Development of Augmented Reality-Based Animal Recognition Application Using Unity

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Abstract

Augmented Reality is a technology that combines two-dimensional and / or three-dimensional virtual objects into a real environment and then projects these virtual objects in reality in real time. The purpose of this study is to develop alternative instructional media using augmented reality technology. In this study, the instructional media is used to teach children about animals. By using augmented reality technology, the teaching and learning process will be more effective because augmented reality technology can display animals in 3D so that the children can see these animals as if they are real. The researchers conducted three stages that were pre-production, production, and post-production stage. The researchers created the animal; animal images in 3D by using the Blender application and also made a textbook containing the description of the animals and barcodes. Using an augmented reality application, the children can see the animals interactively in a real-world environment. The augmented reality application was developed by using a game engine, Unity. This study developed an augmented reality application and a textbook.

Keyword：Augmented Reality;3D;animal,media

1. Introduction

Instructional media for children must be developed attractively and have different values from the traditional learning that is usually only textbook- oriented. The development of information technology facilitates teachers and educational researchers to create attractive and interactive instructional media. Information technology facilitates innovation in instructional media to be more attractive. The interactive instructional media are expected to provide a more detailed explanation so that the students' reasoning skill, learning interest, and attention increase. The use of information technology in an instructional process is through computers or smart phones.

Instructional media developed by using information technology can be in video or animation form. The information technology provides benefits to students and teachers in the teaching and learning process. It also reduces the use of computers and smartphones for playing games (Pribadi 2017), (Yaumi 2018). There are many studies

that develop instructional media in video and animation form one of which is the study of Ponza (Ponza et al. 2018). Ponza developed instructional media for 4th graders on subjects in thematic learning. Arditya et al. also developed instructional media by using information technology (Yaumi 2018). They developed animated videos by using the Powtoon application and the videos were tested to the 4th graders of 1 Kaliuntu Bali public elementary school. The videos contained instructional material of science lesson in the unit of "The Properties of Light and Their Relation to the Sense of Sight". The developed videos were used in 03 Balung Lor public elementary school, Jember Regency and 07 Kepatihan public Elementary School, Jember Regency. Other studies that develop animated video as instructional media are (Novita et al. 2019), (Wardani 2017),(Widiyasanti et al. 2018), (Widiyasanti et al. 2018)

In using information technology to developed instructional media, it is necessary for teachers to get assistance. Therefore, they can do it independently later. Another thing that needs to be done is evaluation. An evaluation is carried out to see the impact of the use of information technology and its effectiveness in increasing the students' understanding. The study conducted by Tuli (Munirah et al. 2019) found that the development of instructional media on social studies class by using information technology increased the students' learning interest by 80% to 90%. This increase shows that the use of information technology to develop instructional media can help students to understand the instructional material. The study conducted by Perwita (Perwita 2020) found that the development of instructional media on Islamic religious class increased the students' final grades. The instructional material was about the story the prophet Nuh. The positive impact of using this media was the increase of the students' learning outcomes and the students' attitudes. The use of information technology has a positive influence in increasing students' knowledge (Harahap & Rezeki 2019), (Marian & Sediyono 2017), (Suratman et al. 2019). Moreover, the negative impacts that arise must be minimized; for example, the dependence on computers and smart phones used to access the instructional media is getting higher, so it is necessary for parents to monitor their children when they use their computers and smartphones (Fitri 2017), (Iqbal et al. 2020),(Widayanti 2019), (Damayanti & Gemiharto 2019)

Along with the development of technology, instructional media are not only in video or animation form. The current technology to develop instructional media is Augmented Reality (AR) technology. AR is a technology that combines two-dimensional and / or three-dimensional virtual objects into a real environment and then projects these virtual objects in reality in real time. The 2D or 3D virtual objects are created by using a certain application and then with an AR application the objects are displayed as if they are real. Objects that are displayed by using AR technology help the users to create new perception that they can interact with virtual objects in a real environment. (Ismayani 2020), (Grubert 2013). The use of AR technology is very common from games to education field. There are several free software such as Unity and Vuforia that are usually used to developed an augmented reality application. (Pamoedji et al. 2017), (Adam Sinicky 2019)

AR technology is used to support information technology-based learning. According to Ilmawan (Ilmawan Mustaqim 2017), AR is one of the technologies that is used in the development of instructional media. AR can provide a different learning atmosphere. By using AR technology, instructional media can perform a simulation of virtual objects

in a real environment in 2D or 3D. Unity and Vuforia are two common softwares to develop AR application as instructional media.

Aprilian (Apriliani et al. 2020) developed an AR application on physics lesson in the unit of optics, and the application is run by using the Android operating system. The results of the evaluation showed that 83.3% of the students who used AR application scored above the minimum completeness criteria. Moreover, 89.3% of the teachers and students said that the AR application as instructional media was very practical when it was used both in the classroom and outside the classroom. Usmaedi (Usmaed et al. 2020) developed an AR application as instructional media to teach English in elementary school. This study produced an AR application as instructional for English lesson. The AR application is developed so that the instructional media is more interactive and easy to use.

The existence of AR technology and the importance of developing instructional media that uses information technology raise an idea to develop an application that will be alternative instructional media to teach children about animals, especially animals that are already rare and extinct. To make the learning about animals interesting and deep, the researchers developed an AR application to teach children about animals through this study

2. Research Method

The purpose of this study is to develop an AR application as instructional media to teach elementary students about animals. This study developed a textbook entitled "Get to Know Animals with Augmented Reality" and an AR application. This AR application displayed 2D / 3D animal images, animal sounds, and simple narration.

The researchers applied an R&D (Research and Development) method. This method was used because this study produced products (Saputro 2017) , (Zakariah et al. 2020) , (Sugiyono 2017). In this study, the products are a textbook and an AR application. The Fig 1 is the steps carried out by the researchers.
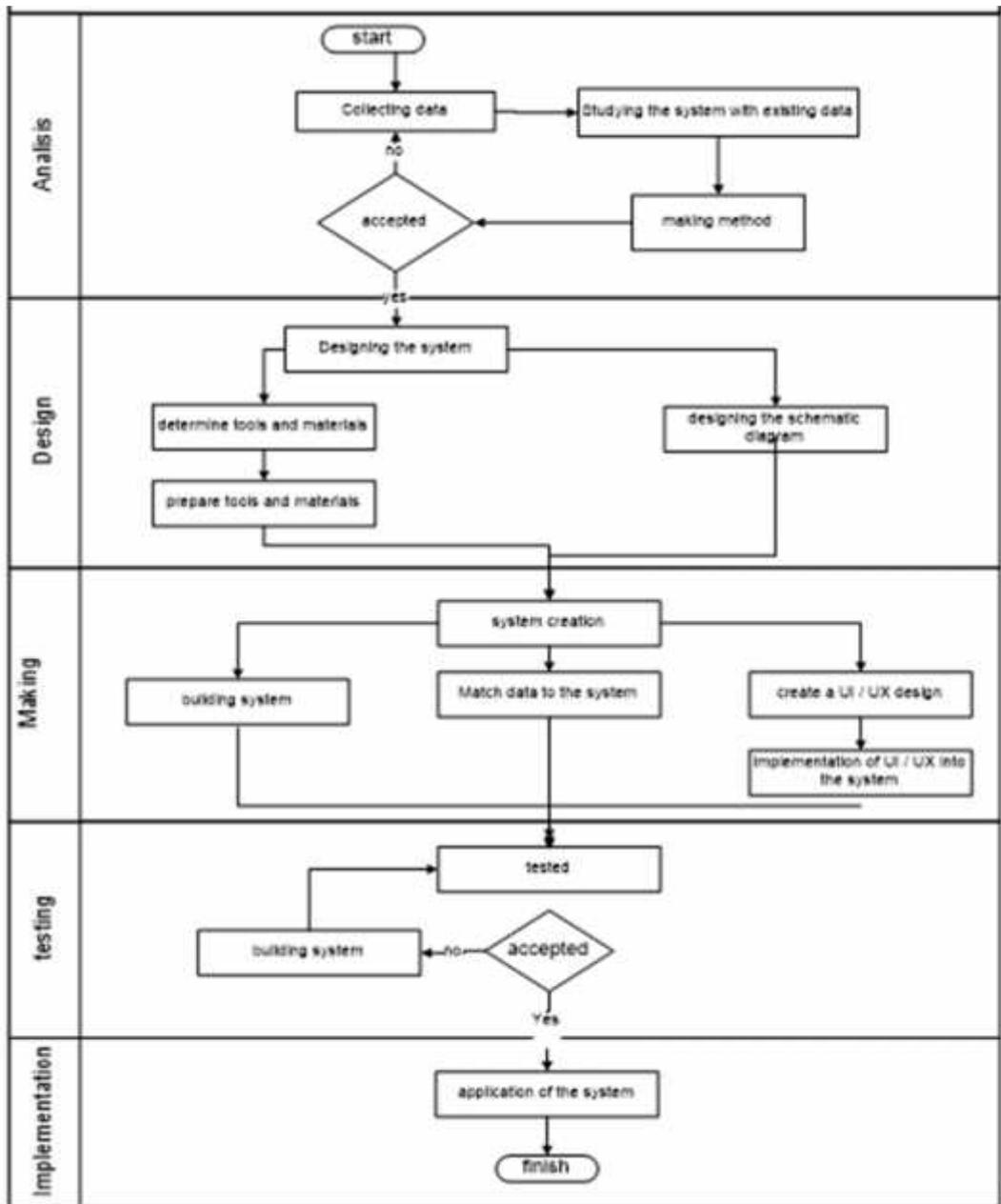
Fig 1. The Research Steps

3. Results and Discussion

3.1. UI and UX Design

The first step in developing this application was designing a user interface (UI) and User Experience (UX) which focused on the appearance and utilization of the application. The purpose of the UI design was to make the appearance of the application attractive while the purpose of the UX design was to make the utilization of the application effective. The results of the UI and UX design are in the Fig 2.
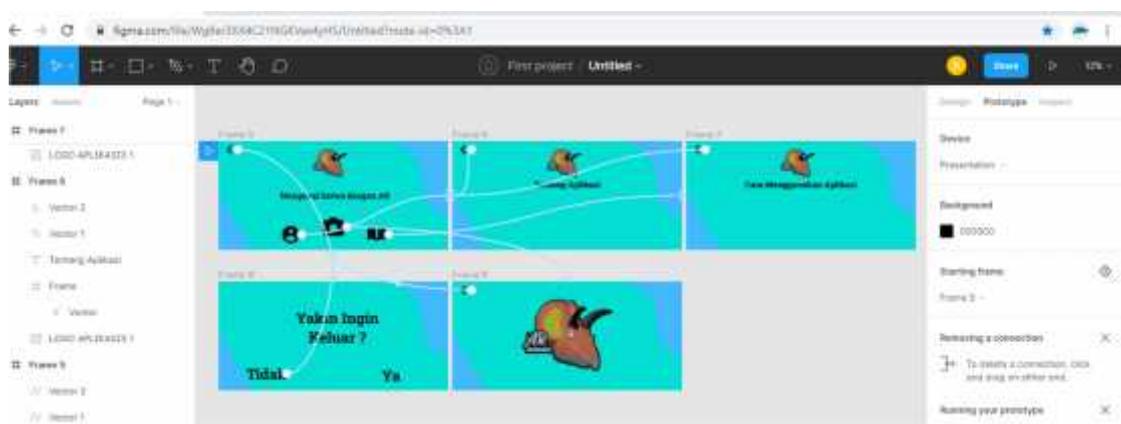

Fig. 2. The results of the UI and UX design on Figma

3.2. Database Design

The Vuforia application was used to store images that were the targets in displaying objects in the AR application. The stored images were images of animals. An example of an image of the target animal is in the Fig 3, and the results of database design on Vuforia are in the Fig 4.

Fig. 3. Images of the target animals

Fig 4. the results of database design on Vuforia

3.3. Analysis of the developed application

The AR application being developed is an application that can display a target in image form into a 3D object. The application is an android-based application that uses Augmented Reality technology. Augmented Reality technology was chosen because it has several advantages one of which is that this technology can display 3D objects. The initial display and the manual page of the application are in the Figs 5 and 6.

Fig 5. the initial display of the AR application

Fig 6 . the display of the manual page of the AR application

The data needed to display the 3D objects with this AR application were animal images. To make it easier for the users, the researchers also developed a textbook. In the Fig 7 is the cover page of the textbook and the pages with the targets that display 3D objects with the AR application.
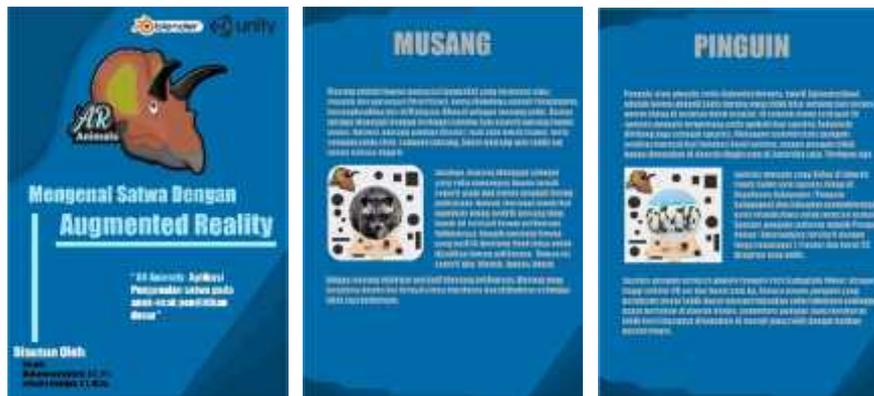

Fig 7. the textbook used with the AR application

3.4. *Displaying Augmented Reality Objects*

The final step was displaying animal images in 3D. As a result, the students got a visualization of the animals in 3D. The process of displaying the 3D objects began by pointing the smart phone camera towards the image in the textbook. The results are shown in the Fig 7 and 8. The Fig 8 shows an image of a penguin on the textbook and a 3D virtual penguin image displayed with the AR application, and the Fig 8 shows an image of a bird on the textbook and a 3D virtual bird image displayed with the AR application.
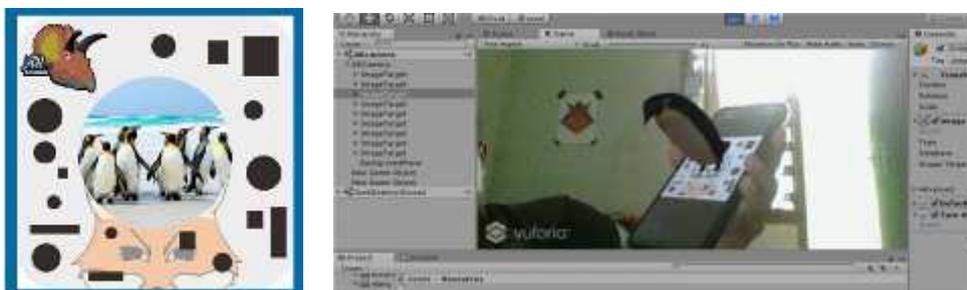

Fig 8. a 2D penguin image and a 3D virtual penguin image

Fig 9. a 2D bird image and a 3D bird penguin image

4. Conclusion

The teaching and learning process for children must be conducted attractively and not just display pictures and sentences. Information technology enables teachers to deliver instructional materials interestingly. One of the technologies that can be used is augmented reality (AR). An AR application can display objects in 3D with sound and text. The developed AR application presents instructional materials about animals in 3D. The application is equipped with a textbook that contains some animal images as the targets to display 3D virtual objects. The process of displaying an image in 3D is done by pointing the smart phone camera at an animal image in the textbook and then the application will display a 3D image along with an description of the animal in the form of sound and text.

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