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Implementation Of Augmented Reality To The Seven World World Using Marker Based Tracking Method (MBT) Android Based

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ABSTRACT

The wonder of the world is cultural wisdom placed in the form of a list of the most important man-made creations. The seven wonders of the world are extraordinary masterpieces that make people think that beauty seems impossible to make in its time. With the advancement of multimedia technology, it needs to be developed into a learning medium about the introduction of the seven wonders of the world 3D using Augmented Reality (AR) technology. Augmented Reality (AR) technology is a technology that combines a two- or three-dimensional virtual object into a real three-dimensional environment and then projects those virtual objects into real time. This research aims to attract students who want to see more real how the original form of the monument of the seven wonders of the world. The design uses sketchup software for object creation, Vuforia Augmented Reality app to create android apps and Unity app to process images, sounds, and graphics. The development of this application uses augmented reality technology with Marker Based Tracking method. This method will track marker patterns that have been saved to display digital elements. The ideal distance for marker detection is 20 -90 cm with an angle slope between 0o - 90o.

Keywords: Seven Wonders of the World, Android, Augmented Reality, Marker Based Tracking

INTRODUCTION

The development of increasingly advanced technology, of course, affects various sectors of human life. This development also plays a role in the development of a learning media. Learning media is becoming more interesting and more concise even though it does not reduce the essence of the material. One of the developments of learning media that is currently still new is learning media using Augmented Reality. Information about knowledge will be in great demand if it is presented in a different way from the others. This is very helpful for students in deepening the knowledge that is only briefly taught at school. Knowledge in books and other print media is only in the form of 2D images so that readers tend to get bored of seeing the picture and find it difficult to know the real shape of an object. The use of Augmented Reality (AR) in learning is an interactive way and is very attractive to students. With the help of cameras and markers that have been embedded, students can see real objects in 3D. The addition of text as a history of information also increases students' insight into this knowledge [1]. But without realizing it, Giving information using voice is easier to catch than using text. This is because humans tend to prefer listening to reading. One of the 3D visualization techniques that is developing very

rapidly is Augmented Reality. AR is a technology that combines real and virtual objects. An object that was previously only seen in 2D can appear as a virtual object in real-time[2]. Currently the research and use of Augmented Reality extends to various aspects, for example in the fields of health, education, military, entertainment, fashion, commercial, to games.

Hearing is one of the most influential factors in understanding something. The existence of text accompanied by sound will increase memory for students. Therefore, information in the form of voice is needed in an application. Features such as zoom, and rotation are additional features that make it easy for students to recognize the details of an object. Thus, it is necessary to improve from previous research so that the 3D visualization of an object has features that make it easier for users to use. In this research, an Augmented Reality application for the seven wonders of the world based on Android will be made.

The method used in this study is Marker Based Tracking with the use of the dominant color yellow. The percentage of detection speed on markers that use yellow is faster than the use of other colors. This is because more coordinates were detected on the marker used in yellow. The camera will track the pattern from the marker that has been designed and then if the pattern matches the input entered then it will display 3D objects from the seven wonders of the world. These objects will be able to be enlarged and rotated from various angles which makes it easier for students to see objects in detail. A series of historical information on the monument's establishment in the form of sound will also be displayed along with 3D objects to increase students' knowledge.

METHOD

Augmented Reality

Augmented Reality(AR) is a term for an environment that combines the real world and the virtual world created by computers so that the boundary between the two becomes very thin. This system is closer to the real environment (real). Reality is preferred in this system. This system is different from Virtual Reality (VR) which is completely a Virtual Environment. With AR technology, the real environment around will be able to interact in digital (virtual) form [3].

Unity 3D

Unityis an application used to develop multi-platform games designed to be easy to use. The Unity editor is built with a simple user interface. Graphics in Unity is made with high-level graphics for OpenGL and directX. Unity supports all file formats, especially common formats such as art applications. In detail Unity can be used to create 3D video games, real time 3D animation and architectural visualizations and other interactive similar content [4].

Vuforia

VuvoriaSoftware Developer Kit(SDK) is a plugin that supports AR application creation. Vuforia provides a downloadable target database feature that can be accessed locally in the AR app. Vuforia is free to use. However, if you want to get additional features, you can use the paid Vuforia [5].

Java Development Kit

Java Development Kit(JDK) is a software development kit which is a set of code, libraries, forms and packages that are useful for creating applications or appletsjava. Inside the JDK there is a Java Runtime Environment (JRE) which will process the byte code generated from the Java

interpreter. The task of this java interpreter is to compile the source. Java becomes source.class which is then source.class which will be executed by JRE [6].

Software Development Kit (SDK)

Software Development Kits (SDK) is a collection of libraries and tool kits such as emulators for developing or creating applications for software, computer devices, operating systems or platforms. In the SDK there are tools needed for android development, including adb shell which stands for android development bridge which can run android terminals such as terminals on the linux operating system, and commands contained in the adb shell itself such as linux commands in general [7].

Marker Based Tracking

This method utilizes a marker in the form of a black and white illustration in the form of a square or an illustration of an image with a certain color and shape. In general, this method requires several things in its processing, such as computer or mobile devices equipped with cameras and sensors that support AR, AR applications, and markers. The system flow is that the AR application accesses the device's camera, then the system will detect the marker through the camera, then display a virtual object above the marker on the device screen. Here's how Marker Based Tracking works:

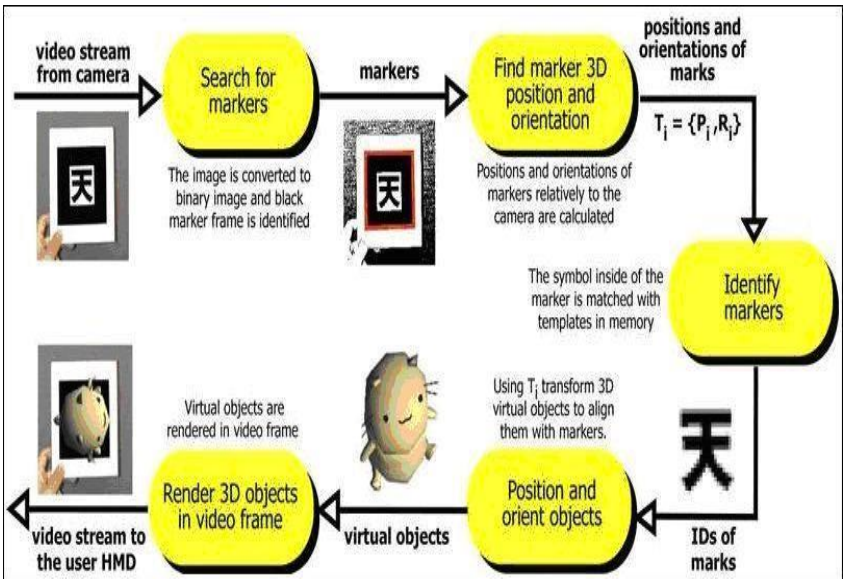

Figure 1. How Markers Work

Google SketchUp

Google SketchUpis a programa very reliable line in making designs, be it 2D or 3D designs. This program is widely used to create various designs such as house designs, highrise buildings, landscape designs, office building designs, shophouse designs, boarding house designs and others [8].

RESULTS AND DISCUSSION

Creating 3D Model Objects

Making a 3d object model in this system is the process of making the 7 wonders of the world into 3d form. This is intended so that the results displayed when using the application will be

more attractive. The 3d model object is created using the Google SketchUp application.

Marker Color Creation and Selection

Marker makingThis is done by saving the image that has been set as a marker into the Vuforia SDK database. The handling of animation interactions that exist on objects displayed through these markers will be handled by Unity and its programming. The selection of marker colors is carried out to examine what colors affect the detection of these markers during the scanning process. The scanning marker process will display 3D objects from each building if the detection is successful. The marker used has dimensions of 432 x 360 pixels. In this analysis, markers will be given different colors, namely colored markers, black and white markers, and grayscale markers (gray scale). These three markers have the same pattern but with different colors. Here are the images and the coordinates detected from each of these markers:

Table 1. List of Markers

No	marker	Detected Coordinates
1		
2		
3		

System Test

In testing this system, the thing that really affects is how the marker is detected on the camera. The test is carried out using the marker detection distance and also the marker tilt angle that can be detected by the application so that it can bring up 3D visualization. To find out these values, the camera used for testing each marker is a smartphone camera with a resolution of the same light brightness level in a room. The results of testing markers for distances and angles can be seen in the following tables:

Table 2. Marker Testing Against 20 cm Distance and Angle 0o - 90o

Distance	Tilt Angle marker	Information
20 cm	0º	Detected
	45o	Detected
	90o	Not detected

Table 3. Marker Testing Against a Distance of 50 cm and an angle of 0o - 90o

Distance	Tilt Angle marker	Information
50 cm	0º	Detected

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	45o	Detected
	90o	Not detected

Table 4. Marker Testing Against 80 cm Distance and Angle 0o - 90o

Distance	Tilt Angle marker	Information
80 cm	0º	Detected
	45o	Not detected
	90o	Not detected

Table 5. Marker Testing Against 90 cm Distance and Angle 0o - 90o

Distance	Tilt Angle marker	Information
90 cm	0º	Not detected
	45o	Not detected
	90o	Not detected

Based on the results of testing the distance and angle of the marker to the camera, the maximum and minimum values of the distance and the maximum and minimum slope angles are obtained so that the marker can be detected by the camera. The value of the results of the distance test and the marker slope angle can be seen in the following table:

Table 6. Distance and Angle Test Results

No	Distance and Angle Test	Results
1	Minimum detected distance	20 cm
2	Maximum distance detected	80 cm
3	Best distance	20 to 50 cm
4	The best angle to show the best results	0o to 45o

User Interface

Table 7. Distance and Angle Test Results

No	Interface	Information
1		The splashscreen page is the initial display that appears on the application before Main menu page appears
2		The main menu page is the page that becomes the main menu of the initial display
3		3D Page 7 wonder worl ddisplays a selection of 7 monuments that the user wants to choose

4		The guide page contains procedures for using the application to make it easier for users mo ment use it
5		The About page is a UI (User Interface) display that provides information about the 7 wonders of the world application
6		Kaaba is a sacred monument for Muslims (Muslims) located in Mecca
7		Petra's 3D objects were originally modeled as rectangles whic hthen formed into like the gate of a palace
8		Borobudur Temple consists of 3 levels where on the first and second levels there is no stupa. The stupa in the temple is on the third level
9		The Taj Mahal is a building that almost resembles a mosque with 4 minarets on each side
10		Tower Eiffel is an iron tower with a smaller shape at the top

11		Chichen Itza is a pyramid of the Mayans in Mexico
12		Roman Colosseum is a building whic hdesignated as a venue for spectacular performances

CONCLUSION

Based on the results of research and discussion in the description of the previous chapter regarding the application of the introduction of the 7 wonders of the world using augmented reality, it can be concluded as follows: The minimum distance between the camera and the marker is 20 cm and the maximum distance is 80 cm with the best distance between 40 - 60 cm. While the minimum angle of inclination of the marker is 0o and the maximum angle is 60o with the best angle ranging from 0o - 40o. Giving the background color to the marker is very influential on the detection of the marker. Black and white markers tend to be easier to identify because it makes it easier for the system to track the patterns on the markers. Bright colors also make it easier for the marker to detect because the pattern on the marker is more prominent than the back color on the marker. Applications for the introduction of the 7 wonders of the world using Augmented Reality can run optimally on the Android operating system with 2 GB RAM specifications.

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