

Augmented Reality Based Instrumentation Book

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Abstract - Augmented Reality (AR) is emerging and is an interactive experience of a real-world environment that combines virtual objects and real-world environments. It increases the learning experiences and also enhances visibility. The project scope will be to provide an augmented reality-based application for users to share the instrumentation device 3D model along with dynamic information to provide enhanced mixed reality experience through our augmented reality application. This application used to display 3D objects using a printed image without any complicated equipment. The main purpose of the augmented reality system is to accelerate learning and understanding of concepts like structures and mechanisms. Instead of reading long manuals, the user can watch with a 3D model through augmented reality. The average person learns better by observing something than by simply reading. This specific system is used to accelerate the learning of the human mind.

Key Words: Unity 3D, Vuforia, Image targets, Blender 3D, Augmented reality, 3D models.

1. INTRODUCTION

Nowadays students are eager to exploring new techniques to feed their curiosity. augmented reality is a very handy tool and it will give them an immense experience in this new-age learning. This paper shows how to develop an augmented reality application and some software like unity3D, Blender3D, and Vuforia platform. Augmented reality is swiftly growing medium and the Vuforia SDK is widespread with over 325,000 registered developers and thousands of published applications. The vuforia augmented reality extension for unity enables tracking functionality and vision detection within the unity. And allows developers to create Augmented Reality applications. The blender software is used to create any 3D models. Unity 3D is a fully integrated development engine that provides the creation of interactive 3D content. Using Unity multiple platforms like PC, Web, iOS, Android, and Xbox can be obtained.

2. BASIC SOFTWARE USED IN THIS SYSTEM

2.1 Unity 3D

Unity 3D is an integrated 3D game engine developed by Unity Technologies Corporate Ltd. It can merge virtual onto reality by human-computer interaction with some augmented development reality tools. It allows Vuforia SDK extension plug-ins to detect and track the corresponding ports and creates AR games and applications. It gives ample development box functions to create interactive 3D content

and games. Unity 3D can append fog, sunlight, wind, water, and other physical materials, animated video and ambient sound to the virtual scene. Also, you can browse, edit and test 3D application scenarios. It is available to release to the required platforms, such as Windows, iOS, Android and so on.

2.2 Blender 3D

It is an open-source 3D computer graphics software used for creating 3-dimensional models such as creating animation, texturing editing, rigging, particle simulation sculpting, etc.,

2.3 Vuforia Augmented Reality SDK

In November 2015 PTC Inc acquires Vuforia. Augmented reality-based mobile applications can be made by using Vuforia. To recognize and track the planar images in real-time computer vision technology can be used. The developers are helped by this image registration capability to orient and position the virtual objects, like 3D models and other media, in the relation to the real-world objects where the mobile device can view by using the camera. In real-time, the position and the orientation of the image are tracked by the virtual object so that the viewer's perspective on an object will have corresponded with a perspective on the target. Thus it combines the real-world scene and virtual object to get a clear vision.

2.4 Android Studio

Android Studio is the Integrated Development Environment for Android app development. It is used to support application development within the android operating system. Android Studio offers more features that enhance your productivity when building an Android app.

3. PROCESS BLOCK DIAGRAM OF THE SYSTEM

This block diagram shows a procedure to create an augmented reality instrumentation book application.

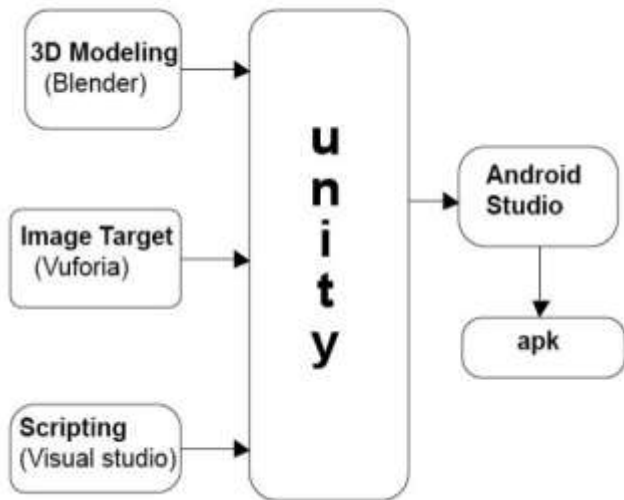


Fig -1: Process Block diagram of this system.



Fig-3: Object mode in Blender3D.

3.1 Procedure to create instrumentation 3D models in Blender

1. First, download the Blender software on the official Blender.org website according to your operating system.



Fig -2: Blender software download page

2. Install and open the Blender software on your personal computer.
3. Go to object mode to add the objects for your model.

4. Then edit your parts in edit mode. Edit mode consists of so many options like extrude, knife tool, insert faces and so on. Use these options for your model to look better.
5. And then go to material property for changing the color of your parts.



Fig -4: shading mode in Blender3D.

6. Then switch to shading mode for adjusting your parts material color looks. Adjust the properties for better visibility.
7. Finally, export an FBX file.

3.2 Procedure to Create Identification Image target on Vuforia

1. First, go to the Vuforia developer portal and sign or login.



Fig -5: Vuforia developer portal.

- And then click the develop tab and get a developer key
And then name it.

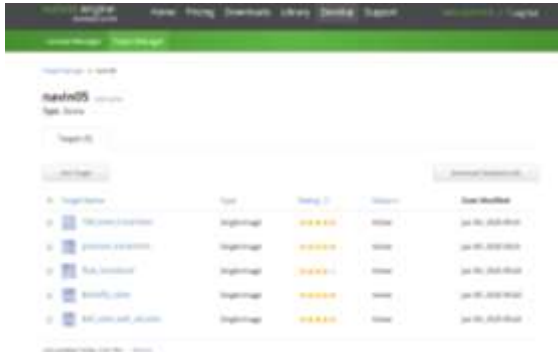


Fig -6: Vuforia target manager tab.

- Go to the target manager tab and then add your image targets
- Your target image should be getting a minimum of 3 stars. that means your image target augmentable.



Fig -7: Vuforia target manager tab.

- See fig.6. these yellow dots determine the augmentable rating. These dots high mean your image target will be getting maximum star rating.

Finally, download all the database. select a platform.

4. PROCEDURE INTEGRATE THE 3D MODEL AND VUFORIA IMAGE TARGET IN UNITY ENGINE

4.1 Installation Procedure for Creating an Android Augmented Reality Application

- Go to the oracle.com and download the java development kit and install it.
- And go to the android studio.



Fig -8: Android Studio download page.

- Go to unity 3d.com and download the unity hub 2018.4.0



Fig -9: Unity hub download page.

- Click and select the plugin and download it.

4.2 Procedure to Create an Android Augmented Reality Application in Unity Engine

- First, open unity hub in your personal computer and type your project name and choose 3d and create.
- Then unity software window will open and go to build settings and switch to android.
- Delete the main camera in your scene. And add an AR camera in your scene.
- Go to the player settings. copy the license key from in your Vuforia developer portal and paste it in unity.
- Go to the XR settings click the Vuforia augmented reality support.



Fig -10: Unity game object window.

6. Click the game object window → Vuforia engine → image.

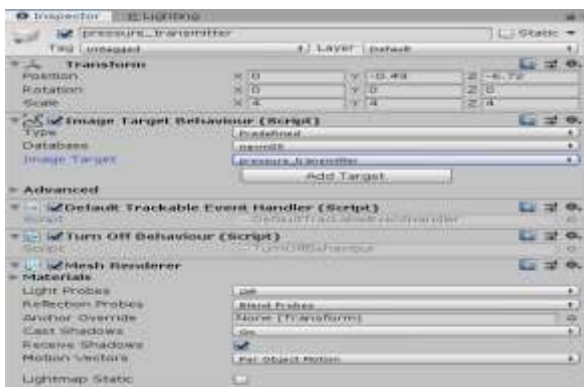


Fig -11: Inspector panel on unity

7. Go to Inspector panel and Choose your image on your database.

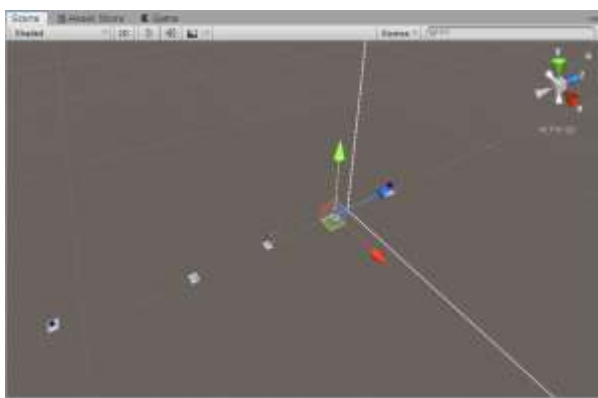


Fig -12: Scene panel on unity

8. Import your 3D models.

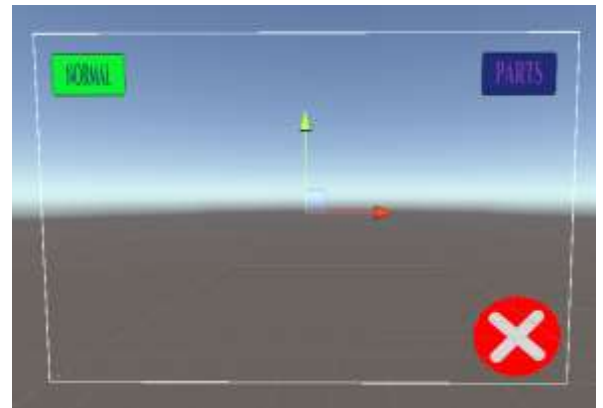


Fig -13: UI buttons in the scene

9. Add UI buttons for close and show the parts details.
10. Create the scripting for UI buttons.
11. And the choose the color or select the image for the UI buttons according to your interest.

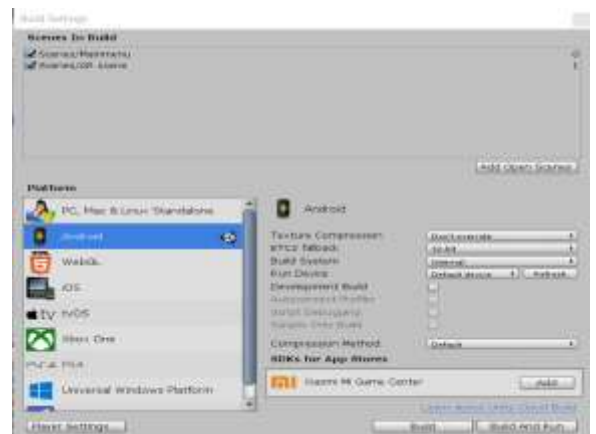


Fig-14: Build settings panel

12. Go to the build settings panel and build the augmented reality application.
13. Install your android phone.

5. RESULTS

Finally, the augmented reality application shows the 3-Dimensional image on our image target. When the user interface button clicked it shows the parts details of the instrumentation 3D model. Exit button pressed means augmented reality-based application is closed. The below diagrams show the results of our augmented reality application.



Fig -15: UI buttons in the scene.

6. CONCLUSION

This paper shows how to create an augmented reality instrumentation book for learners and emphasize the basics of augmented reality and Unity3D, Blender3D and Vuforia platform. This paper introduces a new learning experience. The average learner and slow learning person will benefit through the augmented reality app. If learners use this technology it will enhance their knowledge and understanding concepts. Augmented reality combines real-world environment and virtual objects, so users feel the real-world experience.

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