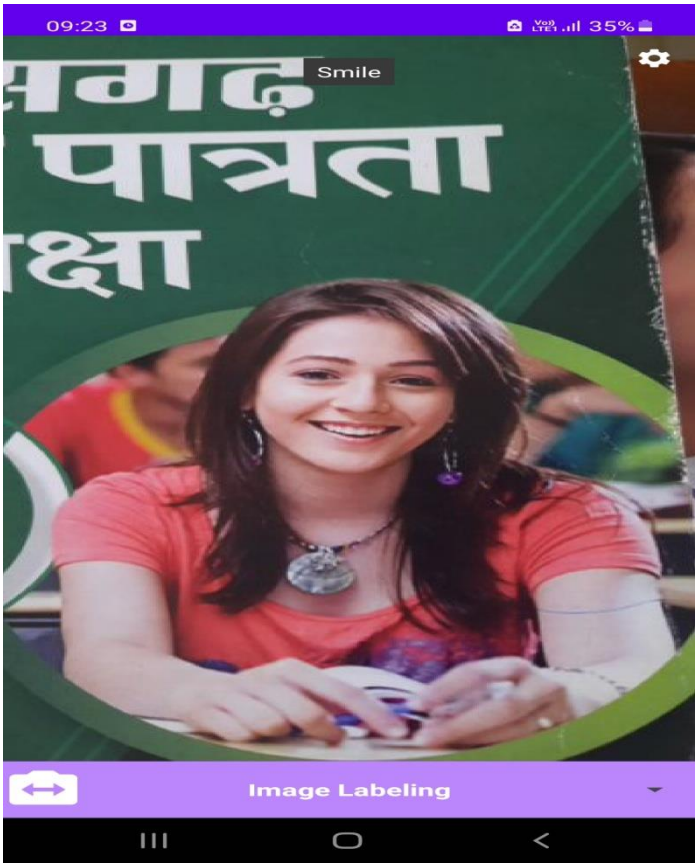

Figure 2.5.1: Unidentified data

An ML algorithm would be prepared on preparing information to 'learn' to perceive facial milestone. Where a straightforward calculation would not be fit for playing out this undertaking, an ML additionally would not exclusively have the option to recognize the photographs as prepared, it would consistently gain from testing information and add to its "learning" to turn out to be progressively exact in its forecasts.

Identified data

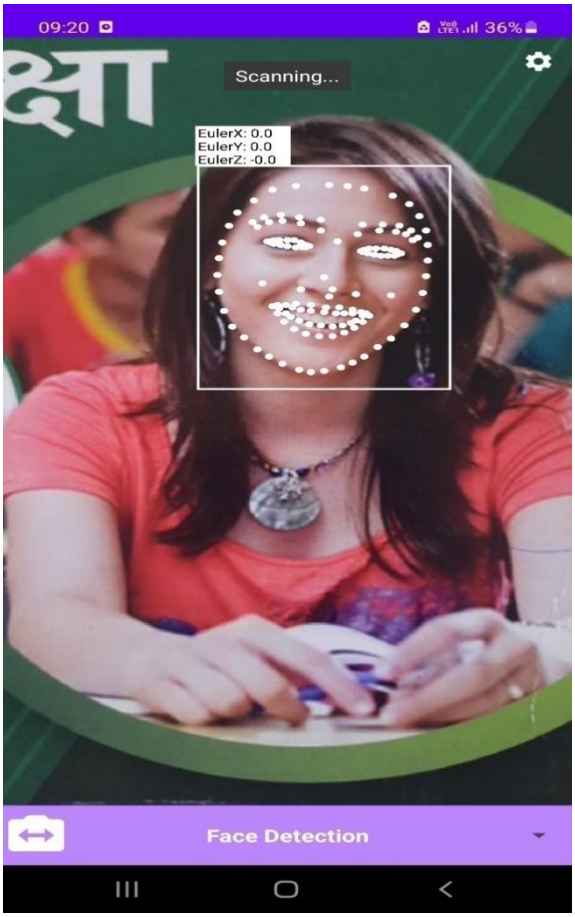

Figure 2.5.2: Identified data

Machine learning is one of the most popular approaches in Artificial Intelligence. One of the key aspects of ML is the usage of new/continuous data to iterate and keep on learning. There are many key enterprises where ML is having an enormous effect: Financial administrations, Delivery, Marketing and Sales, Health Care to give some examples. It is normal that in a few decades the mechanical, redundant errands will be finished. AI and upgrades in Artificial knowledge procedures have made unimaginable conceivable, from self-driving cars to computerized healers.

Figure 2.3.4: ML Kit

With the gigantic development of enthusiasm for ML over the most recent few years, it's just normal to see an item like Firebase ML (Machine Learning) Kit. These days, wediscard enough computational capacity to run AI models on our cell phones, an errand which recently was troublesome (yet at the same time, feasible). With this being stated,ML unit was worked so as to bring ML to mobile in a simple to utilize way (without requiring earlier information of ML), however, in a useful way. For the minute it is vision centered and offers the following features:

ML Kit's base APIs cover:

- Barcode scanning, to scan and process barcodes.
- Text recognition.
- Face detection.
- Landmark detection which identify popular landmarks.
- Image labeling, which identify objects, activities, products etc.

ML Kit goes about as an API layer to custom models to make it simple to utilize these models. Developers can use their existing TensorFlow Lite models with ML Kit. Google is also releasing an experimental model compression flow to reduce model sizes.

Challenge

As our motive of making this application user-friendly, easy to use and lite weight.These are the challenges:

- Building a user-friendly user interface.
- Easy to operate.
- Run smoothly on a device with low configuration.

CHAPTER-3
METHODOLOGY

INTRODUCTION

"Text, Face, And Object Detection Using Machine Learning" is an application which will allow a user to help to understand what's in their mobile phones comer's viewfinder by using the camera. A user simply just can open the application take a picture of text documents and the application will help to recognize the text and will allow a user to copy that following text or translate it to any language. The applicationalso can help to read encoded barcode data, identify the language, detect facial key feature and image leveling. As our project is based on the Android platform. In this chapter of our report, we will go through the discussion about the Requirement Specification of our application.

Business Process Modeling

Business process modeling (or) process modeling, is the analytical representation or put simply an illustration of an organization's business processes. Modeling processesis a critical component for effective business process management.

Development Method

For our needs, Rapid application developing is suitable because it contains prototypingand also application testing.

Rapid Application Development Method

Quick application improvement is a type of Agile programming advancement system. In contrast to Waterfall techniques, Rapid application improvement stresses working programming and client criticism over severe arranging and necessities recording. As it were, Rapid application advancement is less talk, more activity, and testing.

While Rapid application improvement de-underlines severe arranging, there are as yeta bunch of steps or stages every advancement venture experience when utilizing the fast application advancement strategy, which we'll examine underneath.

It centers on info yield source and goal of the data. It stresses on conveying ventures in little pieces; the bigger undertakings are partitioned into a progression of littler tasks. The fundamental highlights of RAD model are that it centers on the reuse of layouts, instruments, procedures, and code.

- Flexible and versatile to changes.
- It is valuable when you need to decrease the general task hazard.
- It is versatile and adaptable to changes.
- It is simpler to move expectations as contents; abnormal state deliberations and middle of the road codes are utilized.
- Due to code generators and code reuse, there is a decrease of manual coding.
- Due to prototyping in nature, there is a plausibility of lesser deformities.
- Each stage in RAD conveys the most astounding need usefulness to the customer.
- With less individuals, profitability can be expanded in a short time.

Use Case Model and Description

This following Use Case Diagram shows the basic model of our application also the relation between auser and a functional model.

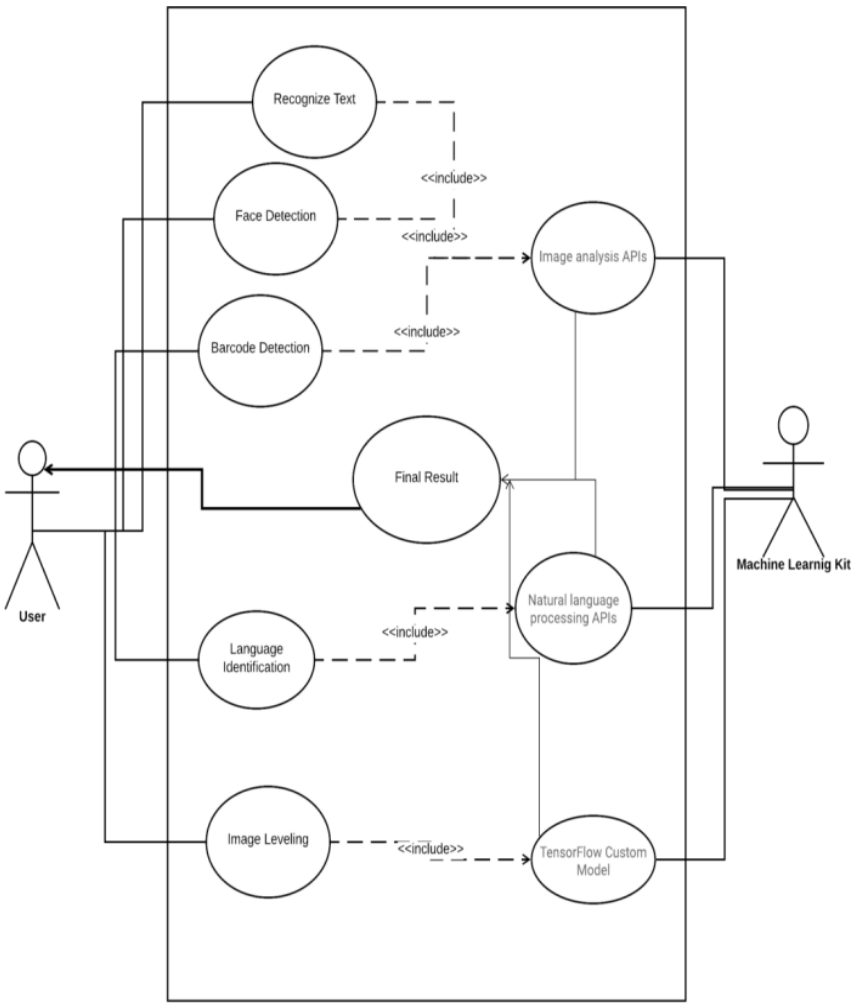

Figure 3.4.1: Use Case Diagram

RECOGNIZE TEXT

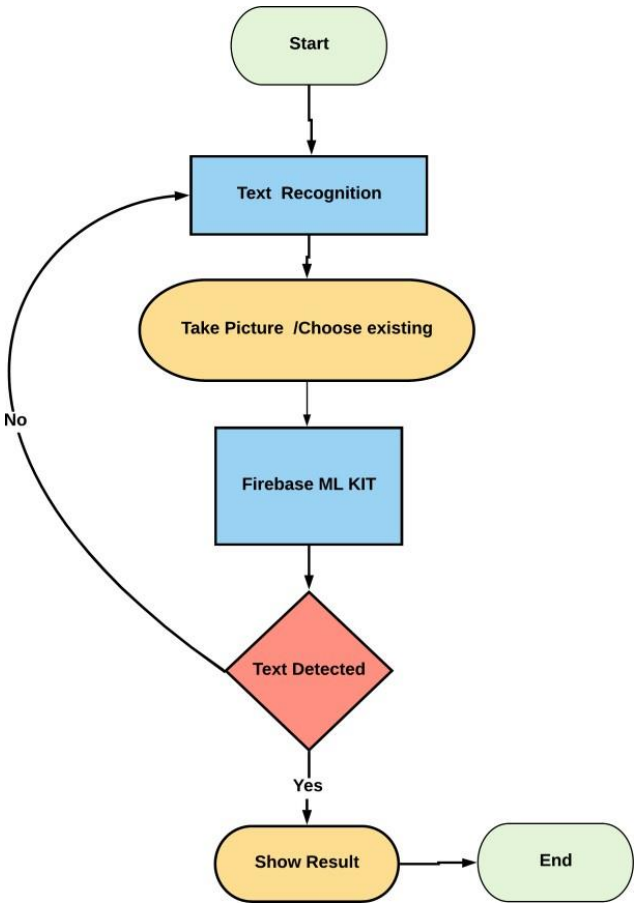

Figure 3.4.2: Recognize Text Diagram

FACE DETECCTION

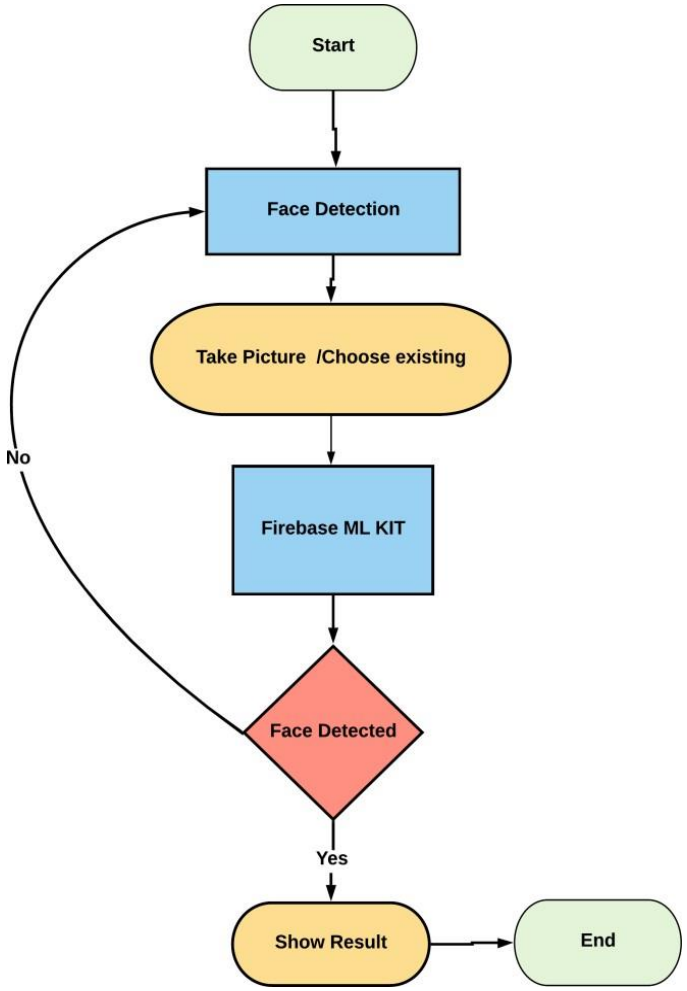

Figure 3.4.3: Face Detection Diagram

BARCODE SCANNING

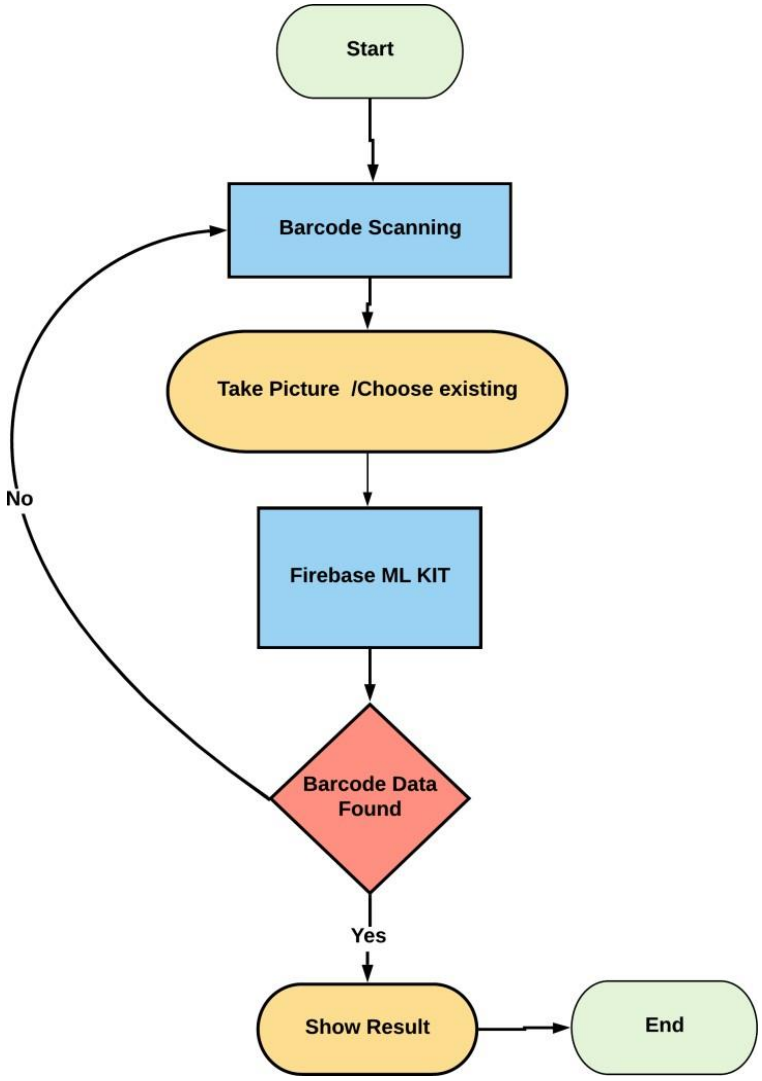

Figure 3.4.4: Barcode Detection Case Diagram.

LANGUAGE IDENTIFICATION

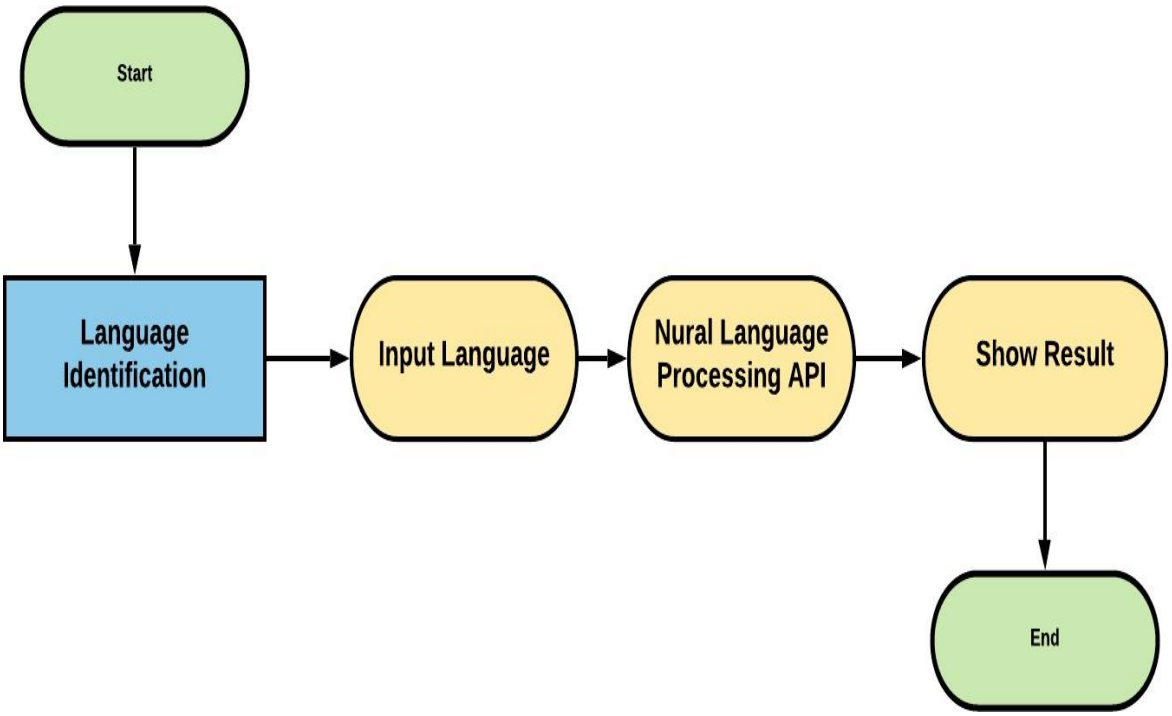

Figure 3.4.5: Language Identification Case Diagram.

IMAGE LEBELING

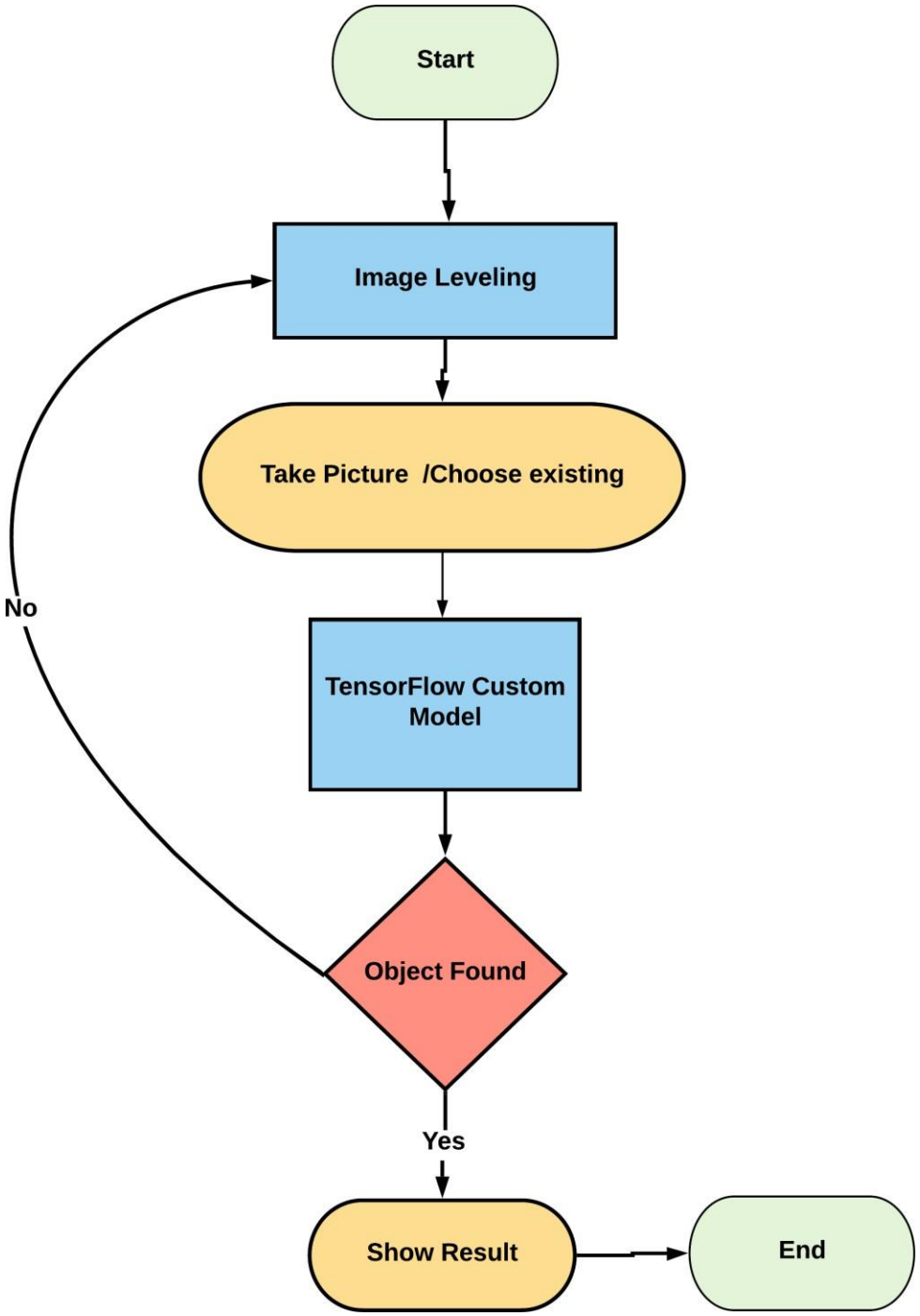

Figure 3.4.6: Image Use Case Diagram

CHAPTER 4

DESIGN SPECIFICATION

DESIGN REQUIREMENT

As we are developing an Android Application, there are some requirements that we need to maintain in order to build our application.

★ Software & IDE

- Android Studio
- Operating Systems (Windows)

★ Programming Language & Framework

- Java
- Android XML
- Machine Learning Kit
- Front-end Design
-

Front-end Design The front-end design of an application is one of the most important and challenging parts. While using an application a user generally depends on the front-end of that application to navigate throughout the user interface and use the functionality. Our main focus was to achieve while developing the Front-end portion of our application is to:

- Simple and easy to use user interface.
- Fast loading speed.
- Browser compatibility.
- Easy Functionality Features.

HOME PAGE

After launching the application this page is showed where all the functionality is shown. User can easily choose any of it by just proceeding it.

HOMEPAGE

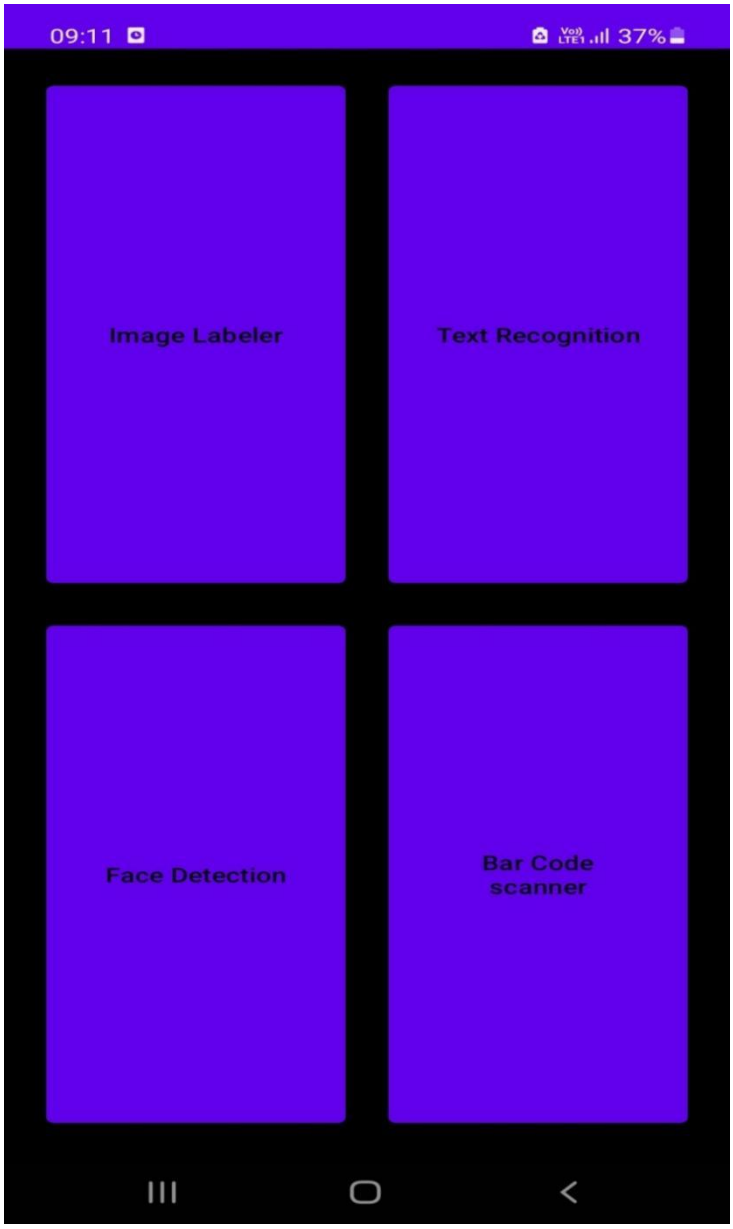

Figure 4.2.1: Application Homepage

DETECT TEXT

This is the simple text detecting user interface; the user simply just can capture an image using the camera or pick an image from the gallery and press “Detect”.

Figure 4.2.2: Text Detecting User Interface

SCAN BARCODE

This part of the user interface is very simple. The user just needs to choose the barcode imagefrom the gallery or capture it using a camera.

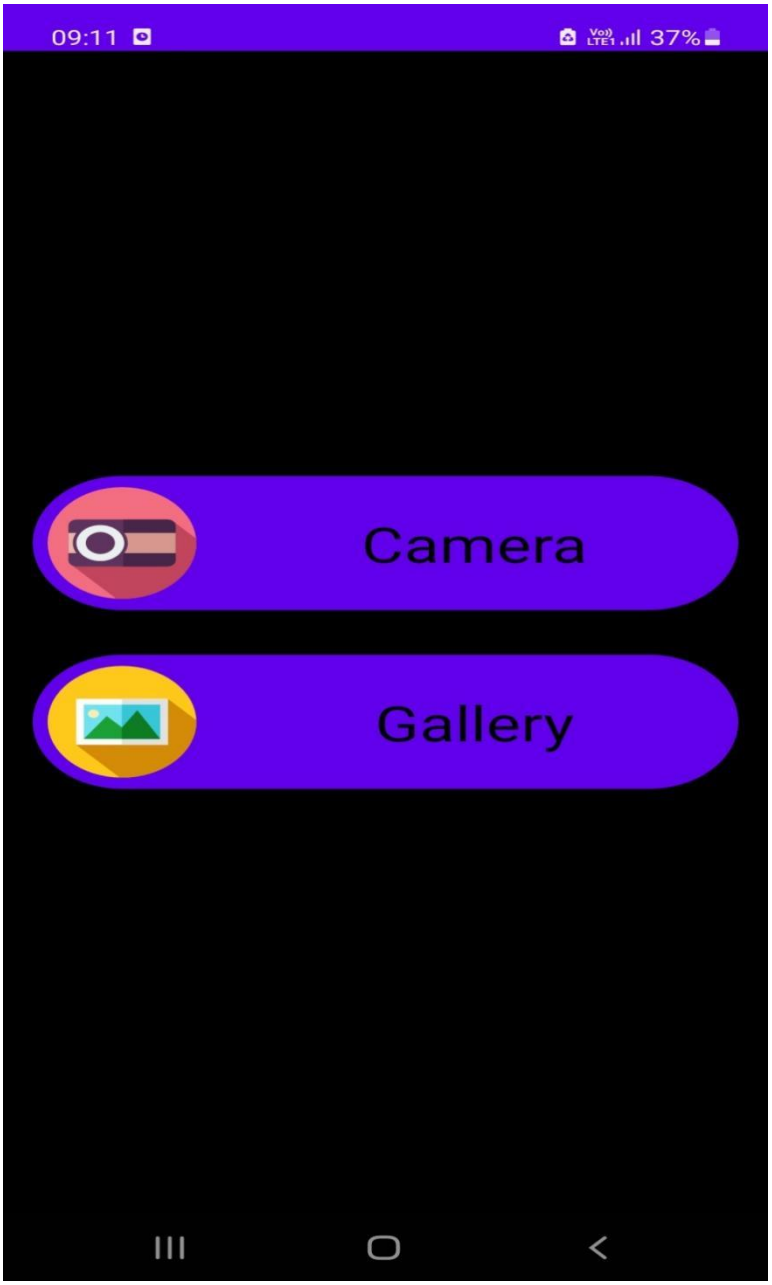

Figure 4.2.3: Barcode Scanning User-interfa

THE OUTPUT OF THE BARCODE SCANNING

Figure 4.2.4 Barcode Scanning User-interface

FACE DETECTION

In here user will be able to detect the facial landmarks like smile and if eyes are open or not.

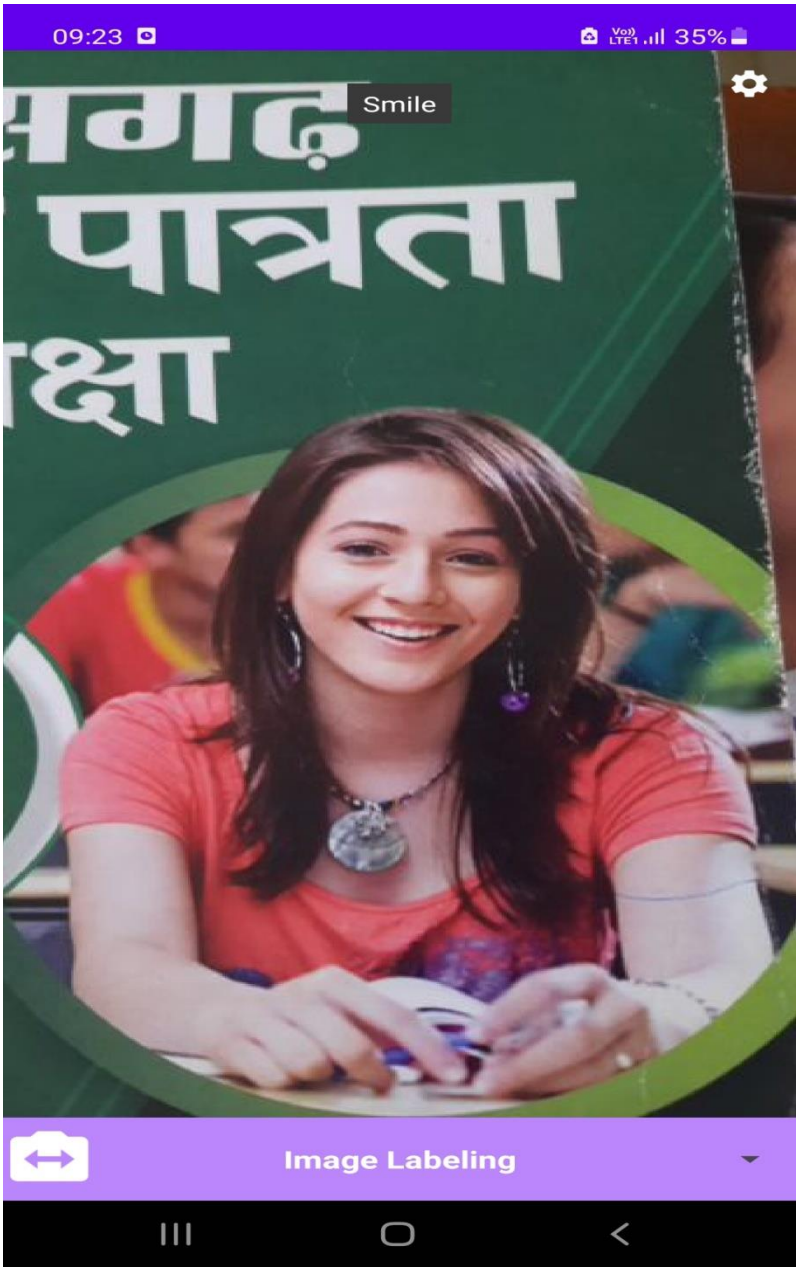

Figure 4.2.5: Face Detection User-interface

OBJECT DETECTION

Here user can take an image, and detect entities it contains, such as objects, animals, fruits, activities and more.

Figure 4.2.6 Object Detecting User-interface.

BACK-END DESIGN

Back-end or the server-side design is actually the core part of any application, by depending on the back-end side an application works. Back-end design refers to everything the user can't see inside the application and where you are fundamentally centered around how the application functions. For our application, we used back-end tools like:

- Java
- Android XML
- Machine Learning Kit

JAVA

Java is preferred for many reasons for developing android applications.
Java is secure (no danger to security since nothing gets executed outside the JVM)

- Object-arranged ideal models.
- Java has plenty of core features that is suitable for android developing.
- JVM (advanced for android): a virtual machine makes the life of an engineer/developer simpler. What's more, android utilizes Dalvik, a VM streamlined tosuit android needs.
- Frameworks and Classes: outside the center library, java has numerous structures and classes.

Android XML

Fundamentally, XML is utilized for format planning. All the UI and format of the application is structured utilizing XML. In contrast to Java (which is Back Bone), XML structures application, how it will look, how parts like catches, content view, and so on will be put and their styling. Aside from these, XML is additionally utilized for parsing information either fromdatabase or server into an android application. (XML parsing).

IMPLEMENTATION REQUIREMENTS

Implementation requirements is the doing, execution with regards to an arrangement, a strategy, or any plan, thought, model, detail, standard or approach for accomplishing something.

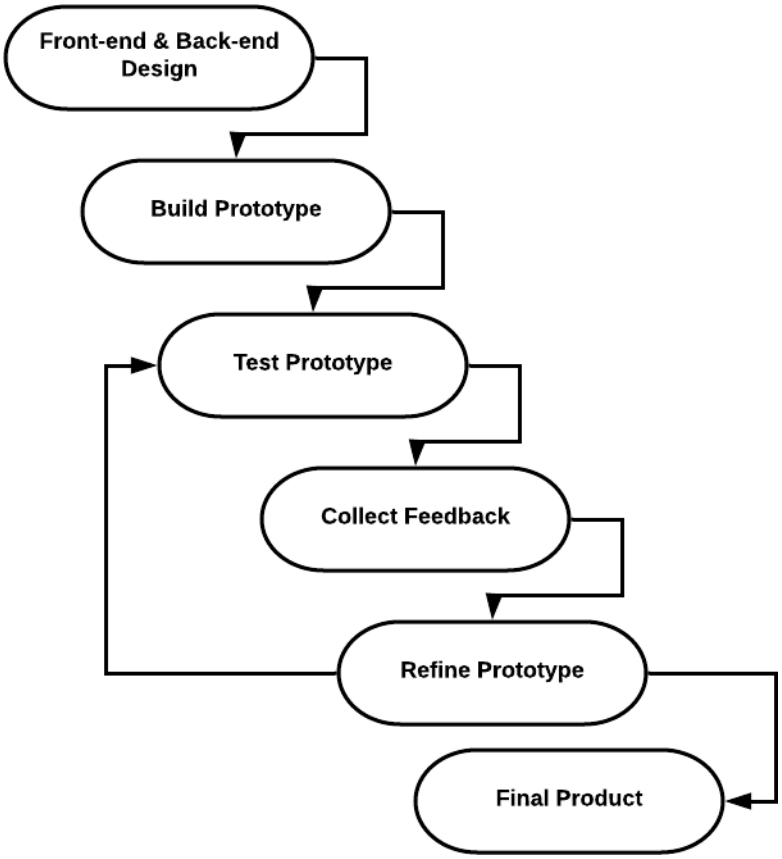

Figure 4.6.1: Requirements of Implementation.

CHAPTER 5

RESULT AND PERFORMANCE

Implementation of Database

For our application, we used Google's Firebase for ML Kit as our back-end database functionalities. it's an SDK that unleashes the power of Google's machine learning capabilities to mobile apps. It's relatively easy to integrate and requires no knowledge of neural networks to get rolling.

As a mobile-focused machine learning SDK, the ML Kit supports both on-device and cloud-based data models, providing easy offline functionality when needed. We begin working with ml kit firebase by adding the dependency for firebase within our application, it would hold all the data of our system & the rest of the basic functionality was handled by Firebase Console.

Implementation of Front-end Design.

Front-end design or the user interface of an application is one of the most important fundamental procedure. The usability of an application depends on how simple and handy the user-interface. So, with that thought, we used Android Studio as our IDE for development. Everywhere in our application, we tried to develop a simple and clean user-interface. Tools we used.

★ **Software & IDE**

- Android Studio

★ **Programming Language & Framework**

★

- Java
- Android XML
- Machine Learning Kit

For making the front-end user interface interactive we choose android material design language which is pleasant to look and makes the user interface more user-friendly.

Implementation of Interaction

In order to make our application interactive, we tried to build a very simple user- friendly user-interface. Throughout the application, the user will find a simple use user- friendly interface which is easy to navigate. Considering the interaction between user and our developed application we tried to focus on making our application.

- Easy to use & navigate.
- User-friendly.
- Interactive user interface.

Testing Implementation

A test case is a lot of test inputs, their execution conditions and expected outcomes that are created keeping a specific result in core interest. In straightforward words, a test case is a lot of conditions under which an analyzer checks in a specific framework to decide whether it meets the particular test necessities and capacities appropriately. Creating experiments is additionally useful in deciding the issues, prerequisites, and structure of a specific application being tried.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

Discussion and Conclusion

It was a magnificent and learning knowledge for us while taking a shot at this venture. This venture took us through the different periods of task improvement and gave us a genuine knowledge into the universe of computer science. The delight of working and the rush includewhile handling the different issues and difficulties gave us a vibe of being in developer industry. From the very begging of this project, we tried our best to develop this application the way we dreamed of.

We are hopeful about our work. It would be satisfactory if our user gets benefited using our application.

Scope for Further Development

Our project can be enhanced with more features and contents to help the user. We have some planned about adding some new features to be implemented and also redesigning all the current features with more functionality in future work to make the system more useful. Some of our plans are discussed below.

- Currently, all of our features are on a device but we are planning to add cloud functionality to that will add some new features to our application.
- Recognizing the Bengali Language.
- Detecting more facial key features.
- Translating text into any language.
- Detecting an object more correctly.
- To make the user interface more user-friendly.

CHAPTER 7
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