Virtual Reality Application For 3D Modelling Objects

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ABSTRACT: *In this current work we have developed a framework for the development of a virtual reality application. We create a virtual tour to denote the process. We collected the data about the object and modelling software. The correct modelling software for 3D modelling and the application is shown in the virtual studio.*

1. Introduction

In the last few years, technology associated with virtual reality has yet to prove its usefulness for computer users. Until now, virtual environments require a computer with high quality graphics with specialized hardware and research software. This picture is changing quite quickly and VR applications from expensive, single-user applications have changed to very acceptable configurations with joint virtual worlds.

This development of technology contributing designers to add new ways of communication with what we see. One of those ways is a virtual communication with a particular subject, object or model. Thus the user has better perception in terms of what he sees and can see the model in three dimensions. This technology is used in this paper in which its created virtual tour thus really existing objects.

Created application can be used as a stand-alone application or be attached to the internet and be accessible to all users who are interested in interacting with it.

2. Memorial Museum 11th October - Prilep

The Memorial Museum 11th October 1941" is located in the center of Prilep. The building in which the museum is hosted was

built at the beginning of XX century. May 1, 1952 in this building was opened for the first time Museum of NLW (National Liberation War) in Prilep, and on the occasion of 20th anniversary of NLW opened permanent museum exhibition.

For cultural monument consists of photographs, documents, maps, drawings, objects and partisan equipment is located in an area of about 236 m2, on the ground floor in Hall 1, and the floor in Hall 2 and Hall3 shown in Fig.1.

Figure 1. Memorial Museum 11th October 1941 - Prilep

3. Creating 3D Model From Museum

The principle of creating such an application starts with collecting information from the Memorial Museum. Information are the actual dimensions of the museum, the size of rooms, taking pictures from the exterior and the interior of the building and photographing all panels in the museum. These pictures later are used to create the needed textures for the 3D model.

When is finished with collection of information, is accessed to modeling process, i.e. creating a 3D model from the real model. Modeling is performed inside and outside the museum and attaches the texture of the object. In our case, modeling is done with animation and modeling software, Autodesk Maya. For the external environment (square) it is used a primitive plane without any special modifications, only increased dimension and position of that plane. In the middle is deducted the surface of the object using a Boolean operation Difference, presented on Figure 2.

Next you have to do is start with the modeling of the external walls of the object. Modeling of the walls is made with primitive cube on which are given the actual dimensions of the object scale. Modeling of the windows and the entrance of the building was done using the Boolean operation difference (Figure 2), which is modeled new facility with the
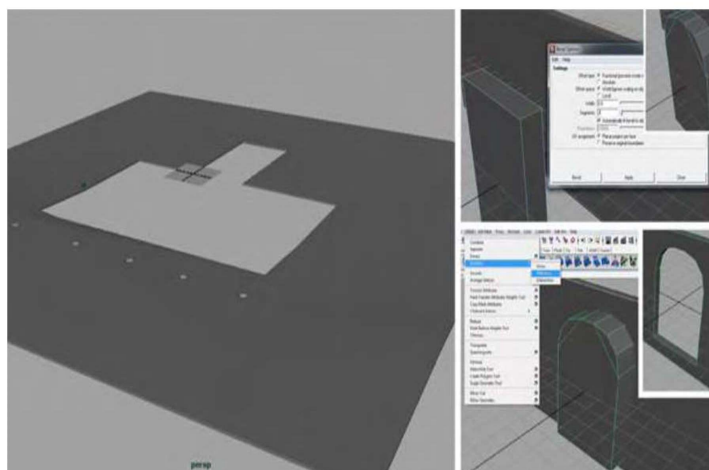

Figure 2. Creating external environment (square) of the museum, bevel option and design of the windows

look of the window and that object is taken from the wall, than gets the final appearance of the wall shown on Fig. 3. On the same principle are constructed the walls in the interior of the object, i.e. is created the base of the wall and from that base are deducted models in form of windows.

After is finished with modeling of the walls, are modeled the windows and the other objects which are on the facade of our facility. Rounding the objects and windows is made using the tool Edit Mesh -> Bevel and is entered the radius of the rounding and number of polygons (smoothness) of rounding (Fig. 2). Is needed smaller number of polygons to obtain the desired shape, because of the bigger number of polygons means more triangulation an rendering problems.

Figure 3.Final look at the entrance and one of the windows and a complete view of the model without texture

Objects (panels) in the building are created using primitives (cubes). Create as many primitives as there are panels and then are changing the dimensions accordingly. When modeling of other object, are used primitives such as cylinder, spheres as well as their combination. Also in this model are used some readymade objects (guns, etc.), which have a proper look at our requirements. This gives the final layout of the ground floor of the model shown in Figure 4.

In a similar principle is created the first floor of the building, first by creating the exterior walls, then with modeling of the premises and objects in the premises. Used are the same tools for creating the windows and primitives for adding the final layout of the building shown in Fig. 4. We are completing with raising the roof of the building and after that starts with phase of texturing scenes.

After modeling of the museum, acceding to the insertion the texture and materials. The quality of the layout depends on the type of material that is used by its visual components, such as the color, brightness, transparency and the surface on which is applied. Textures are used to provide material variation and greater realism, thus simulating different types of material using image file texture or computer-generated procedural maps.
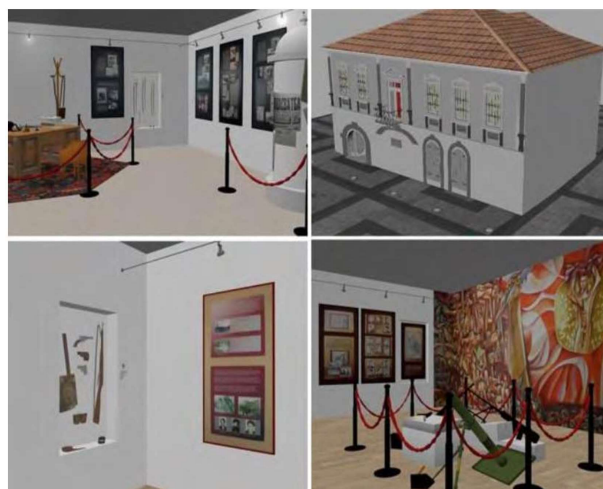

Figure 4. A complete view of model with texture

Working with textures significantly slows performance and rendering the application in EON, so its recommended not to use high-resolution textures and how much it is possible to use a smaller number of textures. The maximum resolution is 1024x1024 and can be inserted .jpeg, .png and .ppm textures. Textures can be imported along with the model or to create separately in EON Studio. In Fig. 4 is shown the complete layout of the model and its interior along with textures and created materials.

4. Creating VR Application

Once we are finished with the process of modeling the object in Maya, we approach to his preparation for input in to EON Studio, i.e. preparing of the object and textures. Before entering of the object, it necessary to make a triangulation of the object. Triangulation represents a process of dividing the polygons which are defined by four or more points, to polygons defined by three points, shown on Figure 5.
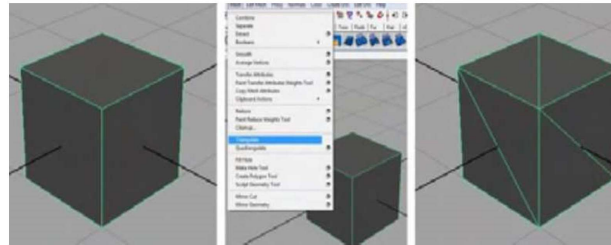

Figure 5. Triangulation

This process of triangulation can be performed in two ways: the first one on the side of the software the object is created (in our case Maya), and the second way - on the side of the software the object is inputted (EON Studio). Because of the size and complexity of the object, triangulation is performed in Maya, not in EON Studio because of greater stability of the software. If triangulation is not performed on the side of the software the object is created, input in EON Studio automatically run, but in our case it was not possible because of the number of polygons of the object, EON Studio was unable to processes by which the program blocks.

Once it is completed the process of triangulation, it is necessary to export the object into a format that can be inputted in EON Studio. The basic format in which files are recorded from Maya (.ma and .mb), EON Studio does not recognize, so this object will be exported in .obj format which is readable into EON. In addition, our object is ready for input into EON Studio.

From the File menu of EON Studio chose Import, from the given options we choose to enter Wave front (+Rhino) .obj. Than a dialog window shows, where can choose which model we want to import, and select the options we want to have this object Fig. 6.
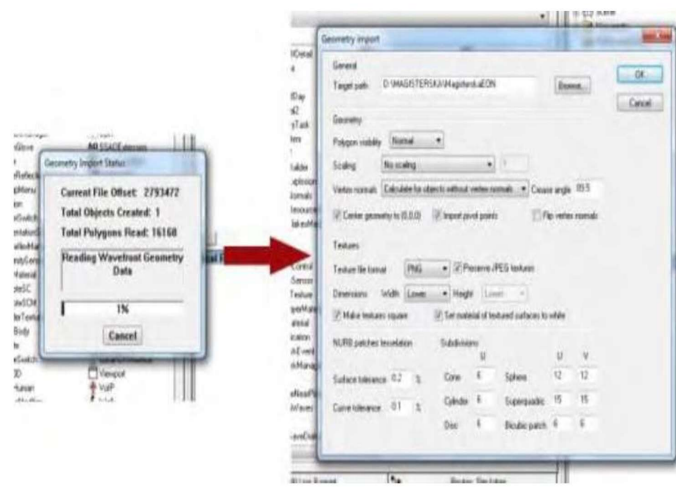

Figure 6. Importing a model in EON Studio

Then it is necessary to create interactivity of the object and the user. For this purpose the tree of simulation in terms of camera, we erase the node Walk and add the node Walk About. With the first node we were limited with the movements of the mouse; while with the second node (Walk About) movement of the camera around the object is executed using the keyboard. Also in the tree of simulation Fig. 7, we can notice our facility which was entered into EON Studio.
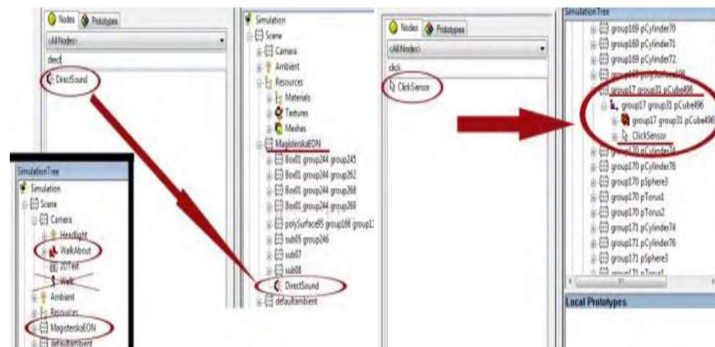

Figure 7. Deleting Walk node, import WalkAbout, ClickSensor and DirectSound node and display our model in the scene

Next interaction that we create is displaying text and sound with a click on some of the panels. For that purpose, firstly in the node of our object (Master EON) we entered the sound node (Direct Sound) shown on Fig. 8, which should display when click on some of the panels. Once is inserted the sound field, it is necessary to select the sound file that will be emitted when click on that panel sound in .wav format (Proba.wav).

To display the text, it is necessary in Camera node to insert node for showing text (2D Text), Fig. 8. The characteristics of this node in the Text field we write the text we want to be shown on the screen when clicking on some of the panels.
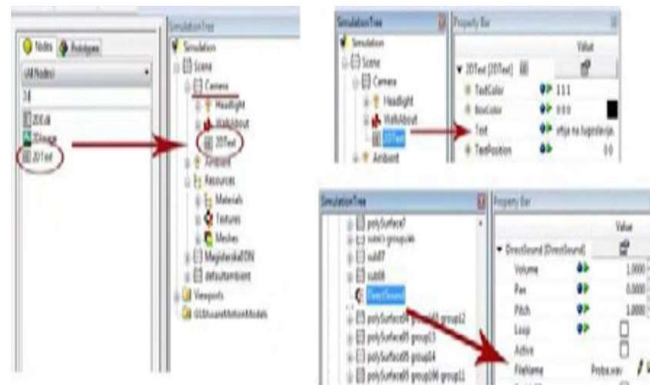

Figure 8. Left: Importing node to display text (2D Text); Right up: Text input field for entering the text you want to display; Right below: Input sound file that will be broadcast

Figure 8. Left: Importing node to display text (2D Text); Right up: Text input field for entering the text you want to display; Right below: Input sound file that will be broadcast;.

Our model is composed of several panels, walls and objects, so we need to find the panel through which we want to play sound and text. In our case it is the frame (node) group 17 group 31 pCube496 and in that section enter Click Sensor node, Fig. 7. With this node we say that when click the panel should show some events, in our case should play the sound and show the text.

The last thing to do is to create a simulation, i.e. to create events that will occur in the simulation. The first event is: to show text when clicking on the panel; Second event is: to play sound on click on the panel, and the last event is to close the text field when click on already displayed text. These events are created in the section Routes: Simulations shown in Table 1 and Figure 9.

Node	Output event	Node	Input event
Click Sensor	On Button Down True	**DirectSound**	SetRun
Click Sensor	On Button Down True	**2D Text**	SetRun
2D Text	On Click	**2D Text**	SetRun_

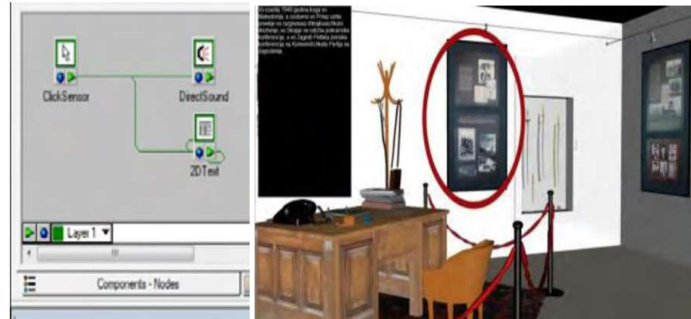Table 1. Links For Creating Interaction

Figure 9. Entering nodes and creating links, and launch the simulation

With that ends the creation of the simulation and events that will contain the simulation, so we can start it. When we click on the panel marked on the picture, in the left part of the simulation shows the text, and in background play the sound which refers to this panel, shown in Figure 9. When clicking on the text, it closes.

5. Conclusion

The technology of virtual reality is a complex area. Characteristic of VR technology over other multi-media systems is behavior in real time. Here is presented step by step, process of creating such applications and at the end will mention some of the problems faced when creating this virtual tour. In Figure 10 can be noted that the model largely corresponds with the real object, which means that the process of modeling and texturing is successful.

Figure 10. Comparison of the outside of the actual object and the model

In addition there is a comparison between the model in Autodesk Maya and model in EON Studio shown in Fig. 12.
From the comparison can be seen that the model in EON Studio looks a bit unreal because we have a great reflection and clarity of the image, so that can be specified as a small disadvantage. However, it may be noted that to some extent, correspond to the model in Maya, and to the real object.
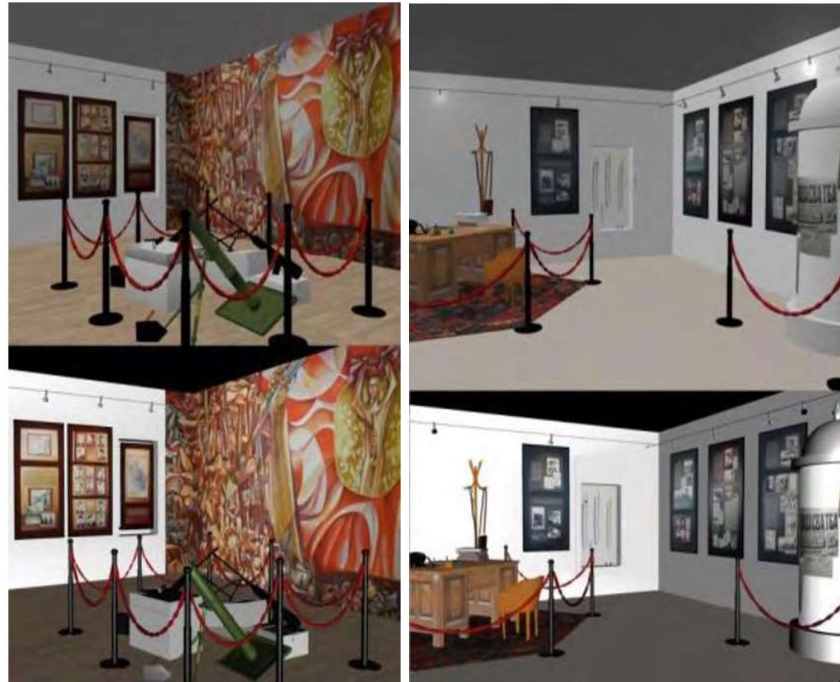

Figure 11. Top - Picture of the rooms, obtained by rendering the model in Maya; Below - picture of the rooms received the application in EON Studio

It is important to note that when insertion of the model in EON Studio, was required to do triangulation. But in process of triangulation, all models made by NURBS are excluded from the model after triangulation as can be seen in Fig. 12. It is recommended during the modeling to use exclusively polygonal objects, because none software can perform triangulation of many irregular shapes created by NURBS.
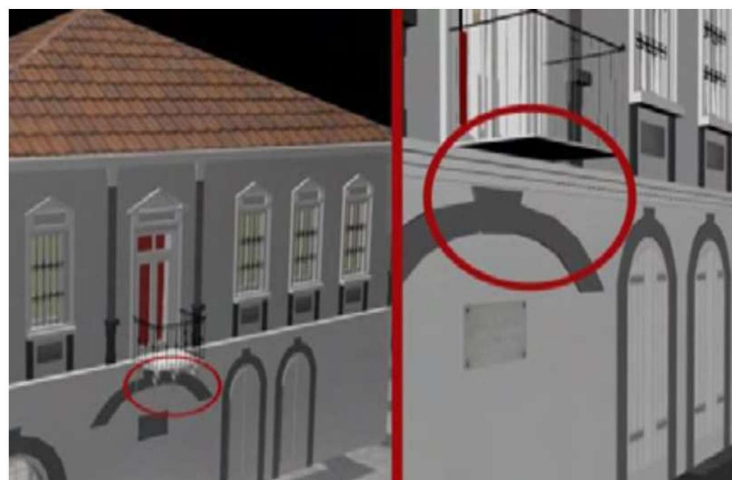

Figure 12. Loss of NURBS objects in triangulation

Last dependence which will be mentioned is the reliability of the model in EON from configuration the application is launched.

Figure 13. Configuration: Laptop computer; CPU - Intel Core i7 - 2630QM 2.0 GHz; RAM - 6 GB; Video adapter - Intel Graphics 3000

Figure 13 shows a graphical application started on weaker graphic configuration, so it can be notice that the model has high losses which means that these VR applications greatly depends on the configuration of the computer, especially from graphic cards.

With this it is completed the process of creating VR application and we saw all the advantages and disadvantages of creating such application.

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