

**LOGO DETECTOR:
AN AUGMENTED REALITY MOBILE APPLICATION FOR LOGO & VISITING
CARD DETECTION**

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of
Bachelor of Science in Computer Science and Engineering

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DAFFODIL INTERNATIONAL UNIVERSITY

DHAKA, BANGLADESH

DECEMBER 2019

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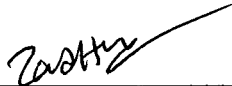
This Project titled “An Augmented Reality Mobile Application for Logo & Visiting Card Detection”, submitted by Shafayat Hossain, ID: 161-15-7032 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 7th December, 2019

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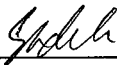
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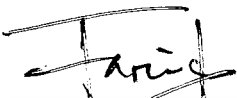
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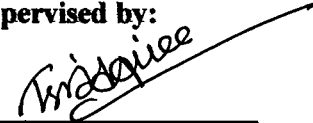
We hereby declare that, this project has been done by me under the supervision of **Ahmed Al Marouf, Lecturer, Department of CSE Daffodil International University**. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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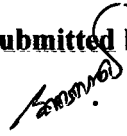
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ABSTRACT

Logo Detector is an Augmented Reality based mobile application that can detect logos and visiting cards using android mobile camera. This application tracks all the features of logos and visiting cards that are naturally found in the image itself by comparing these natural features against a known target resource database. Once the logo are detected, Logo Detector app track the image as long as it is at least partially in the camera's field of view. After that the Augmented Reality technology place information in the detected image all about these logo or visiting cards that we wants to show to the user.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Image processing is a technique to perform certain tasks on an image, or to extract some useful data from it. Nowadays, Image processing is among quickly developing advances. It structures center research territory inside building and computer science disciplines as well. Day by day the demand of image processing is increasing, for the reason “Logo Detector” is implemented as an application. Logo Detector application will be an Augmented Reality based mobile application that will help to find information about logos and visiting cards that are detected. On this project I combine the technique of Augmented Reality and image processing to detecting image properly. Image Targets represent images that Vuforia Engine can detect and track. Unlike traditional fiducially markers, data matrix codes, and QR codes, Image Targets do not need special black and white regions or codes to be recognized. The Engine detects and tracks the features that are naturally found in the image itself by comparing these natural features against a known target resource database. Once the Image Target is detected, Vuforia Engine will track the image as long as it is at least partially in the camera’s field of view [1].

1.2 Motivation

The main motivation of “Logo Detector” application is to make a proper and complete logo detecting application. By using this application user will able to find useful detail about the company or products by detecting their Logos and visiting cards. Another motivation is, since our country will move forward to digitalization so we want bring digitalization in our business sector using this application. By building an Augmented Reality based mobile application that will able to detect any kind of logos and visiting cards, and using this application users will able to find useful information about any product’s or companies that they want to know. Also we can use this technology in medical sector to visualize human anatomy for easy understanding to the medical students.

1.3 Objectives

- To detect different logos & visiting cards using mobile phone camera.
- To formalize an AR (augmented reality) app for any kind of logo and visiting cards for publicly available.
- To provide useful and proper information about logos and visiting cards

1.4 Expected Outcome

The outcome of this project is make easier way to find information about any logo or visiting cards. Sometime we found logos but don't know much about that company. So using this application user will be helpful about finding their desire information.

- We will be able to know the details of the company or any kind of products by the detection of logo and the visiting card.
- It will provide appropriate and useful information by detecting logos and visiting cards.

1.5 Report Layout

From this report a user can easily understood the aim of this project. This report consists of six chapter. What the need of this application, how it can be work, its model, feature and results are given in this this report. First Chapter name is Introduction and it provides Introduction, Motivation, Objective and Expected outcome of our project. Second Chapter name is Background and it provides Introduction, Related work, Comparative studies, Scope of problem and Challenges. Third Chapter name is Requirement specification and it provides Business process model, Requirement analysis, Block diagram, Use case model and Description. Fourth Chapter provides Design specification of our project. Front-end and Back-end design that we used in our project. Fifth Chapter is our project implementation and result are provided. Sixth Chapter provides Conclusion and Future scope of our project and in the last all references are provided that were used.

CHAPTER 2

BACKGROUND

2.1 Introduction

In the era of image processing there are lots of work have been done and they were mostly able to give proper and appropriate information and detection. But with Augmented Reality image detection systems can be more interactive such as using Augmented Reality we can transform or detect the location where the image are actually located. By doing this we can move to our replaced image to that specific area to make a good interactive application. Through this chapter I will discuss about the previous works that have been done separately on Augmented Reality and Image processing. I've worked for many months for the development of the "Logo Detector" application.

2.2 Related Works

There has been lot of related works in image processing technique. For example, there are some application name given below:

2.2.1 Image Recognizer

"Image Recognizer" is an android application that can quickly classifies images and detects individual objects within images, and finds & reads printed words contained within images [2].

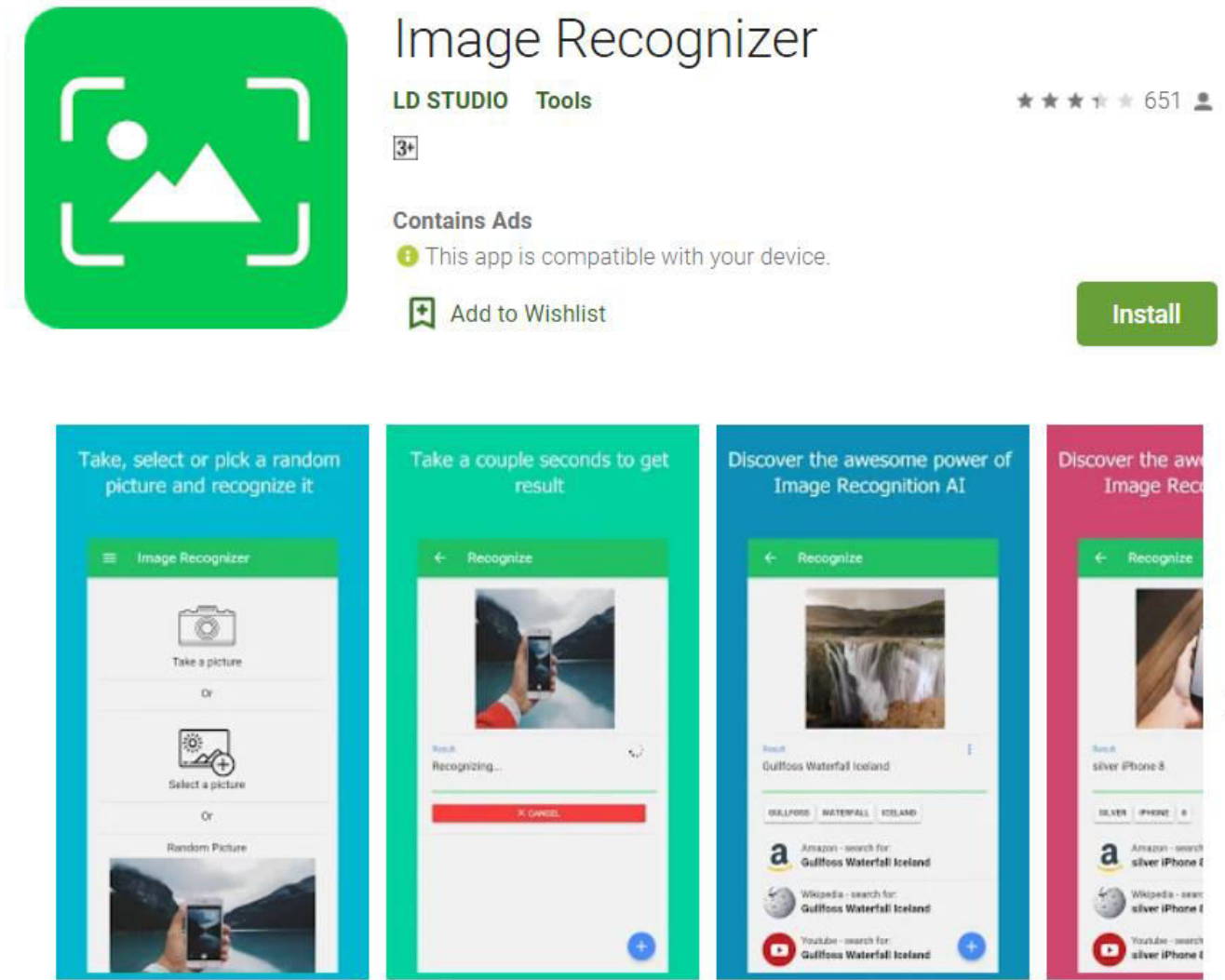


Figure 2.2.1: Image Recognizer.

2.2.2 Image Recognition

“Image Recognition” is an application that can take photo of an object to recognize it and display the text in description box. This app is very easy to use and kids can learn new objects name by simply taking a photo [3].

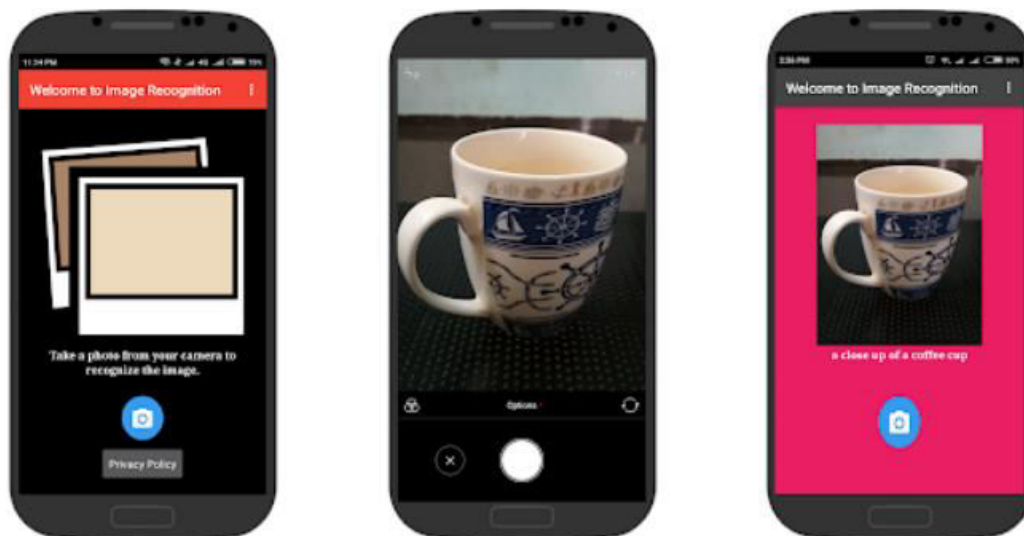
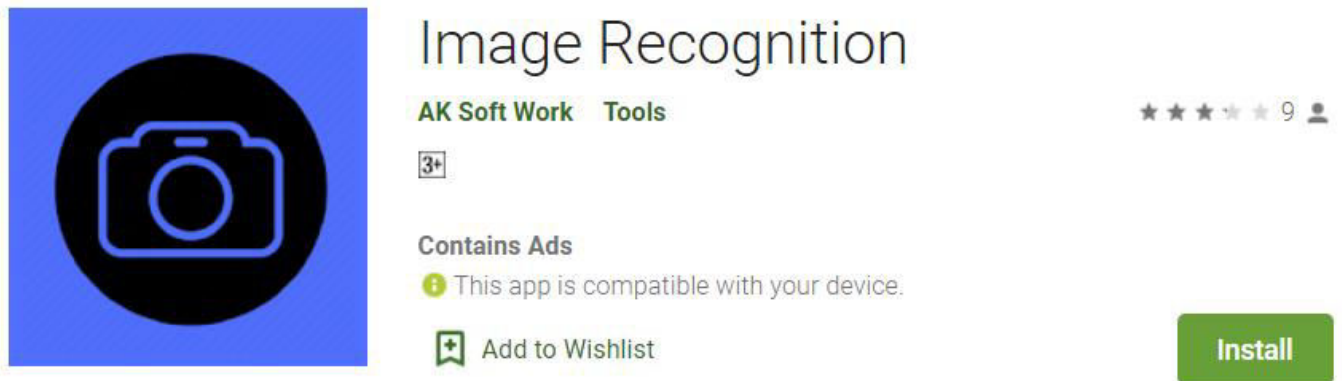


Figure 2.2.2: Image Recognition.

2.2.3 Photo Analyzer

“Photo analyzer” application is used to recognize the objects in the form of image that can be text or photos. After all of the analysis application will give an explanation about the image that are recognized. This app uses Azure Cognitive Service and Apache Cordova [4].

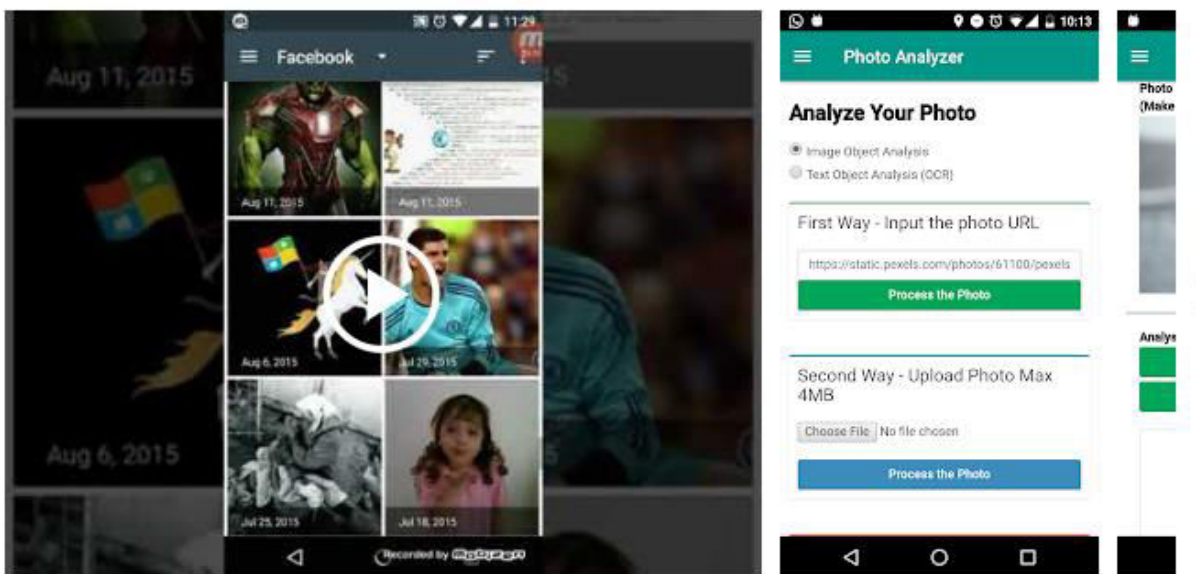
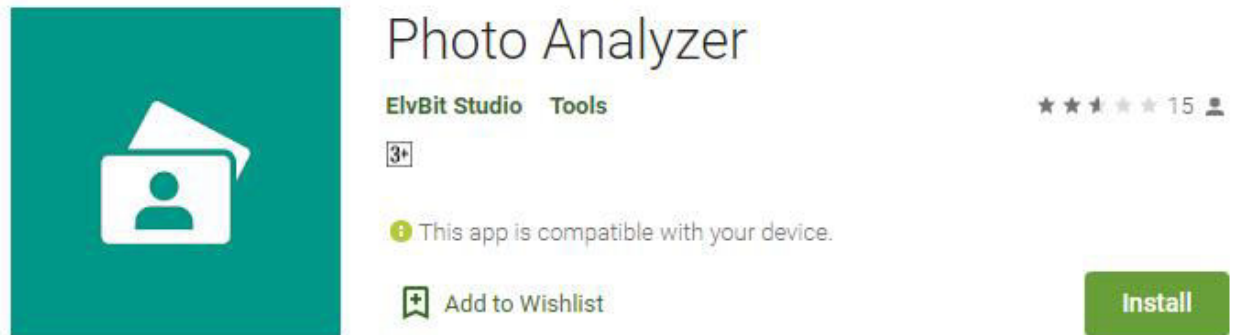


Figure 2.2.3: Photo Analyzer

2.3 Comparative Studies

There are lots of existing application in Google play store which has some limitations. Most of the applications have some problem. Different applications contain different problems and different solutions and most of them are really good to detect logos and visiting cards but not all of the applications are combined with Augmented Reality. But on this application have introduce

Augmented Reality technique that will make you happy and make it faster than other applications. When this application will detect the logo or visiting card, it will show some results that are appropriate and valid information. Hopefully users will be able to find useful information about any product's or companies by detecting their logos and visiting cards that they want to know.

Table 2.1: Comparative studies of application

Application Name	Key Features	Accuracy
Image Recognizer	Extract Text, Logo Detection	60%
Image Recognition	Logo Detection	50%
Photo Analyzer	Logo Detection	20%
Logo Detector	Logo Detection, Playing Video	100%

2.4 Scope of the Problem

Some difficulties I had faced while I was making this project. Those difficulties are not only from development side but also the complex mechanism of high end technology. Some difficulties that I have faced is given below.

- Complex development work in Unity environment.
- Viewing results in detected logos and visiting cards.

2.5 Challenges

2.5.1 Interaction with Android

Basically this is an Augmented Reality based mobile application, that's why making interaction with android was a great challenge.

2.5.2 User friendly

If the app is very complex to use then user will become fed up of using app and it make bad impact. So the functionality of the app must be simple and clear.

2.5.3 Performance

Building a well-designed and bug free app is mostly very important thing to do, and make sure it needs minimum amount of charge and time while performing.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Business Process Modeling

Working with an organizations without well reported procedures is look like as a pilot who is flying visually impaired without appropriately working instruments and route. This paper presents the fundamental ideas of displaying and actualizing business procedures utilizing current data advances and measures.

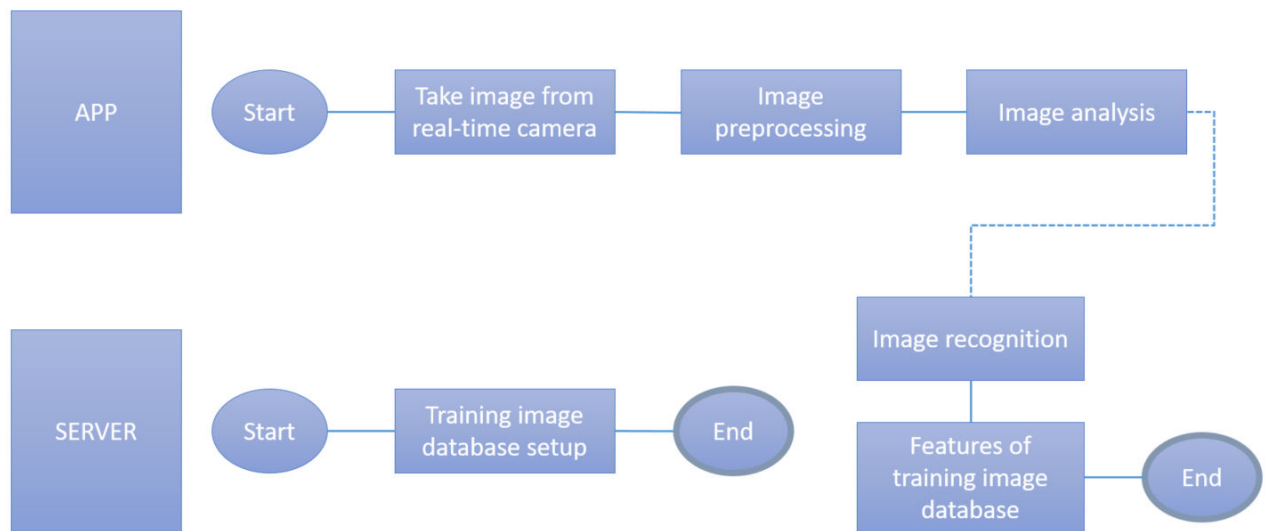


Figure 3.1: Business Process Model.

3.2 Requirement Collection and Analysis

3.2.1 Software Requirement:

- Unity3D Game Engine.
- AR (Augmented Reality) Camera.
- Vuforia Image Target.
- Android Studio IDE.

3.2.2 Hardware Requirement:

- Android support device (Android Smartphone)
- Windows Operating system
- System Requirements:
 - ❖ CPU: SSE2 instruction set support.
 - ❖ GPU: Graphics card with DX10 (model 4.0) capabilities.
 - ❖ RAM: 4GB (min), 8GB (preferable).
 - ❖ Hard Disk: 150GB (min).
 - ❖ Processor: 1.5GHz (min).

3.3 Use Case Modeling and Description

Use case model is a model of how various sorts of clients connect with the framework to tackle an issue. In that capacity, it portrays the objectives of the clients, the communications between the clients and the framework, and the necessary conduct of the framework in fulfilling these objectives. A use case model comprises of various model components. The most significant model components are: use cases, entertainers and the connections between them.

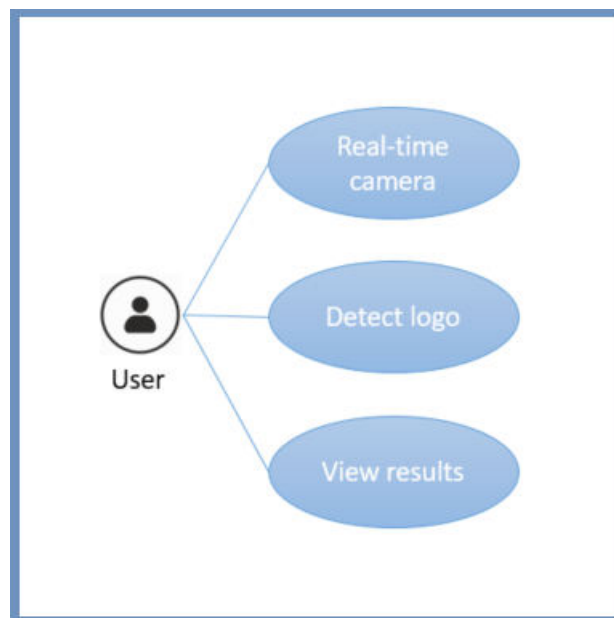


Figure 3.3: Use case modeling and description

Table 3.1: Illustrates the idea of use cases of different users.

Use cases	User of the application
Primary actor	User.
Pre-condition	User must have internet connection on their device.
Description	The user can detect their logos and visiting cards with no lacking of information. After detecting logos and visiting cards user will able to play video and go to visit Facebook or website through browser.
Post-condition	If the user wants to detect multiple logos at a time then they must refresh the camera view by clicking “refresh” button otherwise present result will overlap by previous result.

3.4 Logical Data Model

The Logical Data Model is the one utilized most in planning BI applications. It expands upon the prerequisites gave by the business gathering. It incorporates a further degree of detail, supporting both the business framework related and information necessities.

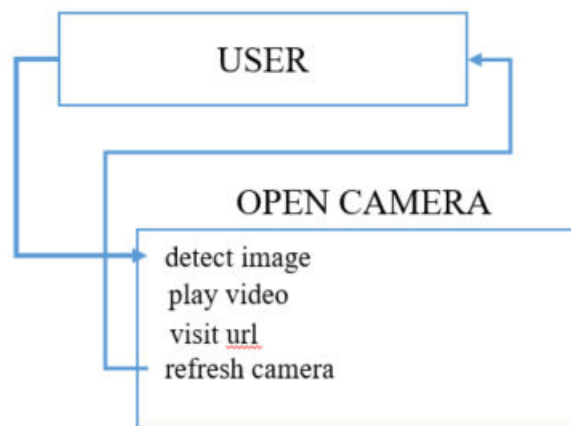


Figure 3.4: Logical data model.

3.5 Design Requirement

- ❖ Any kind of user will able to use this application.
- ❖ User have no permission to access in database.
- ❖ User can detect logos and visiting cards by their choice.
- ❖ Only available trained data will show after detecting image.

CHAPTER 4

DESIGN SPECIFICATION

4.1 Front-end Design

In the portion of front-end design for being user friendly, if the applications front-end design aren't simple, easy and user friendly to use then user will be confused, so it's very important to have a good looking and easy to use front-end design. That's why I build this application as simple as possible. So that the outlook seems very simple and easy.

4.1.1 Home Page

First of all when we get a fresh and simple user interface its mean users will feel free to use this application, that's why I make this home page very simple and clean.

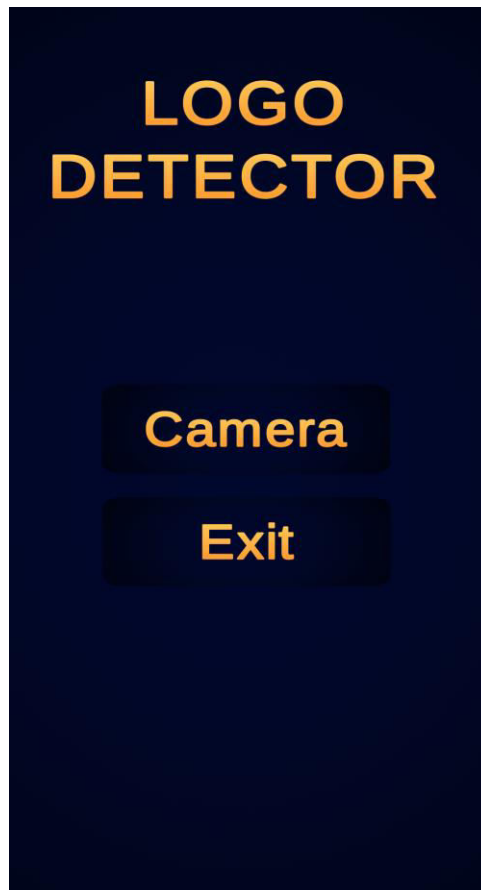


Figure 4.1.1: Front-end Home Page.

4.1.2 Logo and Visiting Card Detection

When user will start detecting logos or visiting cards the application will look like that.

❖ Logo Detection



Figure 4.1.2.1: Logo detection before-after.

❖ Playing video after clicking the play button



Figure 4.1.2.2: Playing video after clicking the play button.

❖ Visiting Card Detection

When AR camera will detect the visiting card then all the information of that visiting card will be shown in the screen and it will be real-time.



Figure 4.1.2.3: Visiting card detection before-after.

4.1.3 Visiting URL

I have added two buttons for visiting URL, once you click on those button then the application will open the URL into the browser.

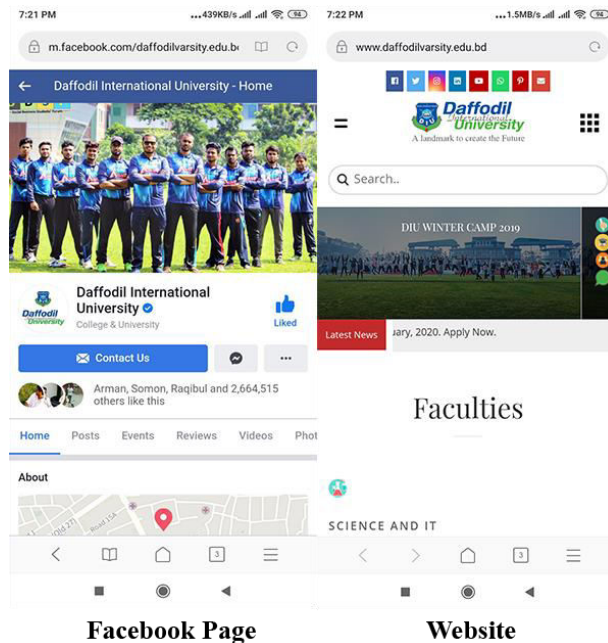


Figure 4.1.3: Open URL when buttons are clicked.

4.2 Back-end Design

- ❖ The whole process of back-end design is divided into two section (Vuforia Engine Database & API and Unity3D Game Engine).
- ❖ Making logos and visiting cards as image.
- ❖ Detecting images edges and vertexes as image targets.
- ❖ Using image target database in Unity

4.3 Interaction Design and UX

Regarding of huge amount back-end work, I have tried to make it comfortable, easy to understand and user friendly by using Unity3D, C# and Intellectual property of Vuforia Engine Qualcomm Augmented Reality (QCAR) that is a bunch of Natural Feature tracking algorithm. Vuforia first detects "feature points" in your target image [Web-based target management] and then uses the data to compare the features in target image and the receiving frame from camera [5]. After that

4.3.1 Interaction With Database

I have added some images to the database for train this application so it can learn from it and detect them as targeted image.

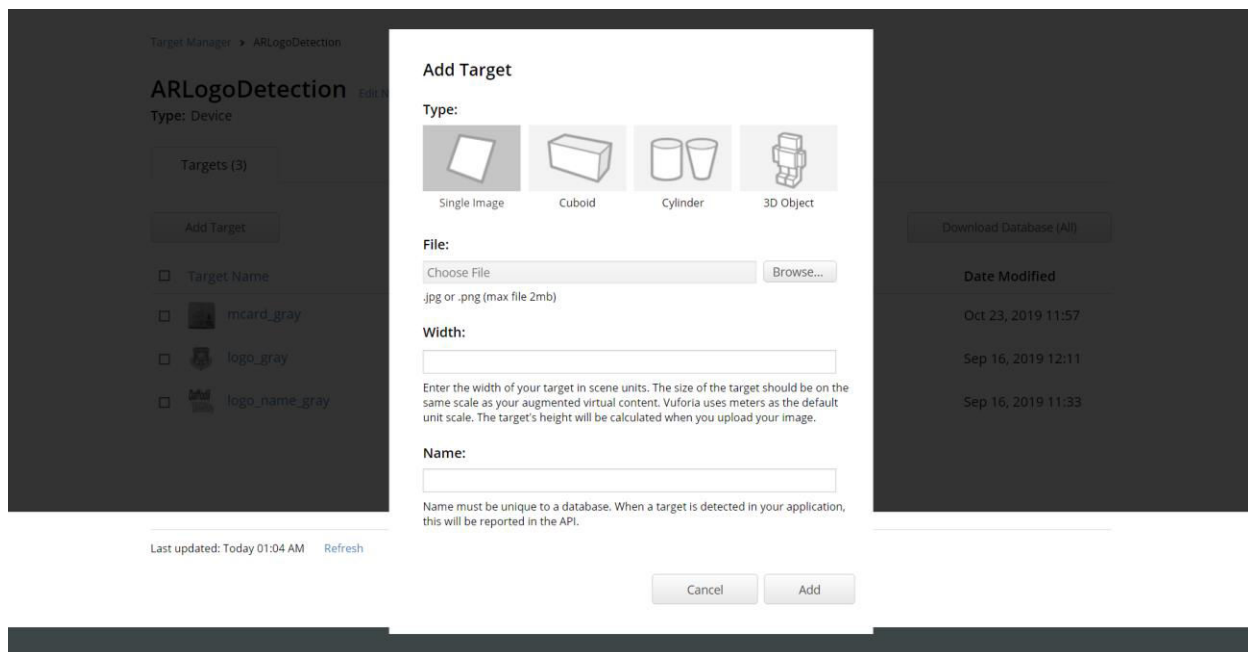


Figure 4.3.1: Interaction with database.

4.3.2 Interaction with Detection System

Vuforia Engine uses Qualcomm Augmented Reality (QCAR) that is a bunch of Natural Feature tracking algorithm. It helps to detect the edges and vertexes of the image that are available in the image. “A feature is a sharp, spiked, chiseled detail in the image, such as the ones present in textured objects. The image analyzer represents features as small yellow crosses. Increase the number of these details in your image, and verify that the details create a non-repeating pattern” [6].

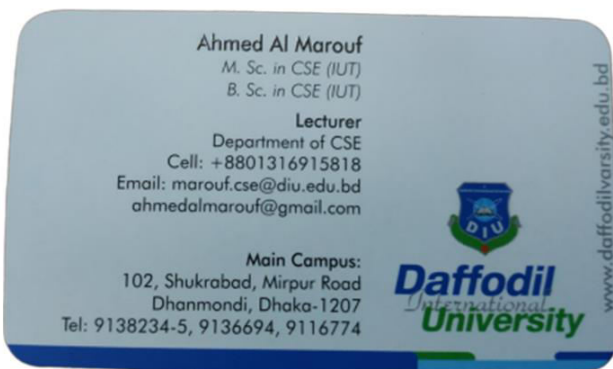


Uploading Image

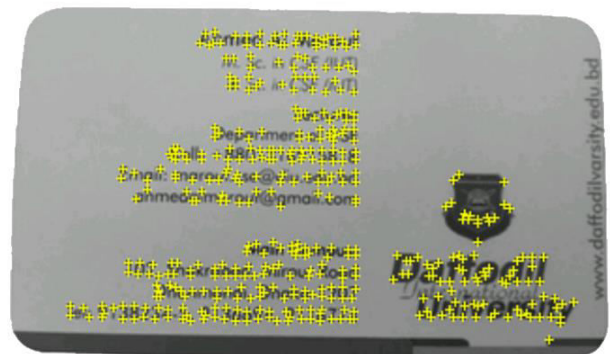


Analyzed Image

Figure 4.3.2.1: Image with high number of features.



Uploading Image



Analyzed Image

Figure 4.3.2.2: Image with high number of features.

4.4 Implementation Requirements

Implementation of this project are divided into some parts that are given below:

- ❖ Used Technology: The main requirements for this project are Vuforia Engine Feature tracking algorithm and Unity3D Game Engine.
- ❖ Programming/Scripting Languages: C#
- ❖ Database: Vuforia
- ❖ Storage: Vuforia
- ❖ Authentication: Vuforia
- ❖ Tools and Sites: Unity3D Game Engine, Vuforia Engine.

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation of Database

I have used Vuforia Engine developer portal database for storing target image. This is the Intellectual property of Vuforia Engine Qualcomm Augmented Reality (QCAR) that is a bunch of Natural Feature tracking algorithm. It helps to store all the data with making it a target image. When images are uploaded in the database they automatically detects those features (edges and vertexes) that has in the images. I have added some images to the database for train this application so it can learn from it and detect them as targeted image.

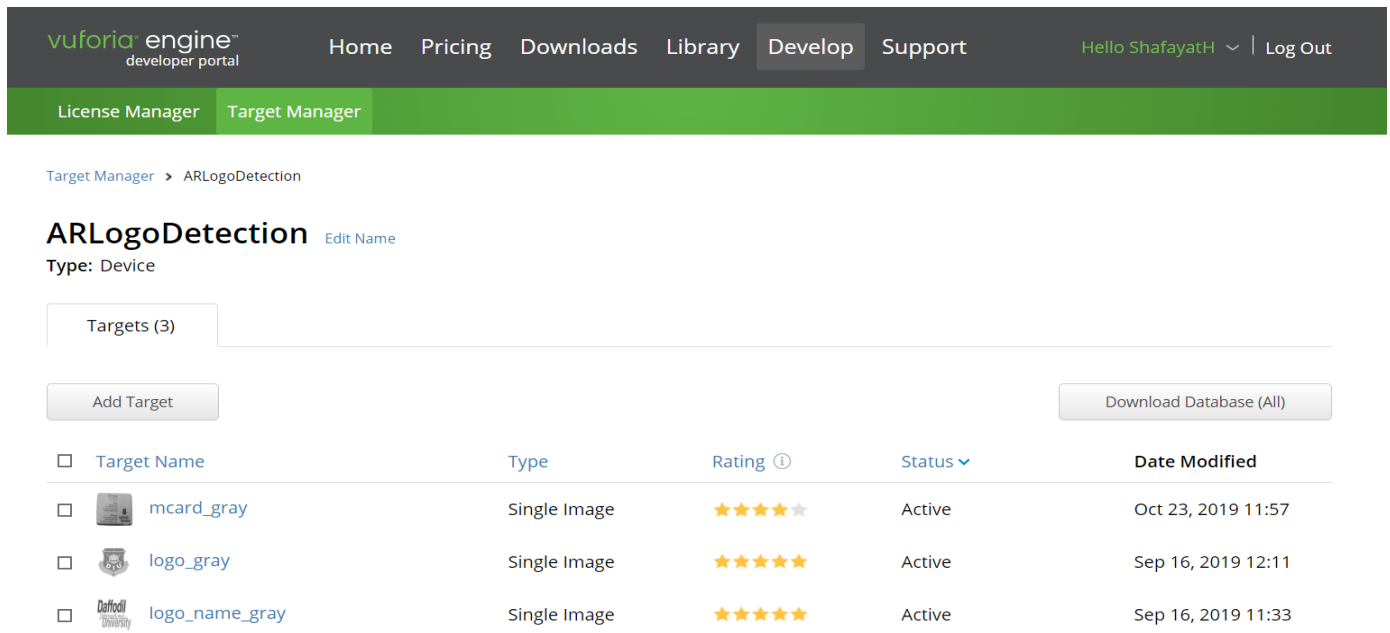


Figure 5.1: Implementation of Front-end Design.

5.1.1 How does AR work:

The Augmented Reality technology can work using one of the following three approaches:

- **SLAM:** Simultaneous Localization and Mapping (SLAM) is the most effective way to render virtual images over real-world objects. SLAM simultaneously localizes sensors with respect to their surroundings, while at the same time mapping the structure of the environment.
- **Recognition based:** Recognition (or marker) based augmented reality uses a camera to identify visual markers or objects, such as a QR/2D code or natural feature tracking (NFT) markers, to showcase an overlay only when the marker is sensed by the device. Marker-based AR technology depends upon device camera to distinguish a marker from other real-world objects.
- **Location Based:** Contrary to recognition based, location-based AR relies on a GPS, digital compass, velocity meter, or accelerometer to provide data about the location and the augmented reality visualizations are activated based on these inputs. It is also known as markerless augmented reality. The location detection features in smartphones make it easy to leverage this type of augmented reality technology, making it quite popular. Some common uses of location-based AR include mapping directions, finding nearby services, and other location-centric mobile apps.

5.2 Implementation of Front-end Design

I have tried to keep this application's front-end design as simple as possible and attractive also. I added videos, Facebook URL, website URL and personal information on the detected image, and many more features have been added to make it user friendly.

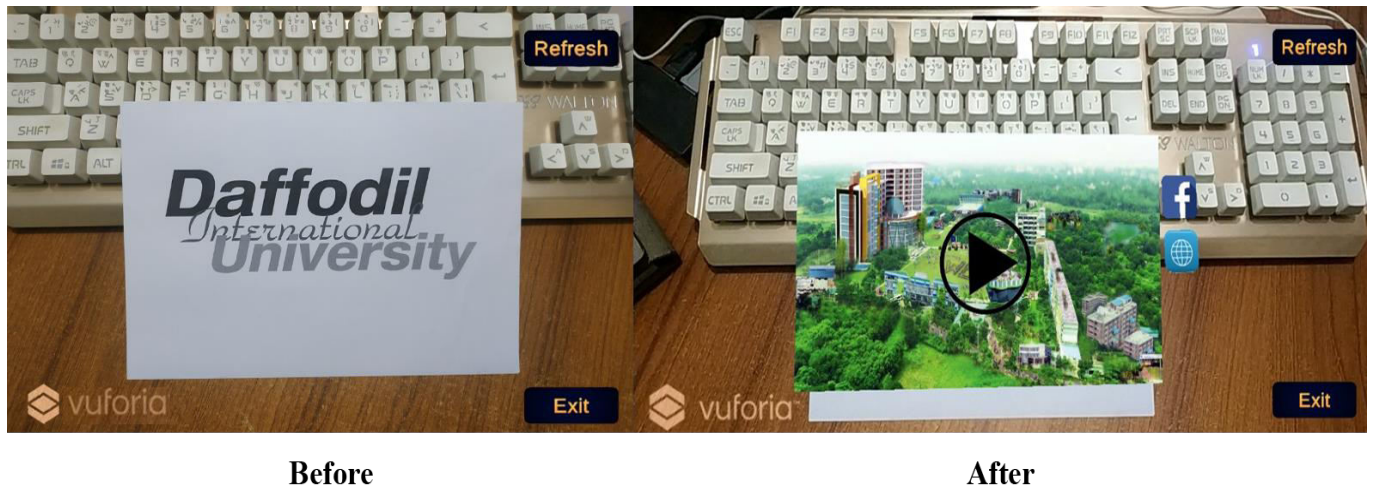


Figure 5.2: Implementation of Front-end Design.

5.3 Implementation of Interactions

5.3.1 Play Video

When a user will start detecting logo, if there is any video about this logo then a play button will shows up. If the user click on the play button then a video will start playing in other activity.

5.3.2 Cache Store and Clean

Augmented Reality Camera store some cache after detecting image. Sometime it helpful because when target image is not in the area of camera field but by storing cache it helps to see the results. But if multiple target are comes to the field of camera view then multiple cache are shows in the main screen that's why it's need to clean the cache for viewing the proper results. So to solve this problem I have added a cache clear button name refresh.

5.3.3 Open URL

I have added two buttons for visiting Facebook page and websites. When user will click the button, application will open browser and show the added URL.

5.4 Testing Implementation

Testing Implementation is a procedure to check the execution of mechanical methodologies. On one hand it executes the approaches to manage check if it works, everything considered, or not, on other hand it exhibits the headway and lacking of the application.

Table 5.1: Testing implementation

Test Case No.	Test Names	Test Case Results (Pass / Fail)	Remarks
TC - 1	Launch Application's Real-time Camera	Pass	None
TC - 2	Logo Detection	Pass	None
TC - 3	Visiting card Detection	Pass	None
TC- 4	Playing Video	Pass	None
TC- 5	Open URL	Pass	None
TC - 6	Refresh Camera	Pass	None

5.5 Test Results and Reports

I have tested this application by ten users who tested every single part of this project and found 100% accuracy to detect logos and visiting cards. The results of testing and implementation is shown bellow.

Table 5.2: Test Results and Reports

Test Case No	Test Case User	Accuracy (Pass)	Accuracy (Fail)
TC-1, TC-2, TC-3, TC-4, TC-5, TC-6	User-1	100%	
TC-1, TC-2, TC-3, TC-4, TC-5, TC-6	User-2	100%	
TC-1, TC-2, TC-3, TC-4, TC-5, TC-6	User-3	100%	
TC-1, TC-2, TC-3, TC-4, TC-5, TC-6	User-4	100%	
TC-1, TC-2, TC-3, TC-4, TC-5, TC-6	User-5	100%	
TC-1, TC-2, TC-3, TC-4, TC-5, TC-6	User-6	100%	
TC-1, TC-2, TC-3, TC-4, TC-5, TC-6	User-7	100%	
TC-1, TC-2, TC-3, TC-4, TC-5, TC-6	User-8	100%	
TC-1, TC-2, TC-3, TC-4, TC-5, TC-6	User-9	100%	
TC-1, TC-2, TC-3, TC-4, TC-5, TC-6	User-10	100%	

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 Discussion and Conclusion

There is no uncertainty that Augmented Reality will reshape something beyond these enterprises. As gadgets adjust to the new innovation, the development of Augmented Reality is exponentially colossal. With such a large number of positive points of interest. From various methods for examining and breaking down, the majority of the information and data persuade that AR innovation is image processing field, also additionally parts that identifying with design and structure, for example, 3D modeling and visualization. With AR being fairly new and creative in each perspective, I have done a general research on AR innovation. This has enabled me to gather more data about Augmented Reality before me centering down my points and goals. At the same time, these investigates additionally help supporting my works extends as I become more acquainted with what would Augmented Reality be able to accomplish in each angle.

All through my essential research, the outcomes are just positive towards Augmented Reality application in image processing and detection system. From the information and hypothesis that I accumulated in the overview, I am ready to find another side of the story, which is the thing that people in general hypothesizes about Augmented Reality innovation. By dissecting the two sides of this research, I am ready to turn out an end that albeit changing the manner in which we configuration is only incomprehensible for Augmented Reality, it can absolutely redo our present plan process into an increasingly exhaustive and straightforward procedure as far as image processing.

6.2 Scope of Future Developments

Augmented reality will contact all parts of our lives, our general, public, and the resulting rules we live by. As we adjust to the new abilities and power that expanded reality offers on us, we should consider things diversely and surrender some esteemed thoughts and dreams. It will change social mores and rules, and challenge the individuals who hold control self-assertively.

- Adding new feature
- Extracting text from logo and visiting cards with Optical Character Recognition (OCR)
- Faster and secure.

REFERENCE

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APPENDIX

APPENDIX A: Project Reflection

I have taken in a great deal by doing this project. Now have a better idea of Augmented Reality and Vuforia Engine than previous. I have found out how to manage time and now I am very acquainted with the clients need in reasonable manner. I likewise have figured out how significant client's information is, with the goal that I have put all of my efforts and hard work to make this application as secure as possible.

APPENDIX B: Build Pipeline of Unity Game Engine

Build Process (or Build Pipeline) is a set of tools and steps that game developers use to create a build. If you're a solo developer, the process is simple. Your code, assets, revisions, and build environment and machine, are all on your local computer. But a team environment requires tools and processes to determine the "authoritative" version of the game the team should be improving. Repository (or "Repo") where assets and code is stored. In professional environments, all files in a project are stored in a Source Control Management ("SCM") system, so multiple team members can work with the same resources with minimal conflicts [7].

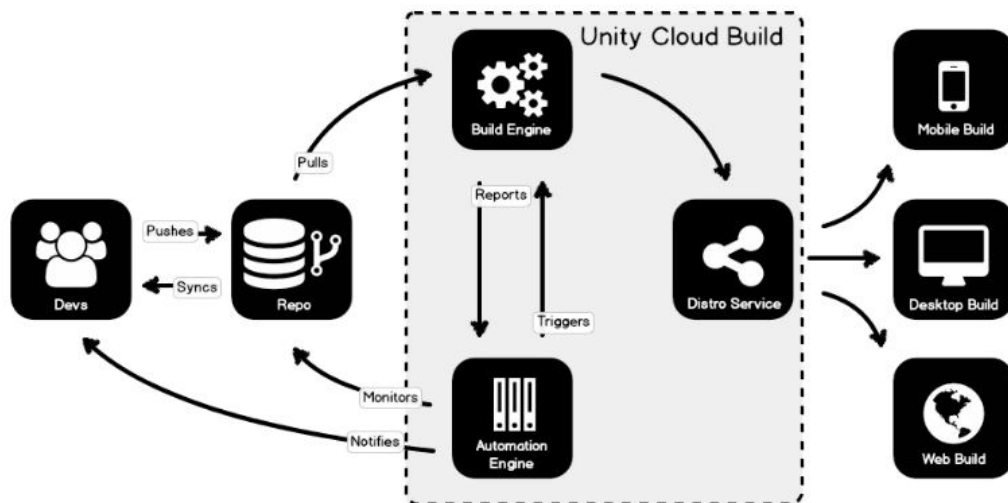


Figure Appendix: Build pipeline of Unity game Engine

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