Polytechnical Engineering College in Virtual Reality

Igor Fuerstner, Nemanja Cvijin, Attila Kukla

Viša tehnička škola, Marka Oreškovica 16, 24000 Subotica, Serbia
e-mail: ifurst@vts.su.ac.yu

Abstract: This paper presents the results of the creation process of a partial interactive presentation of Polytechnical Engineering College in Subotica in Virtual Reality. The modelling of the Institution is made using the 3ds max™ 7. The models are exported to Virtual Reality Modelling Language (VRML). The presentation is made using HTML. During the creation process, several features contained in 3ds considering VRML have been tested. The experience gained, lends to the future process of creating the whole interactive presentation.

Keywords: Interactive presentation, Virtual reality

1   Introduction

1.1   Defining the Problem

During the past few years, the development of internet resulted in higher demands considering the presentations of companies on the www. The Polytechnical Engineering College (PEC) in Subotica has an interactive (client-server) web presentation that offers several different services which include:

-    Textual information about the institution;

-    Literature;

-    E-learning material;

-    Technical support;

-    News;

-    miscelaneous;

but lacks the interactivity in the field of visual presentation of the College.

1.2   Goal

The goal is to create a partial interactive presentation of the College that would add to the value of the current web presentation in the future.

The developed partial presentation should test the possibilities and limitations of this kind of presentation in virtual reality.

2   Modelling and Operating Environment

A building, in this case the *PEC* with its internal structure, is basically a complex 3D object. It consists of several 3D objects (classrooms, staircases, doors, window, etc.). These objects have different properties (colour, material, behaviour, etc.), and are placed in a specific environment (background, lightning, etc.). To crate a virtual reality as stated previously, one has to model the structure, and to adjust the result to be usable in internet surroundings [1].

2.1   Modelling Environment

The modelling of the *PEC* is made using 3ds max™ 7. It provides the creation of 3D places and characters, objects and subjects of any type. They can be arranged and animated in different settings and environments to build scenes for movies, games, or other kind of visualization.

3ds can be used to visualize designs of real things that will actually be built, such as buildings and machines. Lights and materials can be added to the creation to render a visually acceptable still image or movie [2].

2.2   Operating Environment

The chosen operating environment is Virtual Reality Modelling Language (VRML).

Technically speaking, VRML is neither virtual reality nor a modelling language. Virtual reality typically implies an immersive 3D experience (such as a head-mounted display) and 3D input devices (such as digital gloves). VRML neither requires nor precludes immersion. Furthermore, a true modelling language would contain much richer geometric modelling primitives and mechanisms. VRML provides a bare minimum of geometric modelling features and contains numerous features far beyond the scope of a modelling language.

At its core, VRML is simply a 3D interchange format. It defines most of the commonly used semantics found in today's 3D applications such as hierarchical transformations, light sources, viewpoints, geometry, animation, fog, material properties, and texture mapping. One of the primary goals in designing VRML was to ensure that it at least succeeded as an effective 3D file interchange format.

VRML serves as a simple, multiplatform language for publishing 3D Web pages. This is motivated by the fact that some information is best experienced three dimensionally, such as games, engineering and scientific visualizations, educational experiences, and architecture. Typically these types of projects require intensive interaction, animation, and user participation and exploration beyond what is capable with a page-, text-, or image-based format (i.e., HTML).

VRML provides the technology that integrates three dimensions, two dimensions, text, and multimedia into a coherent model. When these media types are combined with scripting languages and Internet capabilities, an entirely new genre of interactive applications are possible. A 3D metaphor presents a natural user experience that supports classic two-dimensional (2D) desktop models as well as extends into broader contexts of space and place. Many have speculated that the 3D world model will supersede and thus replace the popular 2D desktop model as the primary user interface paradigm in the next decade. Of course, there are a variety of challenges that need to be overcome before this is possible, such as 3D user interface and navigation, user training, and ubiquitous 3D graphics performance [3].

2.3   Connecting the Modelling and Operating Environment

3ds scenes can be exported to VRML file format (in this case VRML97), which can be viewed in any VRML97 browser [2].

To create VRML97 files one should:

- Create the objects that make up the scene;
- Define the appropriate helpers[1], to add actions and triggers and prepare the scene;
- Export the scene in the VRML97;
- Test the file in the browser.

2.3.1   Interface

The VRML97 exporter supports the following[2]:

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[1] Helpers are discussed in chapter 2.3.2.
[2] Some elements of the 3ds modeller.

- Lights;

- Cameras;

- Primitives;

- Animation.

2.3.2 Helpers

In 3ds one can define helpers, which manage the behaviour of the WRML world.

2.3.2.1 Anchor Helper

The Anchor helper specifies a click-to-play trigger in the scene. This trigger can be linked to a currently existing object in the scene. This allows a developer to add links to other HTML pages, VRML97 worlds, or alternate cameras in the VRML97 world.

2.3.2.2 AudioClip Helper

The AudioClip helper specifies the name and characteristics of an audio file that can be used by the Sound helper.

2.3.2.3 Background Helper

The Background helper specifies colors and images for the sky and ground in the VRML97 world.

2.3.2.4 Billboard Helper

The Billboard helper specifies a geometry that is camera-aligned in the VRML97 browser. The objects always align to the viewpoint in the VRML97 browser. Any geometry linked to the Billboard helper will rotate about the local Z axis of the helper object to face the viewer.

2.3.2.5 Fog Helper

The Fog helper specifies the color and range of fog in the VRML97 world.

2.3.2.6 Inline Helper

The Inline helper specifies a reference of an another VRML97 file that is included in the VRML file world when it has been loaded into the VRML97 browser.

2.3.2.7 Level of Detail Helper

The Level of Detail helper specifies objects with varying face counts that are appropriate for different viewing distances. Browsers display the less detailed

objects when the viewer is far away from them and substitute the more detailed objects at closer ranges.

2.3.2.8   NavInfo Helper

The NavInfo helper defines how to navigate around the VRML97 world in the browser.

2.3.2.9   ProxSensor Helper

The ProxSensor helper creates a VRML97 ProximitySensor node. This allows to set up a rectangular region in space, so that entering the region in a VRML97 browser starts a set of objects animating.

2.3.2.10   Sound Helper

The Sound helper alows the placing of 3D (spatial) or ambient sounds in a scene. The sound may be located at a point and emit sound in a spherical or ellipsoid pattern.

2.3.2.11   TimeSensor Helper

The TimeSensor helper adds time-based animation controls, such as the start and end frames for a particular object's animation, and looping.

2.3.2.12   TouchSensor Helper

The TouchSensor helper sets up an object so that selecting it in a VRML97 browser starts a set of objects animating.

3   Presentation

Due to the size of the *PEC* building, the modelling process is modular, thus the building is modelled in several parts.

Each floor is modelled separately in two scenes, the hall (Figure 1), and the hallway (Figure 2). The scenes are connected by an anchor helper, which is connected to a mapped plain separating the scenes.

Each door in the hall has a proximity sensor helper atached to it, which activates a mapped plain showing information about the room behind the door (Figure 3 and Figure 4).

The doors can be opened and closed by a button with a touchsensor helper attached to it, which activates a timesensor helper. It either opens a closed door, or closes an open door, enabling entrance to the room behind the door (Figure 5).

Severeal laboratories, offices and classrooms in the building can be accessable (Figure 6).

Each table in the staffrooms (Figure 7) has an anchor helper attached to it, which is connected to a particular person's home-page.

Each news board attached to the walls has an anchor helper on it (Figure 8) and is connected to an appropriate web page, which contains relevant information associated to the board.
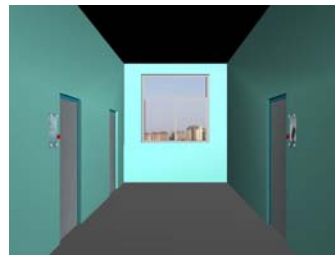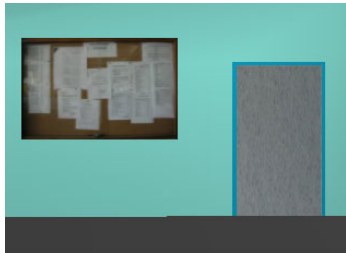

Figure 1
The first floor hall

Figure 2
The first floor hallway
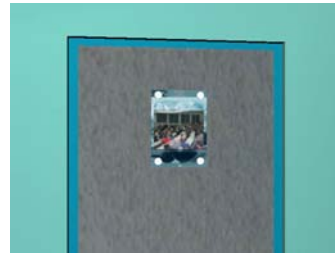

Figure 3
The door before approach

Figure 4
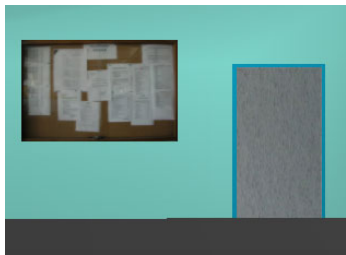The door after approach

Figure 5
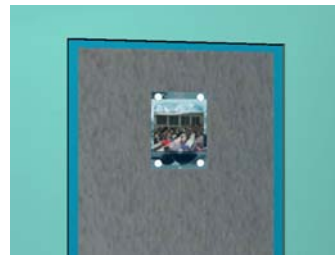The door before approach

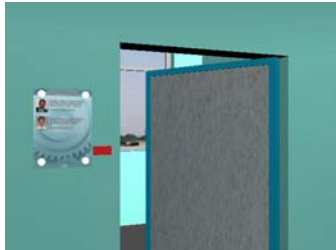Figure 6
The door after approach

Figure 7
The opened door

Figure 8
Classroom

Figure 9
Connection to a teacher's home page

Figure 10
Information board

Conclusions

The developed partial interactive presentation of the Polytechnical Engineering College in Subotica shows that virtual reality can be used for on line presentation purposes.

The modelling of the Institution is created using the 3ds max™ 7. The models are exported to Virtual Reality Modelling Language (VRML). The presentation is made using HTML.

VRML features contained in 3ds can be succesfully used in the modelling process providing an easy way of creating virtual worlds.

Future development should:

- Extend towards modelling the whole institution;

- Provide a more user-friendly navigating tool (e.g. interactive map of the building);

- Establish a database of different elements such as textures, or added models (e.g. chairs, pictures on the wall, wallpapers, colours…), which could be placed randomly upon download of the presentation and could be used in personal customisation for the user;

- Establish a database that could enable upload of personal user information (pictures, etc.) for user personalisation;

- Develop an administrator interface that would enable easy editing and updating of the information;

- Provide tools for instant access towards the institution's administration (on-line administration) for teachers and students.

References

[1]   Igor Fuerstner: Animáció, Szabadkai Műszaki Főiskola, Szabadka, 2006

[2]   3ds max, User reference, 2004

[3]   Rick Carey, Gavin Bell: The Annotated VRML 97 Reference, 1997