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Virtual Reality as Learning Media for Lampung Historical Heritage

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Abstract— Lampung Province has a lot of historical heritage which is a world heritage for future human generations. The Lampung Museum, which was founded in 1975, plays a role in ensuring the continuity of history in the people of Lampung. Dissemination of Lampung history can be improved through education 4.0. Virtual Reality is a technology that allows a user to interact with the environment that exists in the virtual world and can provide information. Virtual Reality can help disseminate the history of Lampung with interactive and humanistic interaction models for historical objects that are presented without being bound by space and time. In addition, the ongoing COVID-19 pandemic has had a major impact on the performance of the Lampung museum in disseminating the history of Lampung. The method used to develop Virtual Reality of Lampung Historical Heritage consists of seven stages, namely Problem Formulation, Determination of Motivation, Idea Development, Design, Prototype Making, Testing, Advanced Development, and Implementation/Release. Eight historical objects were modeled and enriched with information regarding their relationship to Lampung history, namely the Lampung Museum, Thay Hin Bio Vihara, Al-Anwar Mosque, Lampung Siger Tower, Krakatau Monument, Kerti Bhuana Temple, Nuwo Sesar Traditional House, and the Japanese Cave. It is hoped that with the availability of Virtual Reality of Lampung Historical Heritage, the dissemination of Lampung history can be carried out more progressively through education 4.0.

Keywords— virtual reality, historical heritage, lampung, learning

I. INTRODUCTION

Lampung Province is one of the provinces that has many historical relics, one of which is the Lampung Museum building. The Lampung Museum, which was founded in 1975, by the Minister of Education and Culture Prof. Dr.

Fuad Hasan. Lampung Museum has another name, namely Ruai Jurai, which means Two Descendants of Lampung Residents[1]. The Lampung Museum itself was established to be an educational tourist spot so that the public can find out information about the historical heritage that once existed in Lampung Province. However, with the development of an increasingly modern era and the increasing number of entertainment attractions such as beaches, lakes, mountains, fishing ponds, and so on [2].

Thus, people are less interested in visiting the Lampung Museum again. There are many educational tours in Lampung Province and the locations are far apart from one place to another, according to the history that grew from which area. In this modern era, there are many methods of delivering information about history by utilizing the technology that is currently developing. One of them is using Virtual Reality technology as a medium for delivering information about historical education[3]. Virtual Reality is a technology that allows a user to interact with the environment in the virtual world and provide information. Currently, virtual reality is widely used as a learning tool or simulation that is useful for its users, for example, airplane flight simulation, car driving simulation, and even learning for surgery in the medical world[4].

Learning has many methods to achieve the desired goal. One of them is virtual reality, which makes it easier for individuals to receive information interestingly and memorably. At this time virtual reality has become part of the learning system, in all fields, for example, in the fields of education, engineering, medicine, agriculture, and even offices. Not only is the form of delivery attractive, but in terms of innovation and modernization that makes virtual reality a very useful tool in the field of education[5]. The potential for the development of virtual reality in the world of education is necessary because virtual reality is formed

or created with useful learning objectives and can also make it easier for teachers to explain the material being taught.

To make it easier to get information, where technological developments are increasingly unique and renewable, in this case using virtual reality technology, where users can feel that they are in historical places in the province of Lampung. Not only being in a virtual reality environment but also users will be presented with textual information that will explain the place. So that users can find out the place without having to visit far to see firsthand the historical places in the province of Lampung.

With the current COVID-19 (Corona Virus Disease 2019) pandemic affecting tourism in Lampung, people who want to visit historical locations or want to learn about historical locations in Lampung are limited, due to regulations for Physical Disatancing, and Stay at Home by the Government of Indonesia[6]. Therefore, with the Learning application utilizing Virtual Reality Technology, the general public, especially millennial children or also students and students who want to learn, can immediately feel like visiting these locations without having to travel to historical locations in Lampung. In other words, this application makes it easier to learn or find out information about historical places in Lampung, and also improves the tourism industry in terms of technology[7].

Therefore, it is hoped that this application using virtual reality technology can help the Teaching and Learning Process (PBM) and delivery technology that can attract students or the general public to learn history easily and interestingly, and can also generate interest and benefits in the field of education.

The utilization of Virtual Reality still tends to be recreational. The potential possessed by Virtual Reality is quite extraordinary, especially in the field of knowledge dissemination. By conducting research related to the dissemination of Lampung's history, the level of use of Virtual Reality in education 4.0 can be known[8].

Virtual Reality can help disseminate the history of Lampung with interactive and humanistic interaction models for historical objects that are presented without being bound by space and time.

II. METHOD

A. Tahapan Penelitian

The research stages consist of seven stages, namely Problem Formulation, Motivation, Design, Prototyping, and Evaluation. The diagram of the research stages can be seen in Fig. 1.

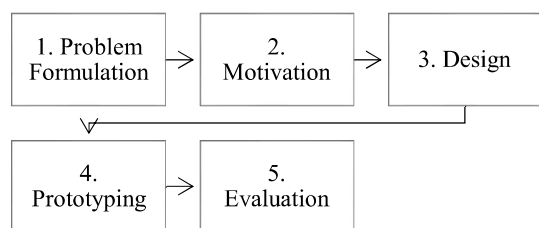


Fig. 1. Research Stages

1) Problem Formulation

The problem that arises is the need for location and time in carrying out Lampung history learning. Thus, we need a way that can reduce dependence on location and time while maintaining an intuitive learning interest through visits to historical sites.

2) Motivation

In this study, the basic application requirements or functional requirements are:

1. Visit virtual tourist spots.
2. View information on virtual tourist attractions.
3. Can select a virtual tourist spot with the location panel.

This study also has non-functional requirements including:

1. Can select via view (Gaze Control)

This Gaze Control functions as a pointer because it only uses a virtual reality headset without using a controller, so the gaze control is used as a pointer. This gaze control has an action to select an action that has a duration of 1.5 seconds.

2. Stereoscopic Display

To present the sensation of Virtual Reality, the display must be dual with a stereoscopic perspective according to the human eye.

3. 3D Rendering 60 FPS

3D rendering can be done in the range of 60 fps so that the eyes do not get tired quickly because it is more in line with the 60Hz average for eye speed updating information.

4. Place switching occurs instantly (Teleport)

Users can move or teleport from one location to another just by selecting the maps menu and selecting the location they want to go to.

5. Can return to the home menu from any screen

When the user is in the historical location of the virtual Lampung, the user can return to the application's start menu.

6. Can exit the application

In addition to exploring the historical heritage locations of Lampung, there is another important feature, namely to exit the application, if the user wants to end exploring the historical heritage locations of Lampung. This is necessary because the user cannot use the back button on Android to exit the application.

At this stage, there is a gathering requirement, such as looking for data about historical heritage places in Lampung in the form of notes, photographs which will later be entered into the database. The list of places to be processed can be seen in Table 1.

TABLE I. LAMPUNG HISTORICAL HERITAGE LOCATIONS

No.	Name	Location
1	Lampung Museum	Bandar Lampung
2	Thay Hin Bio Vihara	Teluk Betung, Bandar Lampung
3	Al-Anwar Mosque	Teluk Betung, Bandar Lampung
4	Lampung Siger Tower	Panjang, Bandar Lampung
5	Krakatau Monument	Teluk Betung, Bandar Lampung
6	Kerti Bhuana Temple	Teluk Betung, Bandar Lampung
7	Nuwo Sesat Traditional House	Teluk Betung, Bandar Lampung
8	the Japanese Cave	Teluk Betung, Bandar Lampung

a) Prototyping

The stages of making the Lampung historical heritage virtual reality application (VRWSL) were built using the Unity 3D Game Engine. Making this application creates the virtual reality that allows users to feel they are in that location and make interactions about the information of the place according to the data that has been taken.

The interfaces that are planned to be used are the Main Menu, Help Menu, Information Menu, and Location Menu.

3 Dimensional model built using low poly and minimal texture. An example of a built 3D object can be seen in Fig. 2.

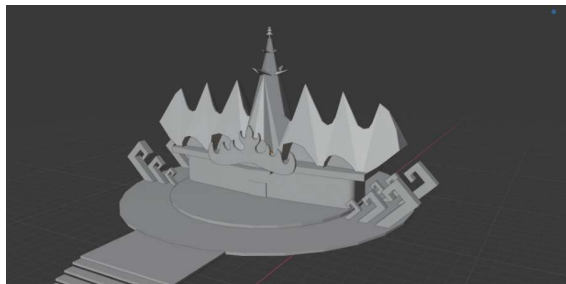


Fig. 2. Siger Tower 3D Model

3) Evaluation

his testing stage uses the Blackbox testing method. When all stages have been carried out, the next stage is testing, which is testing the system whether it is deemed able to achieve the objectives or not. If it is felt not, then the steps that must be taken are to return to the development stage and if it is felt that the testing is appropriate then the testing stage is not continued.

III. RESULTS AND DISCUSSION

A. Prototyping

1) Lampung Historical Heritage Virtual Reality user interface

Based on the interface design of the Lampung Historical Heritage Virtual Reality application, the implementation of the Main Menu, Help Menu, Information Menu, and Location Menu was made using the Unity3D Engine.

The main menu provides access to the Location Menu, Help Menu, Information Menu, and Application Exit Button. The results of the implementation of the Main Menu can be seen in Fig. 3.



Fig. 3. Implementation of the VRWSL Main Menu

The Help menu displays guide information on how to use the application related to Getting Started, Selecting a Location, Information Interaction, and Finishing. The results of the implementation of the Help Menu can be seen in Fig. 4.



Fig. 4. Implementation of the VRWSL Help Menu

The Information menu provides information related to a brief description of the application and the application development team. The results of the Information Menu implementation can be seen in Fig. 5.



Fig. 5. Implementation of the VRWSL Information Menu

The Location menu presents options using location images so that users can choose the location they want to visit. The results of the Location Menu implementation can be seen in Fig. 6.



Fig. 6. Implementation of the VRWSL Location Menu

2) 3 Dimensional Low Polygon Object Modeling

Location modeling is made in Low Polygon 3 Dimensional Object model using Blender software. Using Low Polygon and not using texture, only color for coloring. The Lampung Historical Heritage sites modeled are the Japanese Cave, Nuwo Sesat, the Krakatau Monument, and the Siger Tower.

a) The Japanese Cave

The Japanese Cave model created using Blender is used as a heritage object in one of the predetermined locations, there are several trees, fences, and the Japanese cave itself under the mountains. 3D modeling used is low poly where poly mesh / a combination of several polygons are united, this low poly 3D modeling design is not too detailed and looks minimalist. The results can be seen in Fig. 7.



Fig. 7. Japanese Cave 3D Model

3) Nuwo Sesat Traditional House

The Nuwo Sesat model was created using the Blender software. 3D modeling used is low poly where the poly mesh is a combination of several polygons that unite, this low poly 3D modeling design is not too detailed and looks minimalist. The results can be seen in Fig. 8. 3D Model of Nuwo Sesat.



Fig. 8. Nuwo Sesat Traditional House 3D Model

a) Monumen Krakatau

The Krakatoa monument was created using the Blender software. 3D modeling used is low poly where poly mesh / a combination of several polygons are united, this low poly 3D modeling design is not too detailed and looks minimalist. The results can be seen in Fig. 9. 3D Model of the Krakatoa Monument.



Fig. 9. Krakatoa Monument 3D Model

b) Siger Tower

A 3D model of the Siger Tower was created using the Blender software. This object has ornaments on its right and left. This object also has a connection with 0 KM Lampung which is at the bottom of the Lampung Siger Tower. The 3D used is low poly where the poly mesh/combination of

several polygons is united, this low poly 3D modeling design is not too detailed and looks minimalist. The Siger Tower model which has been combined with the 0 KM Lampung model can be seen in Fig. 10. The Siger Tower and 0 KM Lampung 3D model.

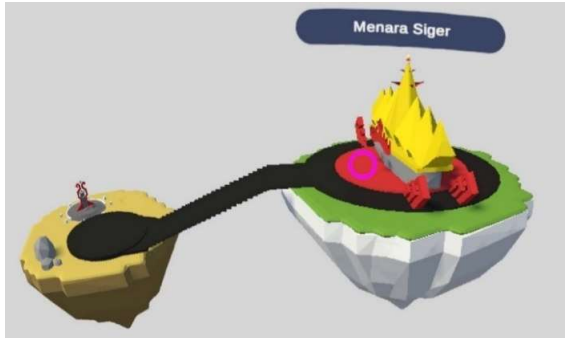


Fig. 10. Menara Siger dan 0 KM Lampung 3D Model

4) 360 Equirectangular Panoramic Image Creation

The creation of this 360 panoramic image is by predetermined locations. Panoramic 360 images were taken using a Samsung Gear 360. The shooting locations consisted of the Lampung Museum (Fig. 11), Thay Hin Bio Vihara (Fig. 12), Al-Anwar Mosque (Fig. 13), and Kerti Bhuana Temple (Fig. 14).



Fig. 11. Lampung Museum

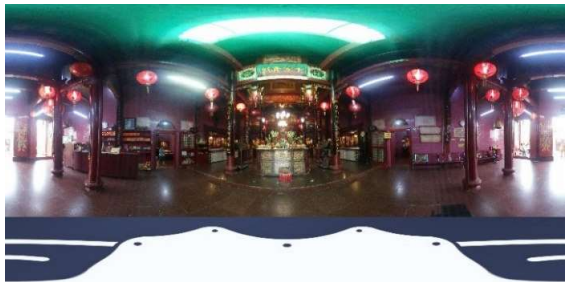


Fig. 12. Thay Hin Bio Vihara



Fig. 13. Al-Anwar Mosque



Fig. 14. Pura Kerthi Buana Temple

B. Evaluation

This stage is testing the prototype of Virtual Reality of Lampung Historical Heritage. The trial aims to test the prototype to the actual state in the field. Tests were carried out on 2018 Samsung A5 mobile devices installed on Google Cardboard.

Tests were carried out on 9 scenarios consisting of 3 functional tests and 6 non-functional tests. The test results can be seen in Table II.

TABLE II. EVALUATION RESULTS

No.	Scenario	Expected Results	Fit?
Functional			
1	Visit virtual tourist spots.	User visit tourist spot in <i>Virtual Reality</i>	Yes
2	View information on virtual tourist attractions.	Information displayed on tourist spot	Yes
3	Can select a virtual tourist spot with the location panel.	User teleport to a chosen location.	Yes
Non Functional			
4	Can select via view (Gaze Control)	Processed in 1,5 seconds	Yes
5	Stereoscopic Display	Display in stereoscopic	Yes
6	3D Rendering 60 FPS	Rendered in average 60 FPS	Yes
7	Place switching occurs instantly (Teleport)	Teleportation	Yes
8	Can return to the home menu from any screen	Home menu button and functional	Yes
9	Can exit the application	Exit button and functional	Yes

IV. CONCLUSION

The Lampung Heritage History Virtual Reality application was successfully built according to the needs of users, namely the people of Lampung who want to travel in virtual reality to eight objects of Lampung's historical heritage, namely the Lampung Siger Tower, Krakatau Monument, Nuwo Sesat Traditional House, Japanese Cave, Lampung Museum, Pura Kerti Bhuana, Vihara Thay Hin Bio, and Al-Anwar Mosque.

The use of Gaze Input Control allows interaction to be carried out directly from the user's point of view so that the system becomes simple and easy to use. This application can be run using the Android platform paired with Google Cardboard to allow easier implementation by the general public.

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