Explore Augmented Reality and Create Simulator in Unity

Sea Garbage Awareness

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Abstract—**This paper is made to explore augmented reality and creating simulator in Unity. The project itself is a game concerning about plastic that ended up in sea and harming ecosystem. The game made to raise awareness about plastic trashes. Unity provides tools to make a game that has lot of features free.**

Keywords—*unity; augmented reality; simulator; sea; plastic.*

I. Introduction

In this paper, I am pursuing on exploring Unity tool. Unity is a tool for developer to create work such as application for many platforms, games, and others. Unity first created by David Helgason, Joachim Ante and Nicholas Francis in Denmark. They first launched their product on June 6, 2005. They want to create game engine that anyone can enjoy but complete with professional tool.

I'm interested in Unity goal. Unity provide a free version for amateur to use. The main reason I choose Unity for this project is that with Unity, people could create any 2D or 3D game with ease. The easiness do not limit creator's imagination. This because Unity supports and provides a lot of tools that is easy to use.

With Unity, people have a lot of tools to explore. Therefore, there are many creation that could be made based on this. For the use of this paper, I explore augmented reality and make simulator game. To make augmented reality works, Unity needs supporting tool called Vuforia. Vuforia is an augmented platform which can collab with another tool such as Unity or Android.

Augmented reality was developed first in Harvard by Ivan Sutherland. He created an AR head-mounted display system. Augmented reality technology that allows people to see virtue image that being placed over stuff in real world. This technology is really happening and could be used for many purposes. I am interested in augmented reality because people could really feel the connection between virtual world, which dominates in virtue world, and real world. Another topic I'm working on is simulator. There are a lot of simulator game existing and it such a big potention in life, so I want to learn how to develop a game of simulator.

The project I am choosing for this paper is a game, created with Unity. The game theme is about sea life. User needs to unlock hero that could be used to help clean the ocean from trash. The simulator give people images of the ocean condition right now that is full of trash that could not be proceed by nature. I choose this game because it gives new perspective for people about sea's life that is worsen day by day. This game is created to raise people awareness about trashes that ended up in ocean and polluting sea.

II. Literature Study

A. Unity

Unity is a game engine made for developer to create affordable game. Nowadays, we could easily find game made with unity. This results in more games played by player are made with Unity. This fact alone states how famous is Unity in game world. This fact makes it unquestionable that Unity become one of the leading company in world. According to Unity, global gamers around the world downloaded Unity-made games to nearly 2 billion unique mobile device for Q1 2016 alone.

Unity claims that their game engine is far more popular amongst develpers than any other third-party game development software. Unity is used by approximately 770 million gamers all over the world. This is such a big number, even if it's compared to Twitter active users which is around 310 million. Therefore, it is no wonder that Unity has big profit in gaming.

As it's been said before, Unity made a lot of games. According to Unity, 34% of top 1000 mobile games are made with Unity. Hereby is some example of top games that are made with Unity.

- Temple Run Trilogy

Temple Run is a mobile game that's been downloaded by more than three millions people on Google Play Store. It is developed by Imangi Studios. Temple Run uses first-person point of view where players has to control the movement by swiping the screen so they still running away from a monster.

- Assassin's Creed: Identity

    Assassin's Creed is developed by Ubisoft Montreal who is such a big name in game industry. It has setting in 1191 AD where the player is the assassin in the middle of Third Crusade's war to tear Holy Land. The player could master many skills that needed to accomplish a mission. One of the series, titled as Assassin's Creed Identity is using Unity.

B. Augmented Reality

Augmented Reality is a term used to describe the concept of lay computer graphics on the real word. Augmented Reality makes combination of real and virtual world as its most important concept. Developer usually put 2D as well as 3D object that can be displayed in real time when the device detect certain picture or object. Augmented Reality has been used in many fields, from entertainment such as games or videos, to medical procedures. Here is some of the example of AR uses.

- IKEA Furniture Catalog

    IKEA is a property retailer who famous in selling home furnitures and supplies. IKEA provides an application which enable user to imagine how the furniture would looked like in their house. Therefore, the customer is easier to make decision of what furniture they should be buying. This feature is very smart because it helps not only the customer but also IKEA itself, because more thoughtful customer means less returned items they should be taking care of.

- Medical Education

    Cleveland Clinic partnered with Microsoft to help medical students learn with augmented reality technology. Microsoft provides a device called HoloLens that enable students to interact with a 3D body representation. This helps students a lot in increasing the ability to understand complex information that's related to human's body. This kind of technology has such bright potention in helping doctors in operation room.

C. Sea Trash

As National Geographic (2017) points out, there are 5.25 trillion pieces of plastic debris in the ocean. Of that mass, 269,000 tons float on the surface, while some four billion litter the deep sea. As people know, plastic is one of the most used things by modern human. From mineral water to container, people use plastic every single day. Plastic is not friendly for nature because nature could not proceed it. Therefore, plastic garbages will ended up polluting sea and also land if human is not using them well. From that study, human already designed a eco-friendlier plastic that after a few years can be decomposed to soil. But for now, still tons of plastic waste are harming environment and the life inside it.

Plastic trash entered the ocean when human decided to throw it into the ocean. The three top countries who contributed a lot in the bulk of plastic trash is China, Philippines, and Indonesia. As Nicholas Mallos (2017) states, spending and consumption have increased in third-world country but it's not followed by a good waste management. In Bandung, Indonesia there ever been a movement to pay for plastic bags, but it has stopped now. The movement alone is not enough for helping condition. People need to get awared of what could happened few years ahead and make great moves to deal with the ocean's condition right now.

The trashes have been harming living things included plants and animals. An example for plants is sea coral that are harmed by the way the plastic blocked the holes that they are using for getting food. For animal that live in the sea, the plastic trapped them so they couldn't move or even breath and it makes them lose their control and ability. There are also a lot of cases where plastic is stucked at their nostril makes them unable to breath. For sea turtle, they ingest plastic because it looks like their food which is jellyfish.

III. METHOD

For this project, I am using Unity to create the simulation of ocean where user could move around and know what it feels like to get stucked in ocean full of trashes. I also use Unity and the help of Vuforia to create Augmented Reality that when user bring a picture to the camera, the device will project a hero in overlay graphic that will help them clear the ocean in the simulation.

The plot of the game is user by default is in the middle of ocean full of trashes. The user could move around by arrow button on keyboard but it's hard because they keep crashing on plastic trashes which slow down their movement. The user have card that when they bring it to camera, they could unlock hero that will help them clean the ocean from trashes. Once they have the hero, they, along with the hero, could lift plastics from oceans into a boat and take them home so they could recycle it.

First thing is to set up Unity. I downloaded Unity 5 and then make a project. I followed a tutorial from Aaron Hibberd (2015) on youtube [10]. After I made a project, I opened the asset store and find the property I'm going to use in this project. I discover that Unity provides a lot of good assets free. After I have my property, I'm setting up the environment so that it would looked like a sea. In Unity, people first have to make a ground to give basic view in Unity because the default is just empty space. Therefore, I created a 3D object plane. This object has not yet looked like a sea, so I have to create material which saves a default textures and color that can be dragged into object. The interesting thing about material is that user could keep the consistency of colors and textures because different object could use the same material. Unity provides template texture and I'm using one of them which gave object

water texture. There I have my ocean that could be moved around by arrow key.

After setting up the sea, I dragged the property into the scene and set up the attribute such as position, scale, and rotation so it looks good. The property I added is a boat which is used to carry the trashes and the trash it self. I added rigid body property to them so they couldn't get through when they collapsed. I set up a location so the trash can be dragged into the boat by hitting a certain key. The interesting thing that I discovered on Unity is physics property where Unity added the law of physics into the object which is very useful for developer to make their game realistic.

I set up my augmented reality project in a different scene. In order to learn augmented reality, I followed a tutorial in Youtube from channel N3K EN. First I register an account at Vuforia, create a project and get the license key. After that, I downloaded the set up it requires so it can be runned with Unity. The Vuforia has a feature to save a database for user where user could upload a picture of things that they would like to be a projection target in augmented reality. After I uploaded pictre, Vuforia gives a default prototype where user just simply import it into Unity. After that, I have to download a 3D model object, in this context is hero, that I want to display over the target I uploaded. For this project, I am using a ten thousand rupiahs for the target and an Iron Man object to load. I need to dragged the object to the scene and after a few set up, the augmented reality is ready.

IV. RESULTS

After exploring in Unity and Vuforia, I able to make the game I wanted. Here is the preview of the game.

Figure 1 Augmented Reality

Figure 2 Ocean Simulator

V. DISCUSSION

Exploring Unity by creating augmented reality and simulator gives me new insights. The first thing that I realized is creating a game with Unity is not hard. People all over the world, even though they did not have basic background on computer science or technology could easily make it by following the tutorial they could found anywhere. The second thing is that it technology is evolving rapidly and anyone in the world should really adapting to the world by learning new concepts and tools. It is important because when we stuck or not eager to learn, other people around the world is growing, faster, and set their eyes into future while we still stucked in this technology that gonna be replaced soon.

Unity has a lot of feature which is nice and give freedom to developer to create whatever they want. The interesting part is Unity gave template, but it is up to us to be creative to make new materials or new creation. So creativeness is really needed from every person. A few from many tools that interesting to me is physics component and material. In physics component,user could choose to apply laws and attributes to an object so it behaves like a real world object, it can fall when didn't placed on top of an object, it can collapse when crashing with another object, and so on. In material, we could create texture and combine patterns and colors that will be applied to object so it will look realistic. Unity provides many material settings such as how the color should spread up, how the pattern should form up in an object, and so on.

VI. RESULTS

After exploring in Unity and Vuforia, I able to make the game I wanted. Here is the preview of the game.

Unity is a friendly game engine to create games that has a lot of features. Unity provides many tools that can be used to make a complete game.

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SIGNED

that this paper is made by me.

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