

Cultural Heritage of Indonesia Traditional Houses 3D Model on a Website

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Abstract—Traditional houses are one of Indonesia's cultural heritage. All provinces in Indonesia have traditional houses as symbols of the characteristics of people living in certain environments. The traditional houses from provinces in Indonesia are located in Taman Mini Indonesia Indah (TMII). TMII strives not only to reconstruct houses from various provinces, but also to create realistic models and shelters of various people in Indonesia. To provide information about cultural house to the general public, in this research 3D graphic models of TMII and the surrounding environment have been created and developed. Virtual Reality technology was used to display the visualization of cultural houses and the surrounding environment in 3D graphics technology. This research used Blender and Unity3D software to create 3D and virtual reality models that can be implemented and displayed on the Website. The results of this research was a 3D website from traditional houses from Indonesia provinces. This web site consists of scenes of traditional houses in TMII where users can explore each of the traditional home environments.

Keywords: cultural heritage, traditional houses, virtual reality, 3D website, virtual environments

1. Introduction

Indonesia is a large country that has a diverse culture. Indonesian culture is spread in all provinces and is a characteristic of unique regions. Indonesia is a big country and has a long history in its development. A number of cities in the country of Indonesia have a collection of art, culture and knowledge. In the New Order government came the thought of the first lady (Madam Tien Soeharto) to create a park that contains representations of art and culture from all provinces in Indonesia, which is called TMII. Taman Mini Indonesia Indah (TMII) is a place or location used to store art and cultural products coming from all provinces in Indonesia, especially traditional houses and art products. TMII preserves art and cultural collections as well as other historic objects. TMII is open to the public so it can be visited by the general public. TMII has a goal to serve the needs of art and cultural information for the community, recreation facilities and to

increase public knowledge. With the existence of TMII the general public can find art and culture coming from all provinces in Indonesia although never visited other provinces. There are many ways in which the TMII to attract people to visit there. By providing information through a number of books, it is also available in other print media as well as through a number of websites. Submission of information through the print media and websites that exist so far is not enough, because many objects and objects (traditional houses, buildings, and parks) which is objects or 3 dimensional (3D) environment. 3D model and 3D objects surroundings will not be intact if the real objects are displayed only through images. Thus it is necessary to be able to display or visualize real objects in 3 dimensional. In this way, objects and environments can be displayed as their original form, so it will be more interesting and the information conveyed becomes meaningful/intact. One of the objects that placed in TMII is a traditional/culture house. This traditional house is a representation of 33 provinces of Indonesia. Examples of custom houses placed in TMII are as shown in figure 1 below.



Figure 1. Tradisional/Culture House of Central Java Province in TMII.

Figure 1 is obtained from a website showing a Central Java platform in TMII. In addition to the picture there is a description of the pavilion and the parts contained in the pavilion, among others. If the information provided is only in

the form of description, then the reader does not know the details about the form or appearance and ornament that is in the pavilion. This problem can be solved if the information about the displayed object is not only in the form of pictures and description, but by using 3d visualization. The reader or the person seeking information will know more details of the object described because it is visualized like the original object. From the background, then in this study developed a way to be able to display the original object by visualizing it in the form of virtual display / virtual. The texture of the visual object is made according to the texture or color of the original object. The information delivery method can use computer graphics technology. By using computer-based web graphics technology, it can be developed an application program that can be accessed through the internet browser to display 3-dimensional objects. Utilization of web-based virtual reality technology can visualize the custom house and environment in TMII virtually so that people know the detail of every corner and space available. Application users can explore every angle or space available in TMII.

2. State of The Art Research in Virtual Reality

The development of virtual world in the form of 3D has been done by a number of researchers. Batty et. al has made the virtual world in the form of 3D city [1]. Similarly the modeling of the city has been made by Shiode in his article on the creation of an urban environment in the form of 3 dimensions [2], and city models for focus based tour animations [3]. However, the development of the virtual world that has been developed has not been using or based on the web, so virtual reality applications are created must use a special program to be able to run it. The latest Virtual Reality technology enables displaying 3-dimensional models via the web, the WebGL (Web Graphics Library). The developer does not require a plug-in on Web browsers where the previous VRML technology was required. It is a Javascript API that can be used for processing 2D and 3D graphics on the Web. Developers take advantage of rendering an animation using Javascript, Web pages, and standard Web stack technology without using plug-ins.

WebGL is part of HTML5 technology, because it is packaged in some browsers that support HTML5 technology. WebGL can work on some desktop and mobile based browsers. WebGL is evolving and making web searches more beautiful in appearance as it displays a moving visualization, from a game to data visualization. WebGL was developed by the Khronos Group, which is an institution that also governs OpenGL, and is a free, inter-platform API that brings OpenGL ES 2.0 to the web as a 3D drawing context in HTML. WebGL was developed by Khronos Group which is an institution that also governs OpenGL, COLLADA, and other specifications. The official release of WebGL by its developers, Khronos is: WebGL is a free, inter-platform API that brings OpenGL ES 2.0 to the web as a 3D drawing context in HTML. WebGL uses OpenGL shading language, GLSL ES, and can be combined with other content on the web in addition to 3D content. This research used Unity3D,

which is a software used for several things, such as for model visualization, creating 3D games and animated objects. Unity3D WebGL allows developers to generate 3-dimensional VR models that can later be displayed through a web browser. A number of previous studies that utilize WebGL to be able to display 3-dimensional objects in large sizes, for example to produce virtual museums [4], Cultural Heritage [5], Cultural Heritage Learning [6], Cultural Artifacts [7], Virtual Educational [8] and Huge City Model [9]. Previous research that has been done was the research on the developing 3-dimensional model and web-based virtual reality in National Monument and its environment [10]. This research has been produced 3-dimensional models of the National Monument and the static and dynamic objects. The texture of the object is adjusted to the original so that the result of making the 3D models corresponds to the real condition of the National Monument. Figure 2 shows the results of the making web based of the National Monument. In addition to the creation of 3-dimensional model for National Monument, the research also created other objects contained around the National Monument, among others, a number of park and statues that placed in the park.



Figure 2. National Monument in a Website [10]

The previous research about cultural houses was published by Hanan [11]. The publication was about Batak Toba cultural heritage. The research tried to use close-range photogrammetry technique to documentation a traditional Batak Toba house. Another research about traditional houses of Indonesia was published by Schefold [12] for transformation in vernacular architecture.

3. Research Method

The research method of developing 3d model in a web, basically there are two main things, i.e. modeling and visualizing in the form of virtual reality. It was needed to be prepared number of steps so that the end product of the 3D modeling of the TMII and its objects surrounding area can be displayed visually on the Web. Users can explore the 3D models and its environments by controlling buttons on the

keyboard or by using other control devices (mouse). The research method that was used in this research as in figure 3.

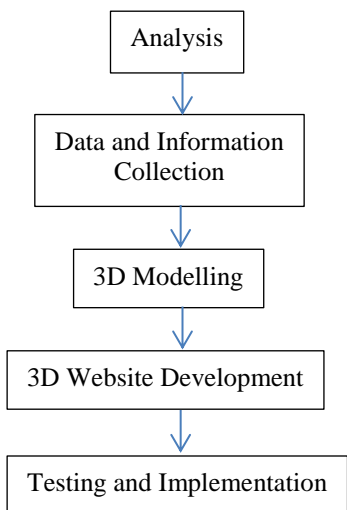


Figure 3. Research Method

The research was begun by analysis. This step analyzed what software, hardware, tools which is needed to generate a web-based virtual reality application. The next step is data and information collection, where this step was done by visiting the location of TMII. This step was collected information of culture houses: shape, dimension and texture of objects. 3D modeling (using Blender software) step created the 3d model from real culture houses and the objects that exist in the form of three-dimensional graphic models. The step continued with developing virtual reality model with Unity3D software. The research continued with creating VR website, converting the 3-dimensional model that has been created in the form of virtual reality that can be showed with a web browser and developing a website. Testing step was testing of the models with examining the models to display whether the model correct or error to display. Test activity also including measuring the loading time of every scene to display in the website.

4. Website Design

The website was designed in 5 main menus. The menus are: culture houses, TMII in virtual reality, history of TMII, about virtual reality and about us. Culture houses menu shows the list of houses and the description about the house, TMII Virtual Reality consists of many pictures of culture house in virtual reality, History of TMII consists of the history of TMII, About Virtual Reality menu shows the Virtual Reality and how to use or navigate virtual reality, and About us. menu consists author information.

5. Result

Result of this research was a website of three-dimensional model of traditional/culture houses and the objects surrounding the environment, which can be displayed in a

web browser. The research data have been taken from the real TMII. Texture data taken from real TMII and then added to each object as original object. To generate the texture according to the dimensions of the original model, adding some texture on large objects must be adapted to the actual dimensions. Virtual Reality shown through the website is placed in TMII Virtual Reality menu. Virtual reality modeling was place by dividing into a number of scenes, where every scene consist of specific traditional/culture house. This was done due consideration of the size of large models that will be hard for a computer that is used when rendering. In the TMII virtual reality culture houses menu, there are 33 culture houses of the Indonesia provinces in VR which can be accessed by the user. At any existing VR models, users can perform a walk-through using the keyboard by pressing the up arrow, down left and right. The website and virtual environment of some culture houses looks beyond is as shown in figure 4.



Figure 4. TMII Virtual Reality Website.

Figure 4 shows the virtual reality sample of traditional/culture house from some province of Indonesia. This scene consisted of culture house including the vegetation and static objects surrounding the environment. Figure 5 shows an example of a 3-dimensional model from a traditional / traditional house from West Kalimantan, a traditional house in Yogyakarta, a traditional house in South Sumatra, a traditional house in Sulawesi, a traditional house in Aceh. This landscape consists of traditional houses including vegetation and static objects that surround the environment. The texture in the traditional house object is obtained from the original object of the traditional house in TMII.



(a)



(b)



(c)



(d)



(e)

Figure 5.Culture House of (a) West Kalimantan, (b) Yogyakarta, (c) South Sumatera, (d) South East Sulawesi, (e) Aceh

6. Testing and Implementation

The result of the 3d traditional houses has been tested by comparing with the real traditional house. The texture that implemented in 3d model should be same as the real traditional house. Figure 6 shows the comparison between the traditional houses and 3d model of traditional houses.

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(a)

(b)

Figure 5.Culture House (a) 3D house model, (b) real house

This website has been implemented and tested by measuring size of scene and loading time of the scene. The website has been tested in Mozilla fire fox browser and user can walk-through and navigates in the scene smoothly. User can navigate using keyboard and mouse to see cultural house and move to another cultural house scene. The website has been published in URL www.vr-tmii.com.

7. Conclusion

This research has successfully to build the culture heritage of traditional houses of Indonesia. This research has successfully generated virtual environment of traditional/culture houses in Beautiful Indonesia Miniature Park (TMII) and objects surrounding the environment. The virtual model of the culture house was successfully displayed in a web. The testing results showed that virtual model can be displayed in the web and the user can walk-through real time to navigate in that virtual scene. Users can easily control the virtual reality models with a keyboard and mouse

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