3DbyStep: A Tool For Authoring 3D Presentations

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Abstract

This work presents, 3DbyStep, an interactive authoring tool for developing 3D training contents. The application is able to combine text, pictures, sound and 3D models in an integrated environment. The produced contents is suitable for using as a standard presentation and also as a means to support self-study in the sense that it can be navigated interactively in a non-linear fashion. 3DbyStep is mainly aimed at application areas where the ability to view 3D models is crucial for conveying key information.

1. Introduction

The construction of an adequate environment, capable of supporting interactive learning, has become possible with the evolution of data processing technologies. A variety of resources for graphical computation – adequate programming languages, 3D modeling software, and high-performance graphics cards, among others – is used in the production of tailored solutions in industrial and scientific research areas. To our knowledge, however, no freely available authoring tool is able to produce training contents composed of various sorts of media – pictures, text, sound and 3D models – in an interactive and easy-to-use way. The 3DbyStep application aims to fill exactly this gap. Since it makes use of free/open source software, the end result can be used in a variety of platforms.

2. Related Work

Several tools are available for authoring and displaying training presentations. Some of these are commercial products (PowerPoint, Corel Draw, Flash), and other are free and/or open source (OpenOffice, Pyntor, KPresenter). All of these, however, are restricted to 2D content. Tools capable of handling 3D models include commercial software such as 3DS Max, Shockwave and Maya, and free software such as Blender, POV-Ray and Wings3D. Unfortunately, these programs are not suitable for use by a novice, nor do they target the authoring of presentations. Commercial software Director is a payed alternative, but is not intuitive enough for general public. Although a large variety of 3D content is widely available, corresponding descriptive material is much harder to find. Training contents almost always assumes the form of video animations, which are exhibited in a sequential and non interactive way. Even when these animations are structured within a Web document [2], the level of interactivity is still modest.

3 System Architecture

3DbyStep is being designed to allow the creation of interactive 3D training contents by offering a high-level user interface. This authoring tool is able to combine multimedia elements in an integrated environment. The hypermedia presentation is executed by a stand-alone player and can be navigated interactively in a non-linear fashion. The composition of slides is done in a WYSIWYG way. The system is based on the acknowledged paradigms of low cost, portability, navigability and ease of learning.

Aiming the efficiency on understanding the presented content, OpenAL and Fmod are used to associate sounds and narrations to 3D models and to their parts, as complementary descriptions.

In order to obtain quick results, several leading open source packages were employed, such as Qt [7], Python [6] and OpenGL [4], respecting the multi-platform environment goals.

The conceptual model defines that one *Presentation* is composed by a set of *Slides*. Each Slide is an arrangement of *Visual Elements* and their *Animations*. Visual Elements include:

- *Picture: Raster images (jpeg, png, etc) or vector graphics (svg file format);*
- *3D Model*: Optionally grouped in parts, each one with visual properties, such as colors, material specifications and others;
- *Text References*: Documented references associated to other visual instances, with editable style attributes;
- *Interaction Handles*: Represented by icons;

Visual Element animations may be:

- Animations for loading another slide;
- Simple animations that put a visual element in evidence, move it around the screen or make it appear/disappear;
- Composite animations where several animations are executed in sequence, together, or following arbitrary schedules;

The main window is displayed in Figure 1.

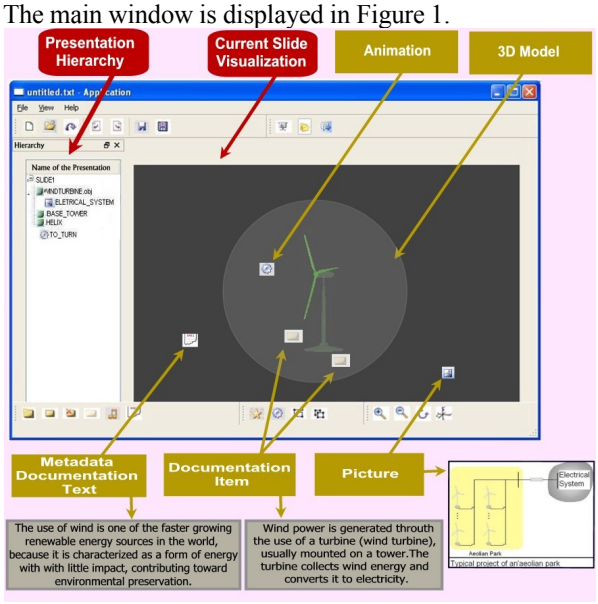

Figure 1. 3DbyStep prototype interface visualization with a wind energy machine model loaded, two text boxes and a 2D picture.

The prototype application is being developed with careful attention to Computer-Human Interface paradigms [1]. Four user interaction modes are defined in the interface: visual elements' documentation, application of animation patterns to scene elements, general 3D transformations and final presentation preview. Separate task bars are assigned to each of these modes, where action elements are grouped following Nielsen heuristics [3].

Event/action association is done in a high level, by applying previously made patterns. In the future, the set of applicable patterns will be expansible through script programming, so new ways of interaction and animation can be easily incorporated to the software by more advanced users.

4. Application in Training

As a field test for 3DbyStep, we have chosen to use it in the production of training material for energy production equipment. The energy area is specially challenging when it comes to share technical information – since it contemplates both large and microscopic instruments. We obtained several 3D models in this field and are creating corresponding training material using as references both a M. Sc. dissertation on the subject [5], and specialist feedback. Additional 3D models are also being created with Blender. The final presentation will be shown to a real audience, so they can freely interact with the learning material. The users' analysis will be collected and processed, as a way to improve or confirm 3DbyStep's quality in the final user experience

5. Conclusions and Future Work

3DbyStep is being developed with the express intent to be at least as easy to use as standard 2D presentation software, while being able to cope with 3D models and building contents with enhanced interactivity.

In addition to finishing and testing the main authoring application, a smaller application capable only of playing the presentations is being developed. Both tools are to be offered for download for Windows and Linux platforms.

Several enhancements are being considered for implementation, such as importing html contents, extending support to other 3D model formats, allowing the set of animation patterns to be expansible through script programming, using XML in the project's file format and allowing stereoscopic visualization.

References

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