

Application & Implementation of Augmented Reality in 3D on Art Gallery

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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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BANGLADESH**

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APPROVAL

This Project/internship titled “Application & Implementation of Augmented Reality in 3D on Art Gallery”, submitted by Khandaker Ishtiaque Hossain, ID No: 152-15-5647; Nowshad Dipu ID No: 152-15-5766; Sharmin Akter, ID No: 152-15-6185 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 3rd MAY 2019.

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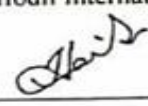
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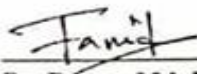
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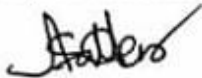
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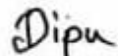
We hereby declare that; this project has been done by us under the supervision of Mr. ABDUS SATTAR, Assistant Professor, Department of CSE Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or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

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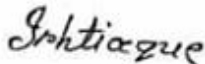


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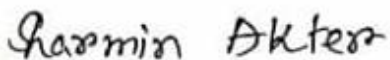
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ABSTRACT

In this advanced world, augmented reality has brought a new dimension to view the world where special technology is being used for advancing the visual quality. Museum photo exhibition is one of the visual implementations of AR .we decorated the project in a standard that can be implemented in art galleries to make spectators memorized .we added image detection, animation movements, video contents that creates unique piece of creativity at a time serving individuals with a different view .We It enhances the scenario within viewers & objects that combines the real view with digital scenario .we worked on unity platform here using c# language.

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CHAPTER 1

Introduction

1.1 Introduction

Suppose, someone is laying down on his bed of his house, and he wants to see the snowfall in that time but that time is summer. How can it possible to see snowfall laying on bed on that time? That wasn't possible but now in can be possible using of augmented reality (AR). Augmented Reality in one of the most advance technology in the world. It is now already using many sectors to develop the experience the real world with losing the sense of reality. AR is recently used in a number fields, such as medicine, education, gaming and simulated training among others.

Augmented reality is an implemented reality with additional effect, not the real one .The extension of real world vision improving our brain perception system .now it's becoming quickly & extremely popular with gamers, 3D artists, teachers & students even astronauts .It's a set of magical virtual objects that sets a magical vision .Objects in real world is augmented or computer generated in it. pokemon games, snapchat filters are primitive forms of this.

There are many museums in many countries where visitor guiders introduce people with the pictures of galleries .If we add extra vision system here, we can create an extra attraction to the viewers through this work.

AR mainly helps the children to create consecration about many things, like their education. In past, we usually saw the 2D image that wasn't interesting or more knowledgeable for us. But now at present this can be possible by AR. It can also more informatics or more knowledgeable in art museum.

1.2 Motivation

In our country most of the people and students lose their interest to know or see something. Because all of our pictures that contains in art museum or books are 2D. In this 2D view we can't see the actual properties or angle so that we can't get enough information to realize. If we can make them 3D with animation, people will be happy to see those pictures and it can increase their interest. They can learn better and get more information. In that way students can learn things a better way and better learning makes better education. After that better education can make a better

thoughts, better technologies and better opportunities. By all these things we can make better country.

1.3 Rationale of the study

According to our country there is no 3D museum. That's why people especially children are losing their interest for technology. They also can't learn better and can't understand perfectly because there is no more information. If we create 3D museum by AR they can learn more things and understand perfectly by 3D image.

1.4 Research Question

What is the impact of technology?

Our traditional values getting lost by using technology but in this modern world people can't pass a single day without using technology. Especially children are mostly addicted with this technology. That's why they don't go to museum and lost their interest and almost forgot about our tradition. But using this project we can make the whole thing interesting so that they can get interest. Also we can provide the traditional and knowledgeable things through this project.

1.5 Expected Output

3D image museum is totally different thing in Bangladesh. People can be benefited more than 2D art gallery.

- Student can learn more than before
- People can understand better than before
- More information are there in 3D animated image
- Can see the image in different angles
- Moreover people experience the real world

1.6 Report Layout

Chapter 1: Introduction, we explained the intro part of our project topics with motivations added, rationale of study, research questions, expectations of our works & lastly report layouts.

Chapter 2:Background,within the chapter we explained the basic work background & other related works done before ,then added summary of research ,challenges faced with our system lastly scope of the problem.

Chapter 3: project methodology, this chapter is all about the procedure of how we created this project work step by step. We added each steps with some short notes on its work basis.

Chapter 4: Experimental results with discussion, this chapter describes, with the overall project work basis, what we have successfully done with proper resulted showing .Additionally analyzing the performance with summery.

Chapter 5: Conclusion, that part of the chapter includes the summery conclusion of our work adding plans of future that we may implement later on.

CHAPTER 2

Background

2.1 Introduction

Nowadays this platform is implementation visual sectors enhancing the museum works using the mind blowing ideas of advanced technologies. Museums had been creating and using smartphone and tablet based AR technologies. At first sight, people can see 2D image but when they will use smartphone or tablet, they can see the 3D version of that image.

2.2 Related Works

- The National History Museum in London unveiled a multimedia center with AR interactive film (Barry & Trout, 2012).
- The Tokyo Digital Museum has also worked with head mounted displays to create a new information-providing system (Ng Giap Weng et al., 2011).
- The augmented reality app is applied to the Bone Hall where there are skeletons which are original but this app adds overlay skin & bone movements
- The Museo ng Katipunan - Pinaglabanan Memorial Shrine was inaugurated by the National Historical Commission of the Philippines(NHCP) last August 2013 as a modernized museum.

2.3 Research Summary

Our main goal is to make a 2D art gallery into 3D art gallery. Here we use and want to develop the Augmented Reality. According to our country, all the pictures of art galleries are in 2D version. Art galleries will be same as before but there is an addition that people can use their phones or tablets to see the 3D version of those image. Example- there is an image of Dragon but that dragon can't move in real because this a 2D image but when we hold a camera in front of the image that show that dragon moving. In that way people can see the image both 2D and 3D version.

2.4 Scope of the Problem

The proposal system helps the people specially children to visualize the 3D image of the 2D image. Only the images that we use in this system are applicable, others are not. So people must have those image. People can use this system randomly, they must have the application and selected image. Otherwise they can't use this system. The algorithms can be implemented in any kind of platform regardless of choice. Using this approach mobile applications or online based web applications can be developed to reach for local people easily.

2.5 Challenges

- First challenge is to use unity because we didn't use it before.
- High and low picture quality image don't adjusted easily.
- Asset selection is hard.
- Create animation is also a difficult task for us.
- Making the data sets
- Collecting the Coding.
- Image possinoning.
- We face difficulties using the synthesizer that takes our voice command

Chapter 3

Research Methodology

3.1 Procedure

- We worked on this four images.
- First of all we collected the assets.
- We used blender for animation process.
- We used windows movie maker and worked on Photoshop.
- We worked on Vuforia Image Target to recognize images.
- We worked on speech recognition
- Then we run voice command where speeches converted to text first



Fig 3.1.1 Base layer

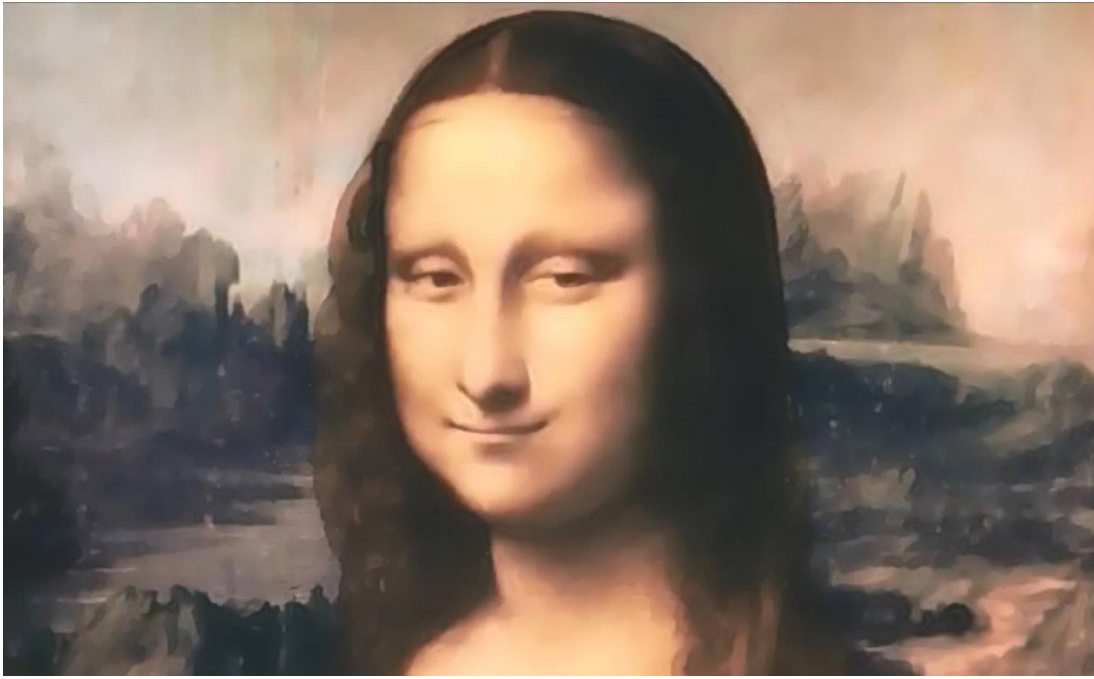


Fig 3.1.2 Monalisa



Fig 3.1.3 Dragon platform



Fig 3.1.4 Aquarium.

3.2 Implementation

The 1st thing we did is importing the vuforia unity extension into our project. We imported the vuforia unity extension through the asset store, when we import the vuforia unity extension it created a new set of folders in my project. We stored our image target resources in the assets folder, then we setup it.

We 1st of all deleted the default camera. Because vuforia provides a custom camera designed for AR application. That's why we call it AR camera. in the AR camera the components will be found in inspector panel. Camera device mood setting are some of the commonly used fields. We set the load data set stored chips.

Then we added image target to this scene.

We can play & move the scene through the AR camera that is also be seen in the preview. Then we configured the AR camera to the image target for the database device.

The other name of device database is trackable data sets and we created it online by target manager by the help of vuforia developer portal. Then we created this on the stored images from the image target sample, then downloaded from database& imported to my project. Then we select the dataset which contains the track, we have configured the image target behavior components through it.

Then we added our model. We scaled the position in the scene. Then we changed the object name as dragon. As we wanted to create an animation to our dragon, we opened the model to elaborate the codes, then we modified it. Lastly we assigned our target image there.

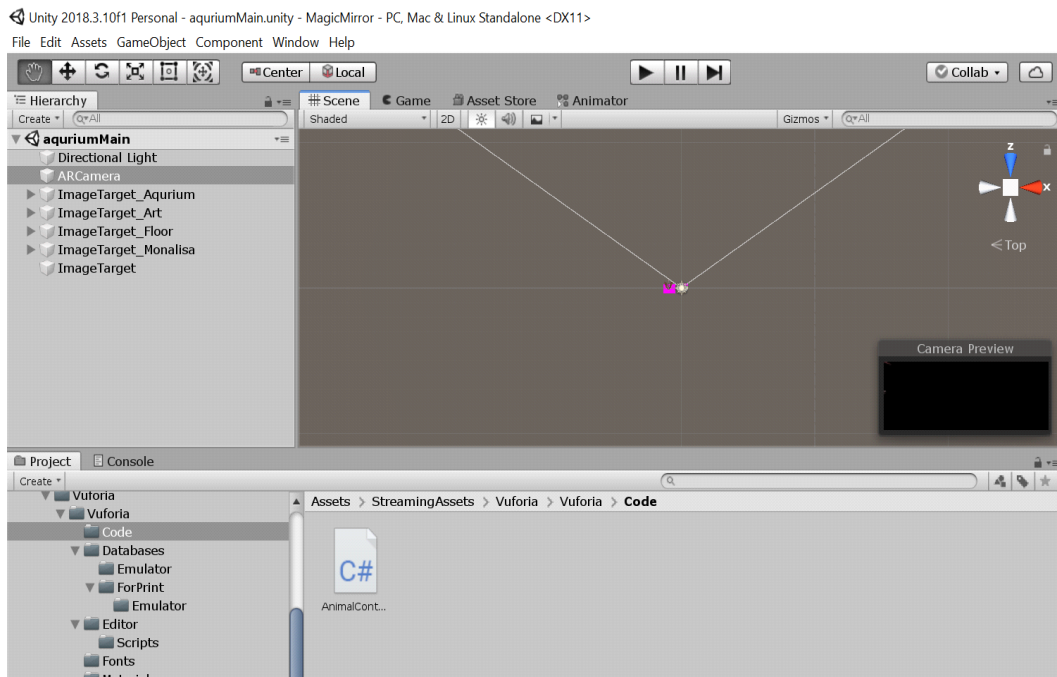


Fig 3.2.1 AR Camera

This is the AR camera positioned for image detection.

3.3 Animator Base study

We worked on animation part settings in animator.

Base layer is putted as directed.

We didn't use any state and exit part in our layers. This is by default layer.

We created new layers called idle state, walk state & run new state.

We created the transaction by entry to idle new, idle new to walk new, walk new to run new & after run new it will come back to idle new state.

That means animator will 1st come to idle and start to walk, after walk it will go to run state then will idle back again.

We created a loop here.so this process will repeat its states over and over till we want to.

That's how we created the base layer part.

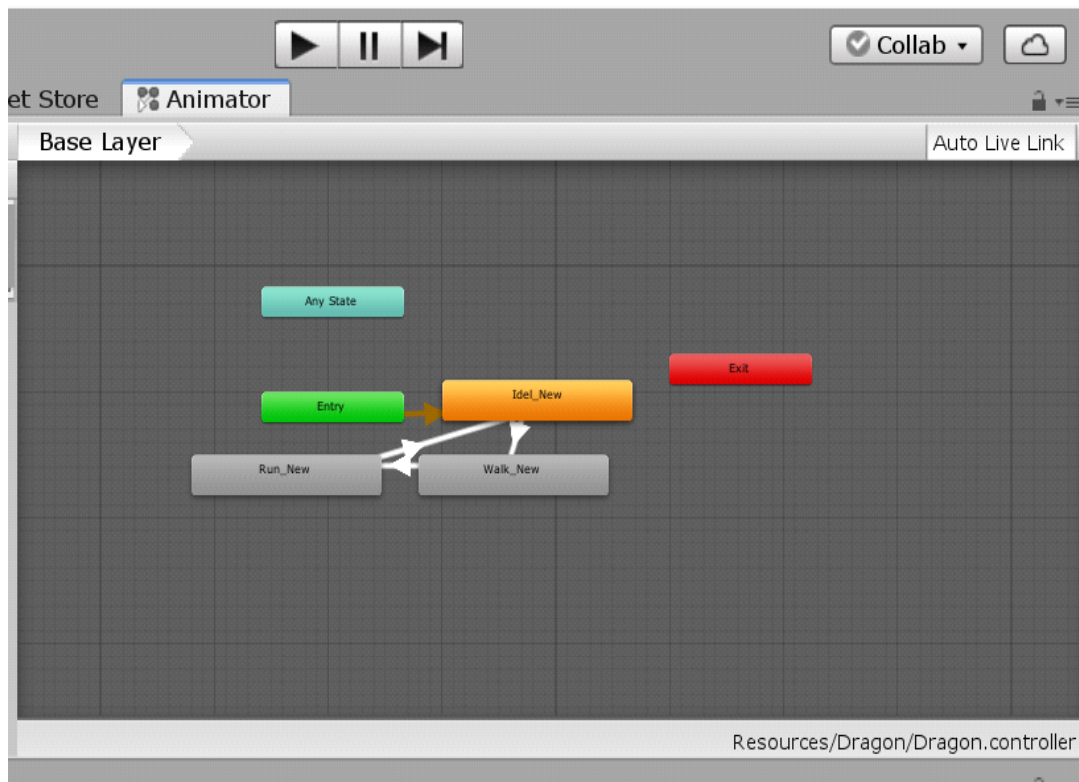







Fig 3.3.1 Animator Base Layer

Then we inserted a database that we created by ourselves for the specific pictures we want to work with. Then we linked this to our unity project parts. Through this our AR camera can detect the specific images we worked with.

Add Target		Download Database (All)			
Target Name	Type	Rating	Status	Date Modified	
 Dance	Single Image	★★★★★	Active	Mar 16, 2019 17:16	
 Monalisa	Single Image	★★★★★	Active	Mar 16, 2019 17:08	
 artimg	Single Image	★★★★★	Active	Mar 16, 2019 16:51	
 floor	Single Image	★★★★★	Active	Mar 15, 2019 15:39	
 aquariumIMG	Single Image	★★★★★	Active	Mar 15, 2019 12:03	

Last updated: Today 01:19 AM [Refresh](#)

Fig 3.3.2 Data Base Layer

3.4 Speech synthesis

We used a technique of human speech called speech synthesizer. This system converts into speech from our normal language we speak.

Then we have used windows speech recognition .we can control this with our voice only .When we say something with our own voice, that command is taken by the synthesizer .we use the command to act like we want within the animator .The animator we used can move through the specific place, can change his side according to the command we give. That’s how we used the synthesizer using command.

3.5 Code

We created the code in visual studio with c#.

```

31 #region UNITY_MONOBEHAVIOUR_METHODS
32
33 protected virtual void Start()
34 {
35     mTrackableBehaviour = GetComponent<TrackableBehaviour>();
36     if (mTrackableBehaviour)
37         mTrackableBehaviour.RegisterTrackableEventHandler(this);
38 }
39
40 protected virtual void OnDestroy()
41 {
42     if (mTrackableBehaviour)
43         mTrackableBehaviour.UnregisterTrackableEventHandler(this);
44 }
45 #endregion // UNITY_MONOBEHAVIOUR_METHODS
46
47 #region PUBLIC_METHODS
48
49 /// <summary>
50 /// Implementation of the ITrackableEventHandler function called when the
51 /// tracking state changes.
52 /// </summary>
53 public void OnTrackableStateChanged(
54     TrackableBehaviour.Status previousStatus,
55     TrackableBehaviour.Status newStatus)
56 {
57     m_PreviousStatus = previousStatus;
58 }

```

Fig 3.5.1 Code-1

```

57
58 m_PreviousStatus = previousStatus;
59 m_NewStatus = newStatus;
60
61 if (newStatus == TrackableBehaviour.Status.DETECTED ||
62     newStatus == TrackableBehaviour.Status.TRACKED ||
63     newStatus == TrackableBehaviour.Status.EXTENDED_TRACKED)
64 {
65     Debug.Log("Trackable " + mTrackableBehaviour.TrackableName + " found");
66     OnTrackingFound();
67 }
68 else if (previousStatus == TrackableBehaviour.Status.TRACKED &&
69     newStatus == TrackableBehaviour.Status.NO_POSE)
70 {
71     Debug.Log("Trackable " + mTrackableBehaviour.TrackableName + " lost");
72     OnTrackingLost();
73 }
74 else
75 {
76     // For combo of previousStatus=UNKNOWN + newStatus=UNKNOWN|NOT_FOUND
77     // Vuforia is starting, but tracking has not been lost or found yet
78     // Call OnTrackingLost() to hide the augmentations
79     OnTrackingLost();
80 }
81
82
83 #endregion // PUBLIC_METHODS
84
85 #region PROTECTED_METHODS

```

Fig 3.5.2 Code-2

```

85 #region PROTECTED_METHODS
86
87 protected virtual void OnTrackingFound()
88 {
89
90     var rendererComponents = GetComponentInChildren<Renderer>(true);
91     var colliderComponents = GetComponentInChildren<Collider>(true);
92     var canvasComponents = GetComponentInChildren<Canvas>(true);
93
94     // Enable rendering:
95     foreach (var component in rendererComponents)
96         component.enabled = true;
97
98     // Enable colliders:
99     foreach (var component in colliderComponents)
100         component.enabled = true;
101
102     // Enable canvas:
103     foreach (var component in canvasComponents)
104         component.enabled = true;
105 }
106
107
108
109 protected virtual void OnTrackingLost()
110 {
111
112     var rendererComponents = GetComponentInChildren<Renderer>(true);
113     var colliderComponents = GetComponentInChildren<Collider>(true);

```

Fig 3.5.3 Code-3

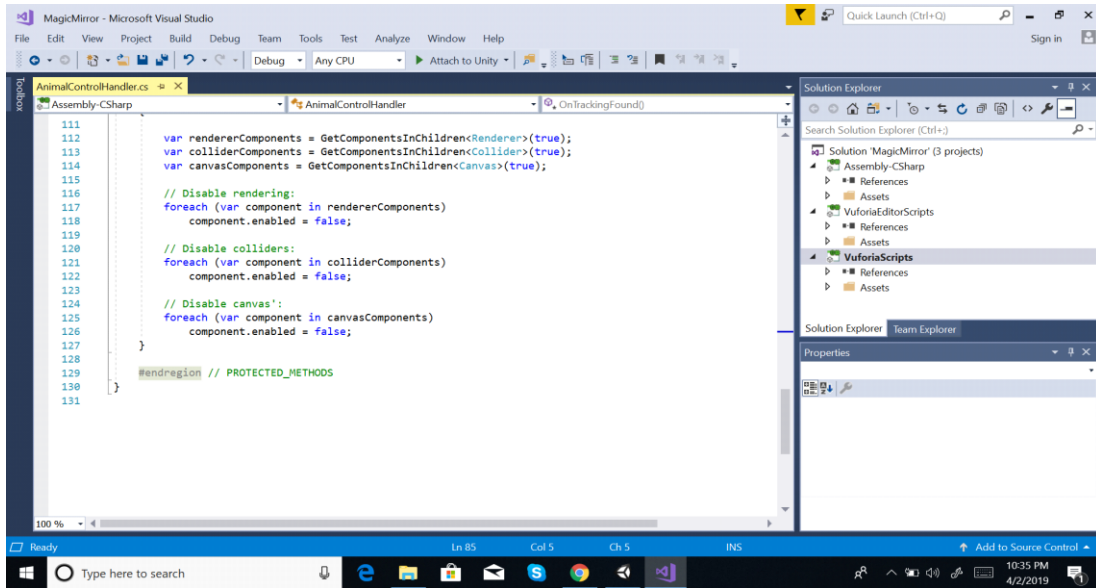


Fig 3.5.4 Code-4

CHAPTER 4

Experimental Results

4.1 Descriptive Analysis

We have created an application that will process the pictures to move, to get animated, and to have a video and so on.

By this we create an application that will blow the attention of the public figure to add an interest, we like to call an extra interest to visit to the art museums or galleries.

People have shared the idea and have showed to others, the people have a very positive view about that project work.

People have got the special interest in dragon animation implementation parts of our project.

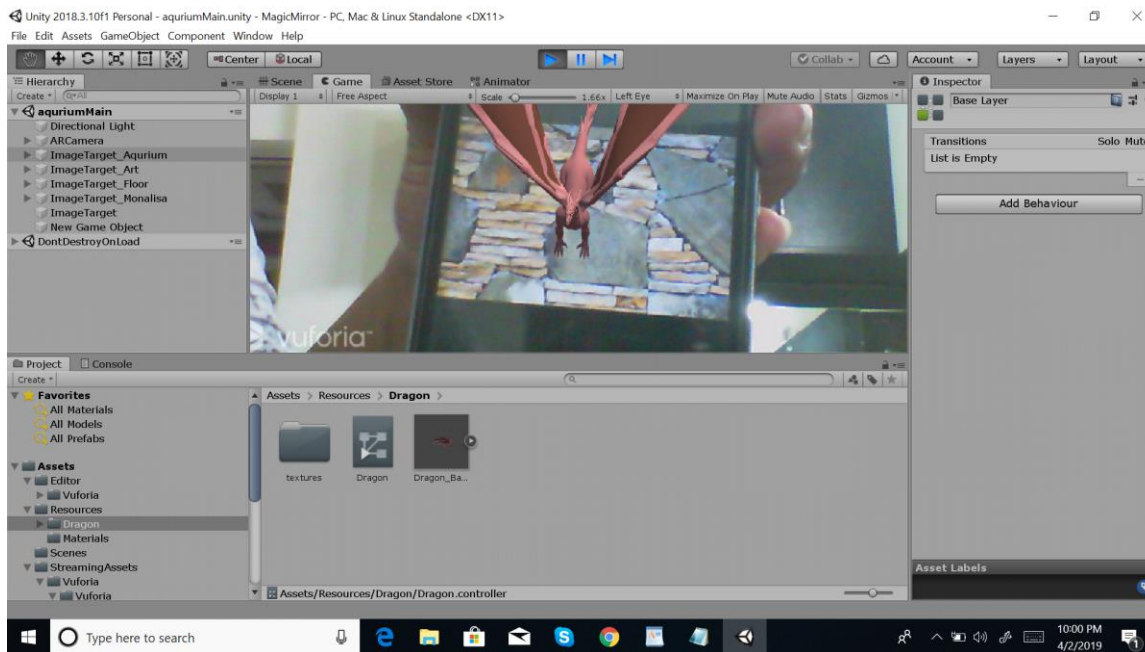


Fig 4.1.1 Dragon Animator

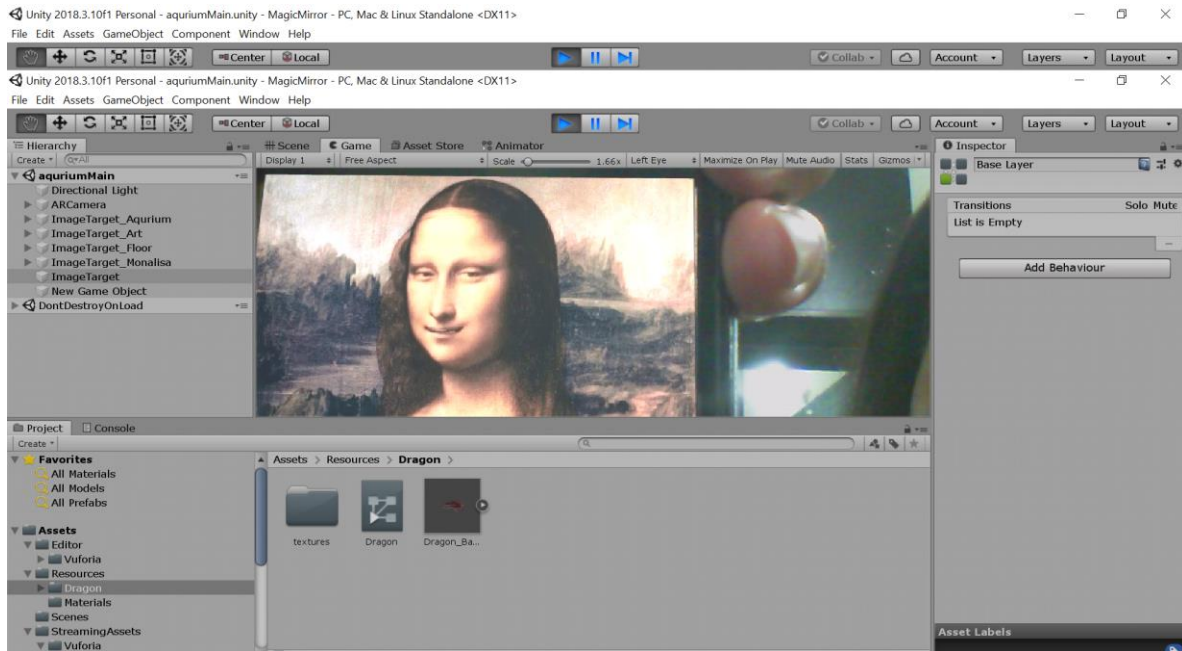


Fig 4.1.2 Implementation of Monalisa

4.2 Summery

We created the project and our base is unity & vuforia.

We inputted different type of implementation to our projects to blow the attention of viewers.

We implemented

- animation,
- image processing,
- image detection,
- video images
- speech recognition to decorate our project.

We are looking for creation a mobile application for that whole process.

CHAPTER 5

Conclusion and implication of future study

5.1 Conclusion

In this work picture are recognized through augmented reality techniques which can be used in different kind of applications to detect any picture which can open a door for helping people and children. The whole process is done with a 97% of accuracy using art gallery images in different angle. Though there are some problems while working for collecting image data of various picture. We try to overcome all the problem and develop the picture detection system. Using this system I am going to new variation of vision to the viewers

5.2 Implication of future study

- We want to make a mobile application that's run the project
- We want to make this application able to have conversation with a user through the picture

To make our life easier, gradually we are getting very much dependent on modern technologies where in our country, art museum sector is very far behind from using these technologies which can be a matter of affluence in an exceptional rate. The proposed system shows a new way to involve with the augmented reality method which is able to moving the images. This approach can be implemented into any kind of mobile based application or web-based application to reach the people of our country.

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APPENDICES

Appendix A: Research Reflection

The purpose of this Appendix is to provide an introduction to Research reflection. The group research project was a challenging and enjoyable experience typical of the course as a whole. We have had little exposure to group work at university. So, it was a nice change to be part of an effective and dynamic team.

The experience of our work taught us many things. In the beginning we were very much confused about our work. We change plan in many times. We enjoyed a lot talking to the developers and other engineers. We think this research result help people specially children who don't like to go to museum.

Appendix B: Related Issues

We had to learn so many new algorithms and techniques to implement our ideas and research work to be effective. Variation of the image backgrounds and positioning image and quality of the images were challenging to modify and reduce the changes in results hereby. Create animation and asset selection are also new for us.

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