

AR BASED 3D SMART FOOD MENU

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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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DHAKA, BANGLADESH

JULY 2020

APPROVAL

This Project/internship titled “3D SMART FOOD MENU”, submitted by MD. MAHBUBUL ISLAM, ID No: 172-15-9912 and SADIA TASMEEM TUMPA, ID No: 17215-9798 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 09/07/2020.

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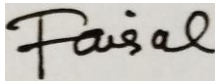
We hereby declare that, this project has been done by us under the supervision of **Abdus Sattar, Assistant Professor, and Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ACKNOWLEDGEMENT

First we express our heartiest thanks and gratefulness to almighty God for His divine blessing makes us possible to complete the final year project successfully.

We really grateful and wish our profound our indebtedness to **Abdus Sattar, Assistant Professor**, Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of “*Augmented Reality (AR)*” to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior draft and correcting them at all stage have made it possible to complete this project.

We would like to express our heartiest gratitude to **Dr. Syed Akhter Hossain, Professor and Head**, Department of CSE, for his kind help to finish our project and also to other faculty member and the staff of CSE department of Daffodil International University.

We would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, we must acknowledge with due respect the constant support and patients of our parents. We appreciate and admire it with respect and gratitude.

ABSTRACT

Augmented Reality (AR) is an interactive experience or a combination of real-world and digital data. It simplify and enhances user knowledge of interaction with physical world by imposing virtual images on real ones. This is the new way of manipulating how we interact with that world, without replacing the real world. Augmented Reality has manifested in various fields today like Education, Navigation, Games, Industry, Medical, Advertisements and Architecture. Technological innovations are always popular with users and potential customers. A company or brand that chooses to use augmented reality applications still has the upper hand to gain visibility into their business. It would help attract new customers and retain the existing ones. Our vision is to serve the best ingredients for the customers and to be known with this product with our hard work and dedication to our business also to become the customer's first choice and one of the famous Smart service providers in the field of smart App World.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Learning is an alternative behavior and ideas by gathering experiences and earning knowledge. Augmented reality (AR) improves client discernment and experience, and enables clients to see furthermore, experience this present reality with virtual substance installed into it. Also, AR permits collaboration continuously. Thus specialists just as instructors have been anxious to investigate improving material for instructive purposes with the assistance of AR innovation. Augmented reality system generates a composite view for the user that is the combination of the real scene viewed by the user and a virtual scene generated by the computer that augments the scene with additional information [1]. The virtual scene generated by the computer is designed to enhance the user's sensory perception of the virtual world they are seeing or interacting with [1]. The goal of Augmented Reality is to create a system in which the user cannot tell the difference between the real world and the virtual augmentation of it [1].

1.2 MOTIVATION

Sometimes we do not understand much to see the pictures of food in the menu card. By this application you will see 3D view of the food. As a result you can make the right decisions in the order of food. App have been augmented with various visualizations, such as 3D graphics and animations, and sound. Augmented reality food menus are an enhanced version of traditional menus and feature detailed 3D models or photographs of actual dishes [2]. Customers scan physical menus with smartphones or tablets to view digital representations of food items along with additional information such as ingredients, portion size, nutritional information and more [2]. AR food menus can also be customized to show complementary choices for appetizers, drinks and desserts [2].

1.3 OBJECTIVES

We submitted an AR application for customer with flowing objectives.

- To make the right decision on ordering food.
- Improved information.

- Easy visualization.
- Helps to know details about the food.

1.4 EXPECTED OUTCOME

Target consumers: AR menus and restaurant apps are a good way to transcend language barriers and engage foreign customers, since they can be calibrated for multiple languages [2]. Adding detailed nutritional information can also lead to better engagement with customers with specific needs such as diabetics or health conscious or those with religion-based dietary guidelines [2].

Evaluate customer experience: AR based food menus can serve as tools to collect data about customer preferences [2]. Apps can have built-in features to provide data on popular dishes, time spent on viewing promotional features and collate answers from surveys to provide valuable information to business owners [2].

1.5 RESEARCH QUESTIONS

- Do you think this is a new way to progress in work field in this era?
- Augmented Reality makes it possible to visualize an object in a personalized context. Is it more than easy to choose and order the food?
- It provides the opportunity for consumers to make well-informed buying decisions anywhere and anytime. Is it really useful for a customer?
- It provides the opportunity for consumers to make well-informed buying decisions anywhere and anytime. Is it really useful for a customer?

1.6 REPORT LAYOUT

We have organized our report as follows.

In Chapter 2, we introduce the background overview of our project. In this part we also briefed about the Literature Review of the project including with different type of AR applications in the present day world and realize their activities or key role in our life [3].

In chapter 3, we specified the development requirements tools. In this part we will show how easily we create an AR application by using Unity, Vuforia and other tools in our project [3].

In chapter 4, we exhibited the implementation of the whole project, like coding part, 3D model view of the molecules and how they reacts with each other [3].

In chapter 5, we specified the result and discussions of our project [3].

In chapter 6, we designated about conclusion and the scope for future work of the project and At last of all, give some related reference to ensure that the information in report are must be correct [3].

CHAPTER 2

BACKGROUND

2.1 INTRODUCTION

The augmented reality (AR) technology has come to remain and changing the way how we interact with the environment that encompass us. Adding digitally created objects to the reallife environment through the smart devices can potentially changing every industry, from education, navigation, marketing and healthcare to entertainment and gaming [2]. At the age of modern science the term Augmented Reality (AR) is used to describe a combination of technologies that enable real-time mixing of computer-generated content with live video display. Augmented Reality enhances a user's feeling and interaction with the real world. The virtual objects display information that the user cannot directly detect with his own senses. The information conveyed by the virtual objects helps a user perform real-world tasks. AR is a specific example of what Fred Brooks called Intelligence Amplification (IA): using the computer as a tool to make a task easier for a human to perform [3].

2.2 LITERATURE REVIEW

In this paper we identified at least 8 Unique Classes of AR application state. These classes contain well-established state like education, medical, military, entertainment and games, robotics, marketing, navigation and architecture.

There is no doubt in the tremendous use of augmented reality in the food industry. Along with the giant manufacturers, the restaurant chain owners are also leveraging the potential of AR for boosting their businesses. From managing tons of inventory of food stock to modernizing the restaurant's dine-in experience, AR takes your business to one step ahead from others [3].



Figure 2.2.1: AR application in food industry [4]

Implementing AR into your food business brings you so many benefits at no extra efforts. From high customer satisfaction to elevating current sales, AR applications can help you giving a new direction to the existing business model [3].

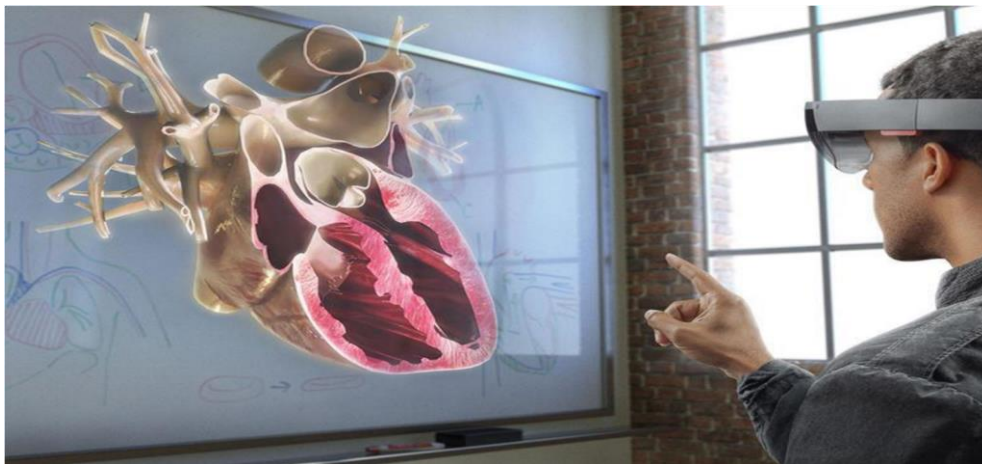


Figure 2.2.2: AR application in medical science [5]

The military sector has always been advancing using technological advances raised for training and development of war. Augmented reality can be used to show true battlefield scenes and increase it with annotation information [6]. Hybrid Optical and Internal Tracker Using Small MMS (micro electro-mechanical systems) Sensor, Cockpit was developed for helmet tracking [7]. Special privileges for military users can be practiced in real-time enemy action like the reality of the training and wartime Augmented reality system at large battlefields. Tactical augmented reality helps to reduce the number of devices that the device should run, and may help reduce the efficiency of our enemies more effectively, to improve the battlefield awareness of the soldier's troops.



Figure 2.2.3: AR application in military [8]

Augmented Reality has been used in video gaming and media entertainment for a long time to show a real picture interacting with one made from computer graphics. Most fundamental ideas of Augmented Reality have been used in the film and science fiction like as RoboCop (1987) and Terminator (1984) [7]. AR can provide advertisers to show virtual advertisement and product placement. Augmented reality has been used to create games in the entertainment industry. Augmented reality gaming is still now a new concept. The first popular AR games on mobile are Pokémon Go and Ingress. More than 25 AR games are released for iOS and Android (such as Army of Robots and Zombie GO, ARrrrrgh, WallaMe, Temple Treasure Hunt etc.) [9]. AR games are able to fight aliens, capturing fantastical animals, protecting the real world kingdom. Augmented Reality is also applied to life swim action, Snooker ball trajectories, annotate racing cars etc.



Figure 2.2.4: AR application in entertainment & game [10]

Augmented Reality Tool for Operators Support, where people and robots share a shared millennium in the workplace. Provides system visualization, video and text based instructions, and visualization of production status. This tool enhances the safety of the operator and hybrid assembly environment through the immersion capabilities of AR technology. Augmented Reality is a norm stage for human-robot collaboration [11]. Robotics has greatly helped the augmented reality. Microsoft was leading leader here in the implementation of AR technology to robotics. The cartographer was opened in 2016 and the standard path packages have become a distinguished 2nd and 3rd mapping solution for robots from Marble suppliers, lift Level 5 Lab Automatic Driving Car.



Figure 2.2.5: AR application in robotics [12]

Augmented Reality Navigation Features seem to be made for retailers in many ways. Navigation is one of the most sensational parts of retail where it can be easily applied. AR is surely made its way in the business world and around the world. One of the ways it is available its practical application is in navigation and maps. In the last year's I/O developer's conference, Google has shown a new augmented reality feature for Google Maps, which will provide real-time guidance to people from our phone camera [11]. The AR display at the museum is one of the reasons for the expansion of navigational applications, due to the amount of equipment it needs. Navigating through seas of different summit and conference events is always a challenge. However, an easy AR solution can strengthen domestic navigation through a pavilion and it can walk in a park instead of running through the jungle.



Figure 2.2.6: AR application in navigation [13]

The augmented reality of construction and architectural projects has established a 3D model of an existing space using a mobile device and 3D models. AR architecture and interior design are the way to support a decision. Before the construction begins, an architect can use the AR application to show its model to engineers and manufacturers, and they can point out potential problems when they are easy to fix and correct the mistakes. It was developed to use AR systems to improve the structure, construction and renovation of the architectural structure in Figure 2.2.7. A prototype system was created to use AR for architectural appeal for skill management and maintenance. Examples of real-time augmented reality visualization service for architectural models are ARki. It incorporates AR technology into masonry by providing 3D models with multiple equality of interactivity for both design and presentation motives.

ARki can be used on any iOS/Android device [14].



Figure 2.2.7: AR application in architecture [15]

Industry dealing with consumer merchants is implementing augmented reality solutions as a part of their advertising strategy. Retail companies and automotive manufacturers with the integration of digitally created media within an existing actual environment is attracting consumers. The trends of augmented reality technology and its potential solutions are used to visualize and examine the effectiveness of Ad strategies.

Therefore, the implementation of augmented reality in the advertisement is helping the industry to offer the direction to the brands and its services. The three-dimensional images within real surroundings provide unique sensory capabilities and opportunities to the Ad industry. The benefit behind the AR in the ad industry is that users retain information and recall the message conveyed through virtual Ads [16].

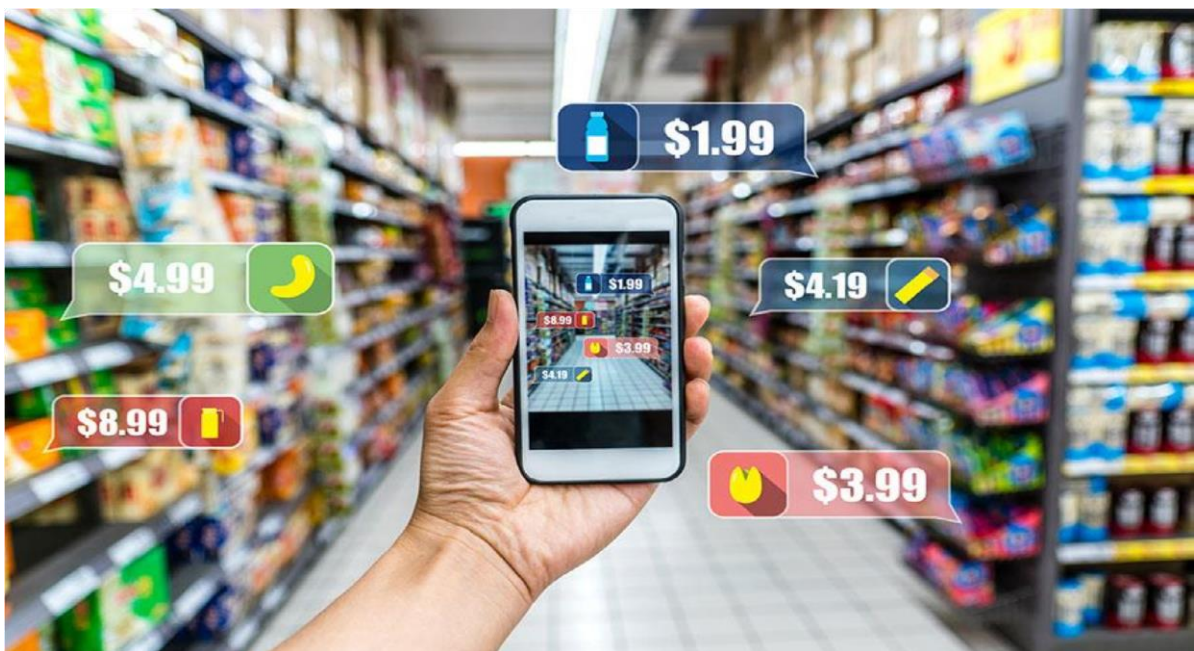


Figure 2.2.8: AR application in marketing [17]

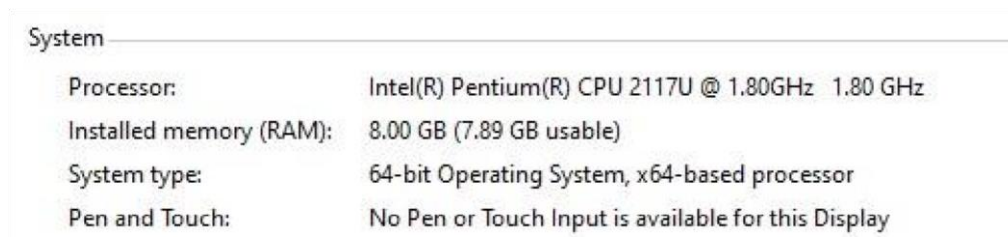
CHAPTER 3

DEVELOPMENT REQUIREMENTS AND TOOLS

3.1 HARDWARE REQUIREMENTS

PC CONFIGURATION:

For making a gaming project, a pc must need a minimum hardware requirement. There is a Figure 3.1 about hardware requirement which is shown below.



System	
Processor:	Intel(R) Pentium(R) CPU 2117U @ 1.80GHz 1.80 GHz
Installed memory (RAM):	8.00 GB (7.89 GB usable)
System type:	64-bit Operating System, x64-based processor
Pen and Touch:	No Pen or Touch Input is available for this Display

Figure 3.1: Hardware Configuration

Processor: Intel Pentium

CPU: 1.80 GHz

RAM: 8.00 GB

DEVICE CONFIGURATION:

Android Version: Up to 6.00 (Marshmallow- Pie)

RAM: 2GB

ROM: 150MB

CAMERA: 5MP

This is the minimum device configuration

3.2 APP REQUIREMENTS

In order to fully appreciate the requirements of an App developing system, it is important to have details on the following:

- Current methods used in industry for developing App.
- An understanding of the formats available.
- Implementation details of the methods used in App development.

The first thing to ask is why is it necessary to develop an app accurately?

Because one can usually satisfy by using this App for the first time. Comparing with the other Apps one can easily see the difference to fascinate a user easily.

3.3 UNITY PROJECT CREATION

At first we create an account in unity to start a new project. For starting a unity project developer should set a project name. Our project name is '3D SMART FOOD MENU'. As our App is 3D, so we choose 3D platform. After that clicking on "create project" button created our project in our selected direction. There is a Figure 3.2 about project creation which is shown below.

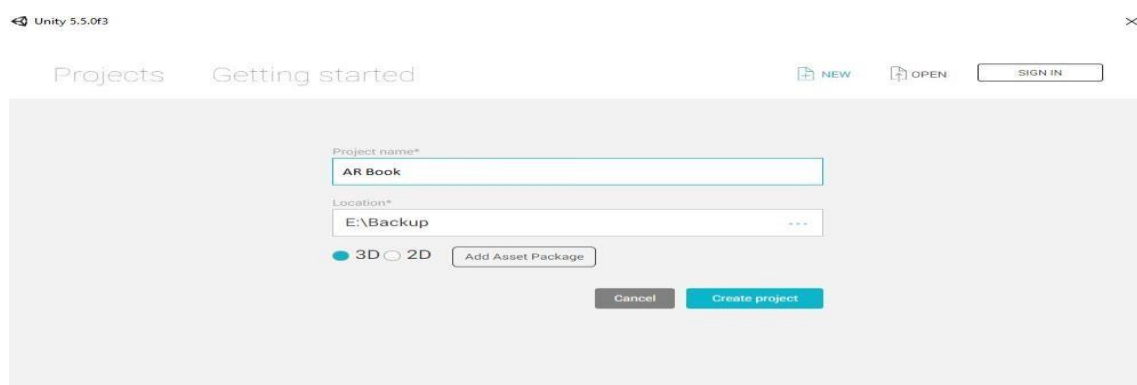


Figure 3.2: Creating project in unity

3.4 ORGANIZING PROJECT

The good practice of handling a project is get organized stuffs before get started. While we created our project in our location we have noticed that there is a built-in folder named assets. Here we put all of our different stuffs in an organized folder view. An App contains of too many contents like animation, audio,

scripts, scenes, materials, particles, sdk etc. The benefits of we had done this is while we want to find something we will get it on its named place. Because management of time is very necessary. Project organizing Figure 3.3 is shown below.

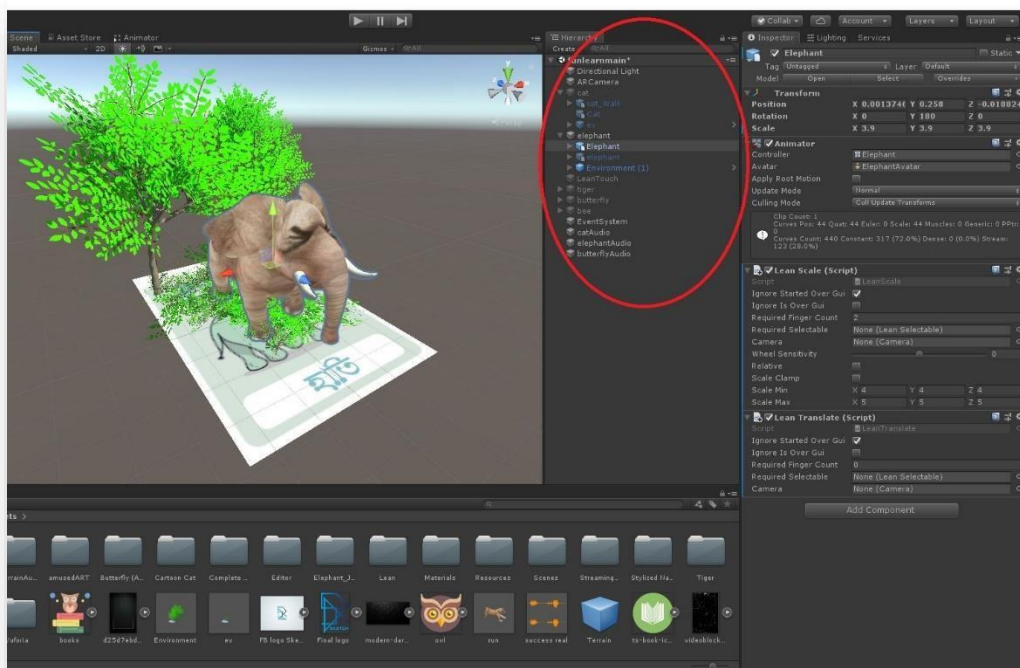


Figure 3.3: Organizing Project

3.5 VUFORIA

In this project we use Vuforia SDK. It is a Software Development Kit (SDK) for creating AR application. It allows putting virtual 3D objects is related to real-world objects at the camera screen. For implementation we use Vuforia Engine in version 7.5. We develop an android application of kids learning by using Vuforia.

3.6 WORKING WITH VUFORIA

First we need to Login to Vuforia developer platform by using vuforia user account & password.

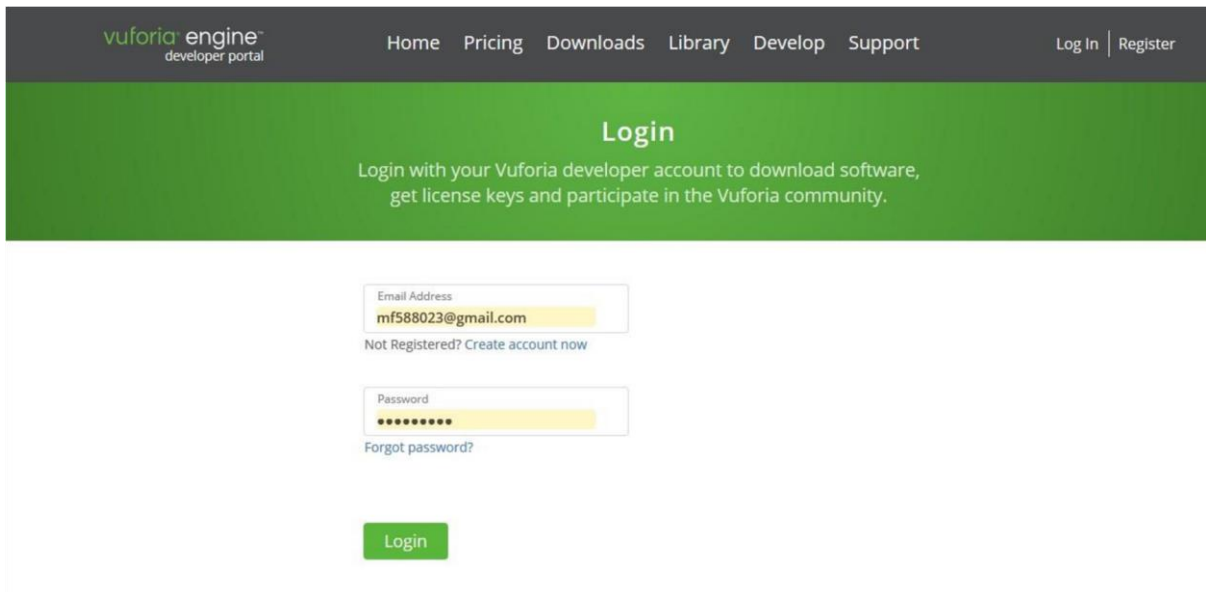


Figure 3.4.1: Vuforia Login

Click to Develop tab and press Get Development Key button. Copy the license key. And paste to the license box in unity app. It is required for Vuforia to work.

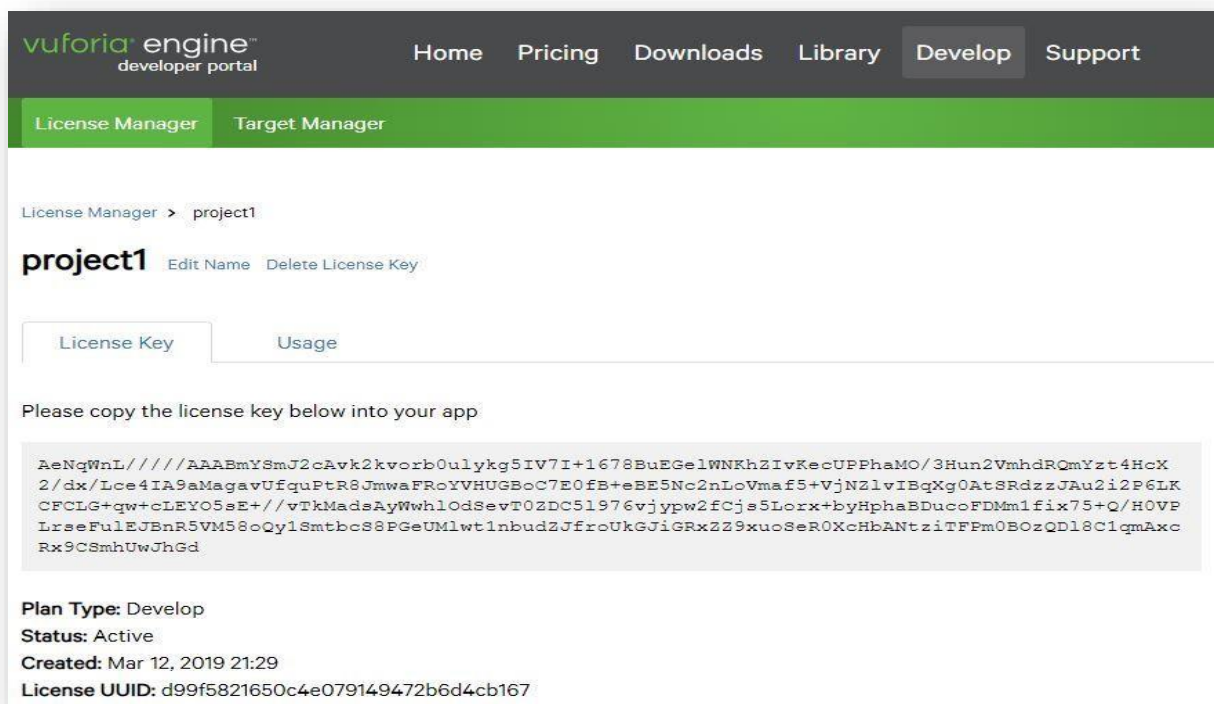
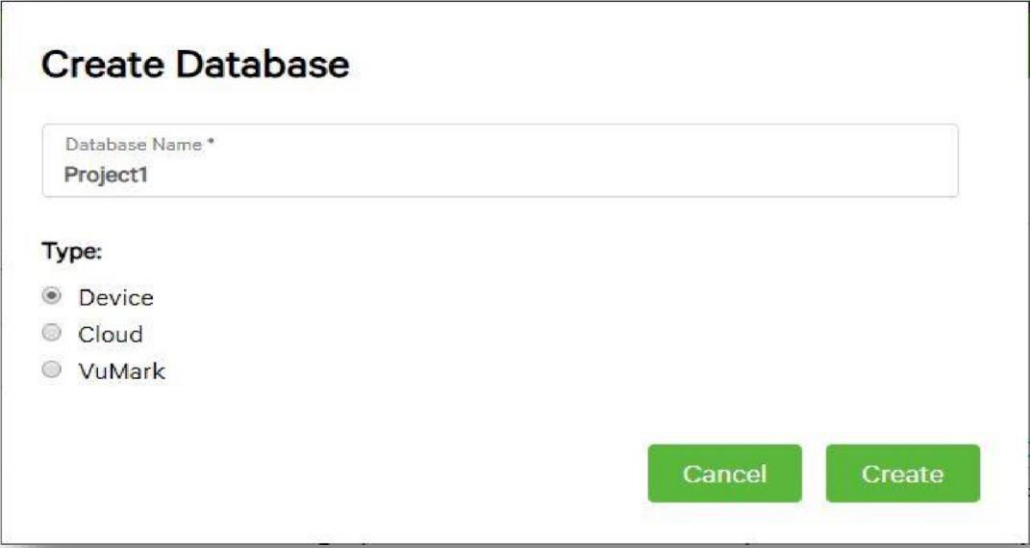


Figure 3.4.2: Vuforia License Manager Key

3.7 CREATE DATABASE

We have to select “device” and put a name in the database section. And click “create” to make a database.



Create Database

Database Name *
Project1

Type:

- Device
- Cloud
- VuMark

Cancel Create

Figure 3.5.1: Create Database

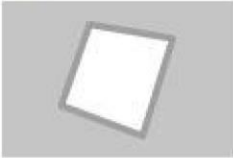
After setting our database, we have to go into its details. We add a new target. A target is an object that recognized by Vuforia and work with. There are 4 types of targets:

- Single Image (that is our pick)
- Cuboid
- Cylinder
- 3D Object


At the next, we upload an image file, input its width and name it.

Add Target

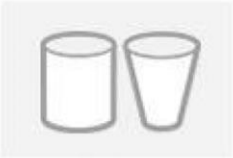
Type:




Single Image



Cuboid



Cylinder



3D Object

File:

Browse...

.jpg or .png (max file 2mb)

Width:

Enter the width of your target in scene units. The size of the target should be on the same scale as your augmented virtual content. Vuforia uses meters as the default unit scale. The target's height will be calculated when you upload your image.

Name:

Name must be unique to a database. When a target is detected in your application, this will be reported in the API.

Cancel Add

Figure 3.5.2: Add Target

It take place on the target list after adding. It is worth to pay attention to the ranking of targets. The higher, the better. It means that an image or object with higher ranking has more specific points for Vuforia to recognize it. In our case, the image has the highest possible ranking.

When we add all of our targets, we choose which ones we want to have in our Unity package. After this, we press the Download Database button. We must choose Unity Editor as a development platform.

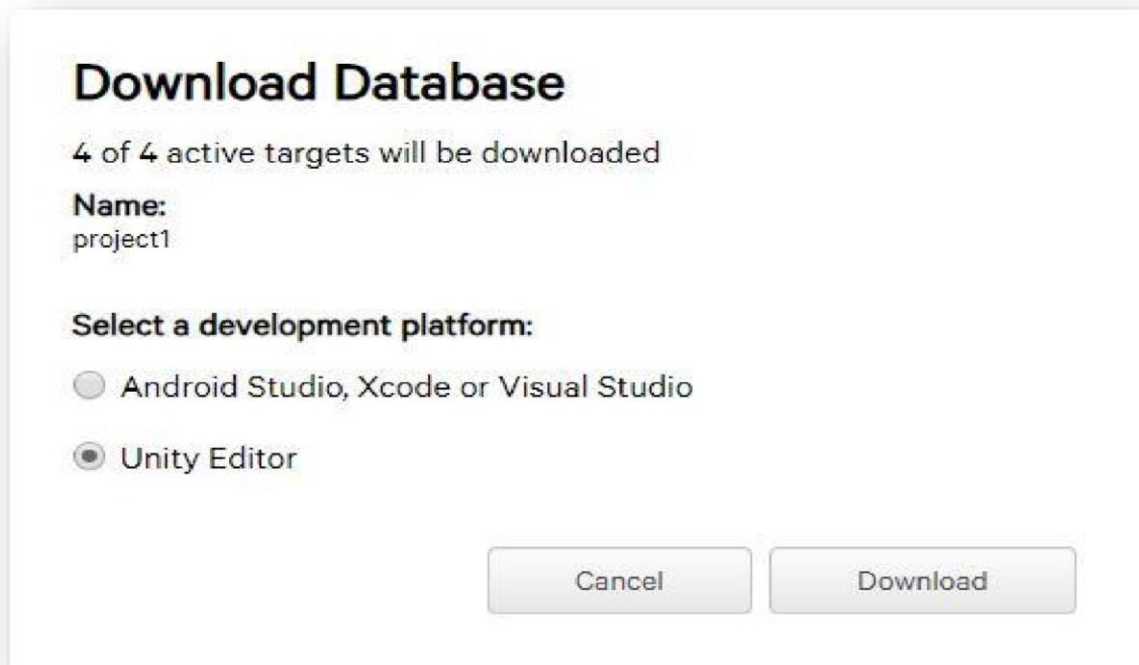


Figure 3.5.4: Download Database

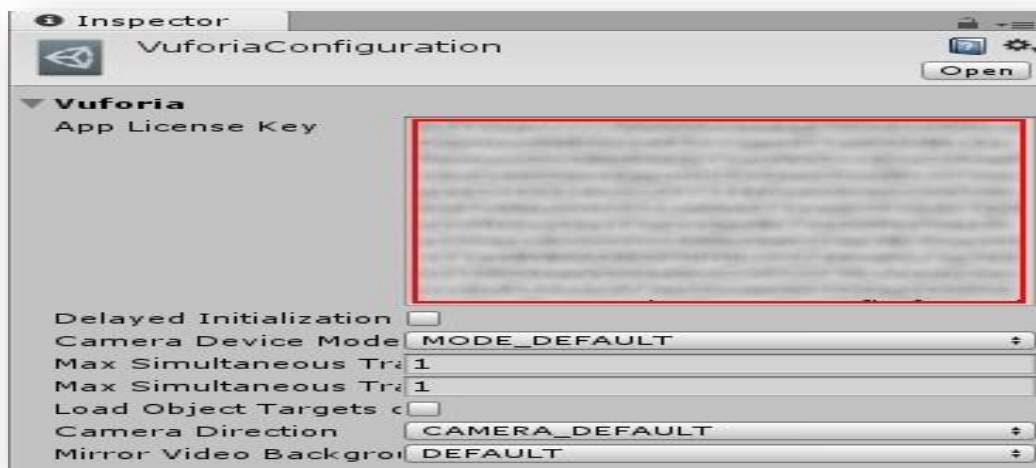
3.8 USING VUFORIA IN UNITY

Now, we import our database to the Unity project. We can do this by choosing Assets->Import package->Custom package and picking our file. To work Vuforia we use a special camera object called AR Camera. We have to delete the standard Unity camera and then, from our assets, we must choose AR Camera and place it on the scene. In the scene hierarchy, click a right button of the mouse and from the menu bar that is appear, at first select Vuforia and after AR Camera.



Figure 3.6.1: AR Camera

Now, we have to add the license key in Vuforia configuration.



If our app wants to recognize the objects in the real world, we have to add these objects to the scene. An object that represents a Single Image is called simply an Image. We can find Images in the same menu as AR Camera. After adding it to the scene set its position to 0, 0, 3 and in the Image Target Behavior script of this object set a database and image target to the corresponding element. From now on Vuforia is recognize our image in the real world.

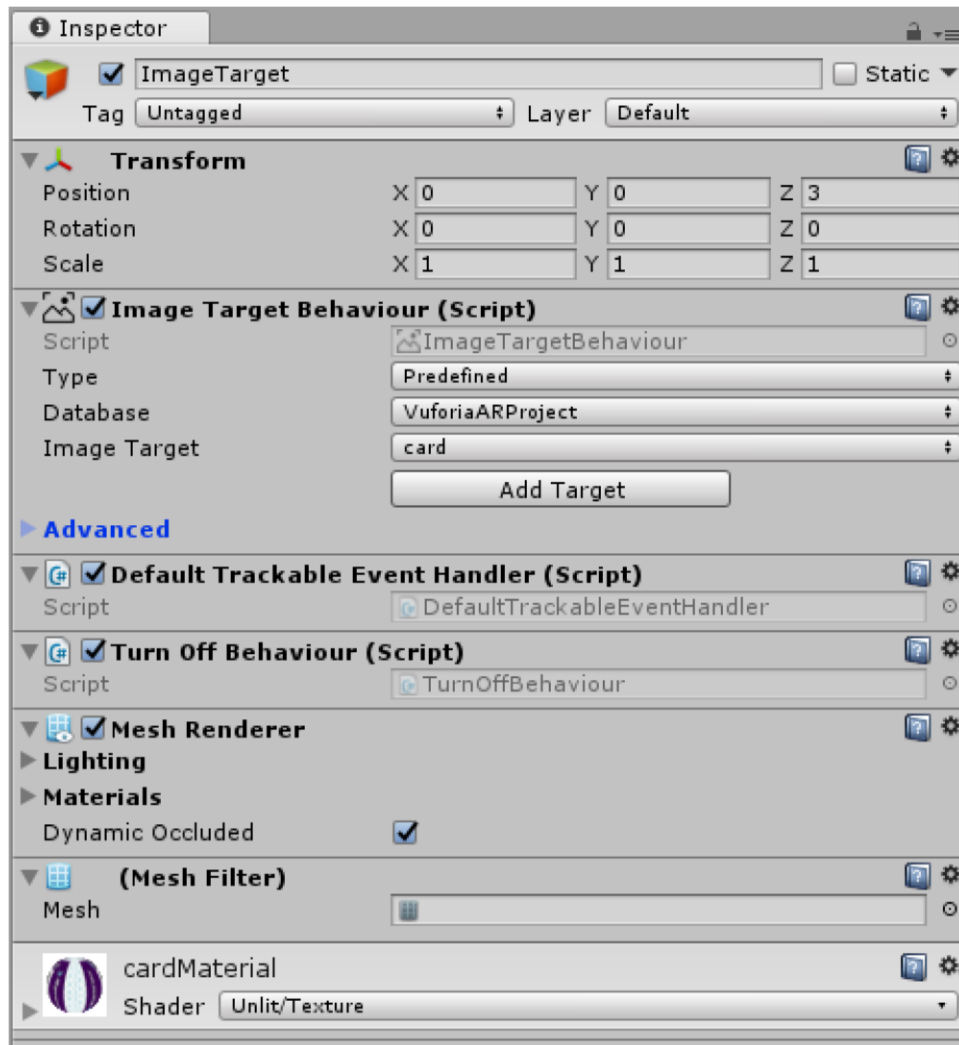


Figure 3.6.3: Image target

The last thing to do is to add a 3D model as a child object of the Image and set its position to 0, 0, 0 Now go back to Vuforia Configuration, set Dataset for our database and activate it [18].

And that' all. Now we have to simply build a project into apk file and install it on an Android device. To do this go to **File->Build Settings** and press **Build** button. In the app all we have to do is point our camera to the chosen image and our model will appear [18].

3.9 USE CASE MODELING AND DESCRIPTION

A utilization case is a rundown of activities or occasion steps that characterizes the connections between and performing artist and an engine to accomplish an objective. In AR application building it is essentially called use case demonstrating. According to the Unified Modeling Language, the client is called a performing artist, in this application, the user will be performer and the application will give all the idea how they can use it [19].

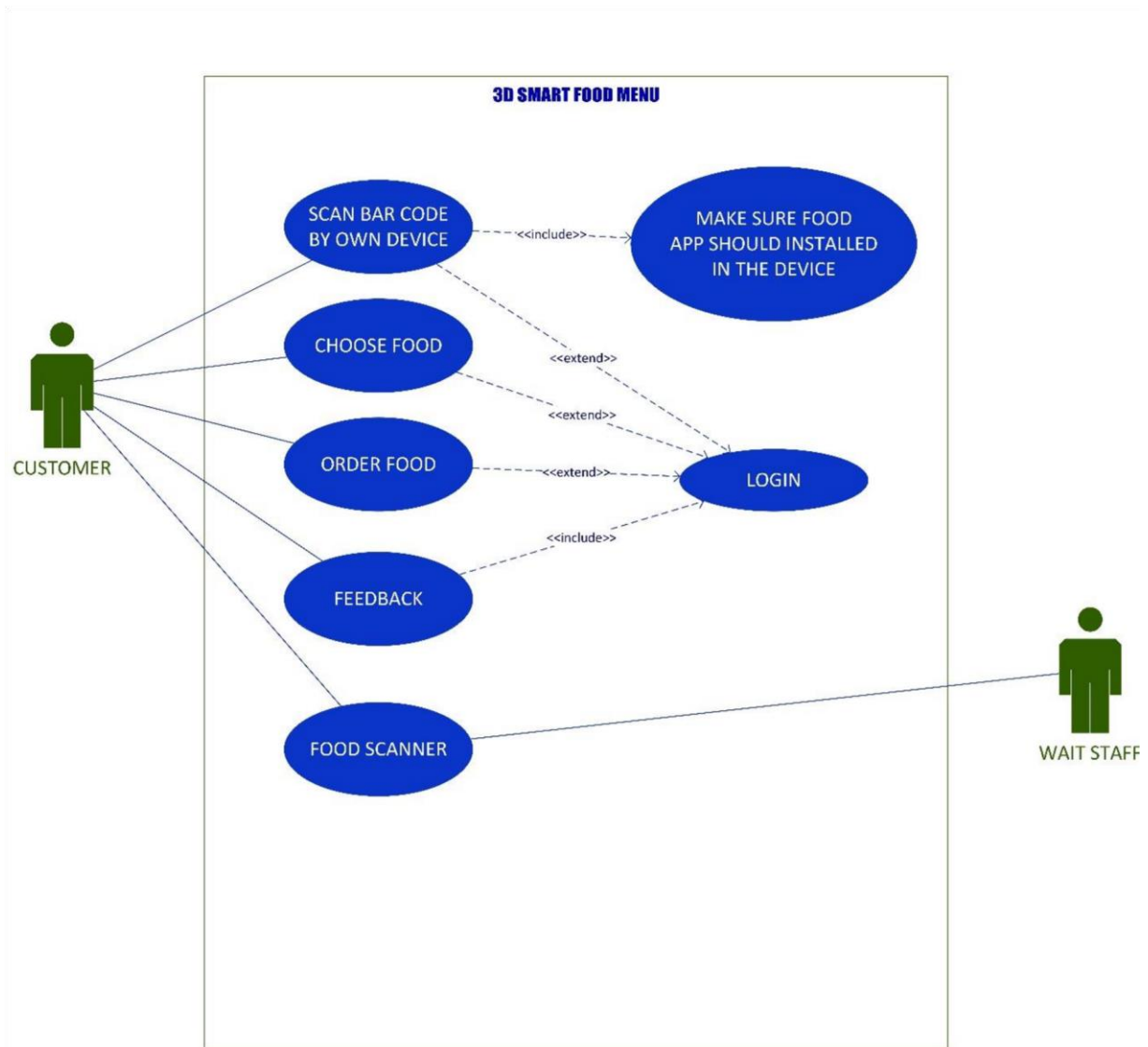


Figure 3.3.1: Use case diagram

USE CASE DESCRIPTION:

Use case: Access 3d Smart Food Menu App.

Primary Actor: Users

Precondition: Open Camera

Event Flow: Show different content by scanning menu card and visualize 3D food.

Exit Condition: Press the back button twice and exit or click the exit button.

3.10 LOGICAL DATA MODEL

An entity relationship diagram (ERD) shows the relationships of entity sets stored in a storage [19]. An entity in this context is a component of data. In other words, ER diagrams illustrate the logical structure of databases [19].

The relationship of the entity sets of the storage and cloud is shown by the entity relationship diagram (ERD). It can be said that, the logical structure of a storage is illustrated by the ER diagram [19]. It goes deep to the database as much as possible and describes the data model. All the entities and relationship among them are included in the diagram [20]. In the following figure we have given the ER diagram of the application [20].

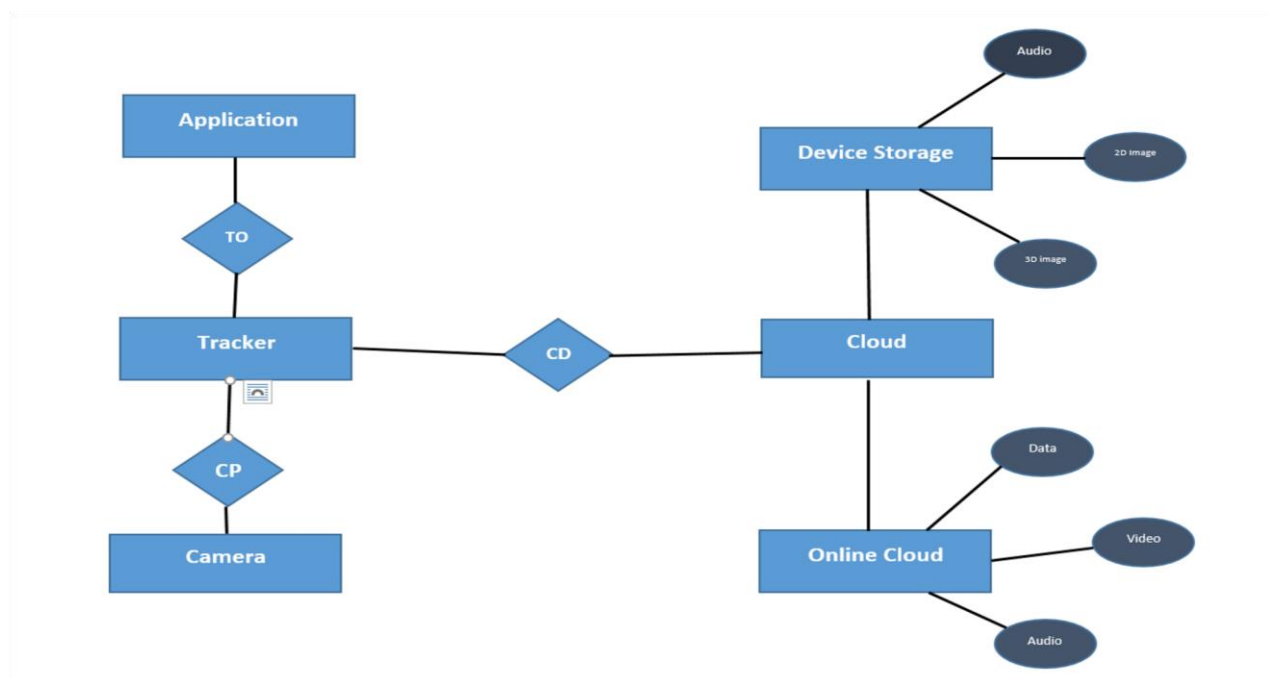


Figure 3.3.4: ER diagram

CHAPTER 4

AR APPLICATION IMPLEMENTATION

4.1 INTRODUCTION:

Implementation means a set of idea, plan, practices and informed-policies in real-world services. Implementation of interaction is common task for all development projects. Nowadays technology has leading in an amazing way and the tendency is to occur faster. Now technology offering many advanced product and services, which makes our day to day life easier and comfortable. In this paper our aim is to develop an application for chemistry lab by using Augmented Reality (AR).

4.2 WORKING PROCEDURE:

For implantation our project at first we install unity3D editor [19]. At next we create an account in unity. Then we create a new project here we insert project name, location, select model & then create project.

After that go to file> build settings and then select android platform & then click player settings, XR settings, & click Vuforia Augmented Reality supported then build and save this scene.

Go to asset > Vuforia > AR camera. And also delete the main camera. In AR camera, inspector (Open Vuforia configuration, Vuforia, app license key).

For app license key & unity package we login Vuforia engine (for login we have a Vuforia account).

After login go to Develop tools > license manager create a license & name this project1. Then go to target manager & create database for unity package.

Name this database Project1 & type to device and click on **create** button to create databases. Then click to a single target image and insert a jpg file within (300/300). Set a name and click to **Add** button.

If we show this database, target manager > click > Project1 (Show features for camera detection point on image) & for download this database > select Unity Editor > click on Download.

Now we again open Unity3D > AR camera > Inspector > Open Vuforia configuration > vuforia, app license key (paste the license key provided by Vuforia).

Asset > > Vuforia >> Image

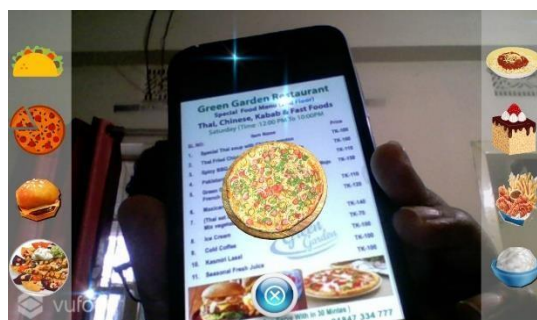
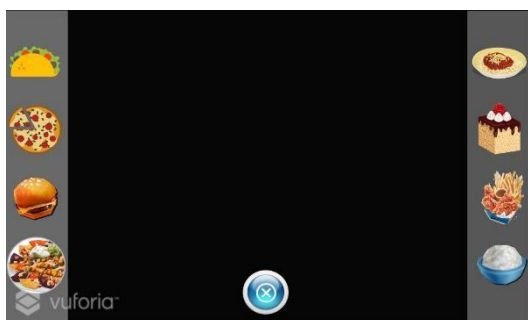
Asset >> Vuforia >> 3D object > > sphere

Project >> Asset > >Vuforia > >Script > >click right button > >create C# > >name > >CollisionDetector.

Double click on collisionDetector > open Visual Studio > Write C# code for 3D object physical movements of selected molecules & save.

Finally, we use this code for our selected 3D object/ molecules just drag & drop C# code on 3D object Inspector.

At next we click file > Build setting > Android/iOS/others > select scene > build > name the apk > Save.



CHAPTER 5

RESULT

5.1 RESULT

- Use of AR for restaurant innovativeness [3]
- Managing the huge food inventory [3]
- Attractive restaurant menu [3]
- A customer can know more about a dish [3]
- Present your catering and event planning menu ideas through stunning 3D images that give potential clients realistic, to-scale dish combinations that create the perfect event [18]
- Digital food as experienced through AR is more easily accessible than VR and is an innovative way to engage with an audience [19]
- As food brands aim to sell a gustatory experience, rather than a product, experiencing digital food could help a brand build an emotional connection with an audience [19]
- Digital food is environmentally conscious, avoids waste, avoids overconsumption, and does not require any transportation [19]
- The new trends in digital food reflect the ever-changing way we exist online and how we share what we consume [19]
- Faster the customers adopt AR and VR, the quicker its roots grow in this industry [20]

CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1 CONCLUSION

In recent, efforts have been made to use augmented reality as a device for food industry.

6.2 SCOPE FOR FUTURE WORK

AR is still at a beginner stage in the Food and Beverage sector. Faster the customers adopt AR and VR, the quicker its roots grow in this industry. Similar to how social media marketing has become a "must-have" for any business, Virtual and Augmented Reality mobile app development will also have the same fate [20].

Augmented reality has a lot to offer businesses that work in the food and beverage industry [21]. It can spark customer engagement by educating, entertaining, and showing brand transparency. Augmented reality not only engages consumers, but also inspires them to see, taste, and experience your product in a new way. Considering the fact that consumers become more comfortable with tech innovations, some of the food and beverage companies have already found their way to use augmented reality technology [21].

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