ONLINE PRESENTATION OF PRODUCT WITH THE USE OF 3D MODELS

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ABSTRACT

In the field of Information Technology as well as computers and broadband accessibility, current developments have influenced accelerated growth in internet transactions every year. However, electronic transactions are generally restricted by narrow multimedia means as offered by modern information technology. Additionally, a key element of e-business is efficient product presentation.

Technology, which enables presenting a client or a contractor with a full image of the product in 3D, raises the attractiveness of displayed assortments offered by online sellers.

By applying technology based on Java, a virtual model can be introduced which may be examined from every angle at a reduced or magnified size, depending on the viewers' preferences. This will not crowd or otherwise adversely affect hard disc space, and as a result it does not hinder the speed of networking, as compared to traditional presentation of products displayed as digital images.

KEYWORDS

3D model, interactive interface, Java Script solutions, product presentation, VRML, e-commerce, web 3D format, 3 – dimensional presentation

1. INTRODUCTION

Past years have shown vast development and an increased number of new websites created for the purpose of electronic commerce. These days, almost every company provides buyers with online catalogs where they can familiarize themselves with the products offered, compare prices, and check an item's availability. Typically, products are presented by a series of pictures; however, users are generally unable to interact with products. This restriction does not concern items like books or electronic parts, where the title or symbol provides all the necessary information; rather, it does limit a consumer's understanding of products that require both an image, as well as interactive behavior and 3-dimensional presentation.

This limitation is strictly related with the challenge of implementing three-dimensional (3D) graphics on the internet. While the written information or photography is adequate, the lack of incorporating 3D graphics and user interaction is still an open problem.

There are two main issues of this problem which should be addressed: performance and interface navigation. 3D models require significant computational power and data delivery which are seriously limited by users' bandwidth connection. Moreover, although human perception is tuned to work in a three-dimensional universe, it is very difficult to operate in a more complex, virtual, 3D environment presented on a two-dimensional screen.

Large improvements in graphic hardware technology allow low-cost machines to interactively display very complex 3D scenes. Armed with hardware accelerators, graphic boards can be used to render thousands of textured elements in real time and every effective 3D web technology must be able to take advantage of this. An object's realism is related to the level of detail, but a higher value of detail causes increased file size and extensive transmission time over the network. The key is balancing online transfer time with the quality of an object.

Recently, a set of new technologies has been proposed to solve this and help companies create more intuitive and interesting 3D e-commerce sites.

This paper presents and compares main available products that help to create interactive objects for the purpose of websites and e-commerce.

2. 3D INTERACTIVE MODELS - SOLUTIONS

3.1 3DAnywhere

3DAnywhere (see Figure 1) is a complete system for publishing 3D scenes on the web. It can take 3D scenes from industry standard programs and let anybody on the web manipulate them. It is a cutting-edge program used for creating, manipulating and editing interactive 3D shapes and images for websites. In addition, it can also create actions and motion for VRML pages. The program relies on the user having a know-how knowledge of 3D modeling. Internet novices might need more time to become accustomed to this, but once learned, it yields the possibility to create great-looking pages. This application is best used for product demonstrations on the web.

3DAnywhere is a Java program, so it will run on systems such as Microsoft Windows, Apple MacOS, Sun Solaris, and Linux; moreover, users can use any Internet browser. The user of a 3DAnywhere model is able to carry out a variety of actions in the applet without having to reload it: rotating, zooming, changing points of view, changing colors and textures, and loading a new 3D scene. The authors are enabled to create customizable products by controlling presentations through a set of parameters and JavaScript API functions. 3DAnywhere imports data model information from VRML files; these standard files are supported by almost all 3D modeling software.

Figure 1. 3DAnywhere – product can be rotated and zoomed according to user preferences.

3.2 Shout3D

Shout3D begins with a model description in VRML or Shout3D format and allows users to add some publishing effects such as background, anti-aliasing or bilinear filtering. Shout3D is a Java applet collection; Shout3DApplet, ExamineApplet, and WalkApplet are the most significant applets. Shout3DApplet is the rendering engine to present 3D graphics and the other two applets allow users to click and drag within the applet's perimeter to change the point of view in the scene. Other applets have traditional features for specific demos, games, or applications. There is no need for Plug-ins for Shout3D. Moreover, Shout3D is able to do the following:

- read and show 3D scenes containing animations, clickable links, and most other features of VRML 2.0;
- use JavaScript to control the scene, respond to mouse and keyboard input, or watch and respond to changes in the scene itself;
- create new Java applets and node classes that extend the behavior and feature set of Shout3D

Figure 2. Shout 3D

Figure 2 shows an application of Shout3D used with an e-commerce web site. This particular project (in cooperation with Macy's) led to a website for 3D fashion shows. The right side of the picture displays the user interface that allows changing the set, model, pose, and camera attributes. Shout3D was designed as a reaction to booming customer demand for an alternative to existing 3D playback technologies. Shout3D represents the most advanced cross-level 3D enabling technology written in pure Java, with automatic loading and a highly optimized 3D rendering engine at its core.

3.3 Anfy3D

Anfy3D (see figure 3) API is the Anfy3D engine for the Java language and claims to be the fastest interactive 3D renderer with shading available in Java knowledge today. Anfy3D creates a real-time animation of 3D objects, complete with shading, texture mapping, transparency, motion blur and fog. Some sample objects provided with the applet are sphere, cone, waving sheet, and labyrinth. It can be saved as an applet for one's personal webpage, or as a screensaver.
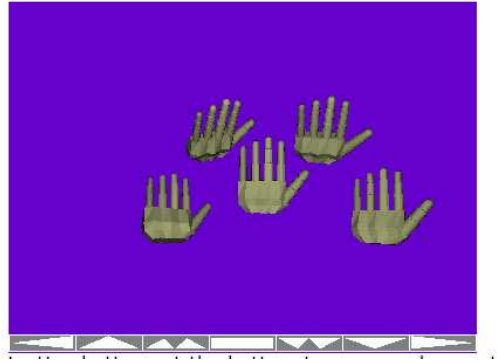
Figure 3. 3D Hand Interactive Hand using Anfi3D

3.4 Active Worlds

Active Worlds is a 3D virtual reality environment for chatting, exploring, and building places on the net. It opened June 28, 1995, and was developed by Worlds Inc, but it is now run by Activeworlds, Inc. It is a universe of hundreds of virtual worlds which belong to private people and companies. Its technology has been very popular with teachers around the world, from architecture departments to science labs, for it adds new dimensions to learning. In reaction to the increasing demand from educators, Activeworlds Inc. initiated The Active Worlds Educational Universe (AWEDU). The AWEDU is an original educational community that makes the Active Worlds technology available to educational institutions, teachers, students, and individual programs in a given area. Educators are able to discover new concepts, learning theories, creative curriculum design, and discover new paradigms in social learning through this community. In addition to the over 80 educational worlds available in the AWEDU, there are a number of educational worlds in the main Active Worlds Universe where classes and experiments are carried and meetings are held. Activeworlds Inc. offers educational pricing packages for institutions interested in mastering virtual worlds in the Active Worlds Universe or within their own intranet servers.

3.5 Cult 3D

With Cult3D, users are able to view 3D products on websites in Microsoft Office documents such as PowerPoint and Adobe Acrobat. With the click of a mouse, users can rotate and zoom a Cult3D product model to view it from any perspective, push buttons to open spaces or move parts, and listen to music or voice tours. Cult3D is currently the most used real-time Web 3D format which is based on real clients presenting 3D content online.

Today, over 500 brand name companies including ABB, Breitling, CNN, NTT DoCoMo, Nokia, Sony, and Toyota, are actively using Cult3D to raise the effectiveness of their e-communication undertakings. Cult3D could be used for e-commerce and e-marketing, product support and training, sales presentations, and entertainment.

Cult3D aids selling and marketing products on the Internet. Customers can entirely explore and understand products they are considering to purchase, which can lead to higher sales, reduced product returns, and higher customer satisfaction. It is expected to move away from the PC towards new platforms, such as game consoles, set top boxes, PDA's and cellular phones.

What can limit the adaptation of Cult3D is the need to download a viewer. Constant goals are to reach reduced viewer file size, smaller initial download, a smoother download and installation, reduced upgrade file size and integration with applications and/or hardware that are built-in on the various platforms.

Cult3D offers tools to help increase the practicality of presented models by adding effects like light, textures, and shaders. Also some levels of interaction like the capability to assemble parts together or to open and close objects are provided.

Mainly for groups of similar products, and for configurable products, the Cult3D object creation process could benefit from automation. Natural features to explore are automated export from 3Ds max and other tools for the .c3D format, automated creation of .co files, automated Cult3D Designer operations and automated creation of compositeCult3D objects form a set of sub-objects.

3.5.1. Components of Cult3D

Cult3D Exporter converts the models created in other 3D software applications like Maya or 3D Studio Max into the Cult3D Designer format. Cult3D Designer enables users to apply Java coded interactivity, sound, animation, and special effects to the model. It also includes a mechanism of file compression which enables file size compression of up to 95%. Cult3D Viewer enables the viewing of 3D interactive objects on the web as well as in MS Office documents, Adobe Acrobat files, Macromedia Director files, and others. Rendering features include 32-bit rendering for high visual quality. This tool is also armed with Phong, Gouraud, flat and constant shading, transparency, bilinear filtering, and stereoscopic 3D and full-scene progressive antialiasing. Cult3D uses software based on rendering technology and therefore does not require any additional graphics hardware. As a result, it can work on standard PCs and, in the future, on wireless devices. Through cooperation with graphics board manufacturers, Cult3D also supports hardware from NVIDIA and ATI.

3.6 vSpace MASTER

vSpace Master, as seen in Figure 4, alters regular 3D models into reusable Master Models. The 3D content can derive from CAD systems (AutoCAD, Pro/ENGINEER, Solidworks, etc.), industrial design tools (Inventor, Alias Studio, Rhino, etc.), visual effects packages (3Ds Max, Maya, etc.), or any other tool with VRML97 or DWF export capability.

Timeline animation is analyzed to determine each part's range of motion, and object hierarchy, geometry, and texture data is all preserved. The vSpace Master user can then clean up the data for reuse, including assigning better names to parts and animation sequences, defining complex product simulation scripts, and fine tuning material appearance and lighting.
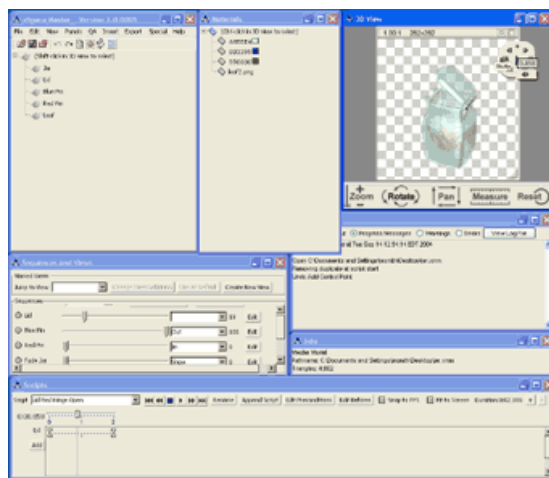

Figure 4. vSpace MasterUser interface

vSpace Master also includes:

- A revolutionary polygon decimation algorithm, which quickly creates "levels of detail," produces low-polygon approximations of each part, while also preserving original triangles. One controls this decimation, being allowed to dedicate more polygon detail to some parts, and less to others. The low-detail version is used in web applications, while the high-detail original is used for offline rendering in the vSpace Server.

- A sophisticated optimizer eliminates unnecessary object hierarchy, links adjacent meshes, and even drops objects and materials which are hidden throughout the tour. This allows the reusable Master Model to maintain every bit of hierarchy and detail for a broad range of applications, without impacting the size of the web tours produced.

- Dedkov compression can represent in depth geometry with less than one byte per triangle in many cases. The compressed model is then automatically placed in a web product tour pattern, complete with a user-friendly internationalized toolbar and control buttons for each of the scripts defined in the Master Model. The web tour uses Kaon's Meson Platform, the same plugin-free viewing platform used by Dell, Sony, and Cisco to present their products. Alternately, you can place the compressed model into a 3D PDF, ready for sharing in Adobe Reader 7. Adobe Acrobat Pro and Illustrator CS2 users can use the PDF-ready 3D model

in any PDF. For models with megabytes of texture, Kaon's vSpace Texture tool enhances vSpace Master, giving fine control over compression and optimization techniques specific to texture imagery.

3.7 Universal 3D

There are many media which are great source of ideas, education or entertainment; however, one of the very powerful ones are interactive 3D graphics. Yet, technical barriers limit widespread use of interactive 3D matter, even though digital video, audio or photos are easily exchanged through the Internet.

Dramatic increase of bandwidth and computing performance in last years has created opportunities for new communications media. Potential use of 3D content beyond the engineering community, however, has been prevented by lack of standards. Nevertheless, common use of 3D technology promises improved media that revolutionizes the way complex data are communicated. For instance:
- Companies could have powerful, cost-effective training devices based on interactive simulation by means of repurposing product designs.
- Electronic manuals would offer interactive guides for supporting and repairing products.
- Customers of online shops could check products by using the 3D models.

The leader in creating an open format for sharing and visualization of 3D data in nonengineering applications, which is called Universal 3D, is Intel. A "JPEG" for 3D graphics, which is a standard format, and Intel's software are to support the repurposing of existing 3D CAD data to be used in other applications.

In December 2004, Ecma International, an industry standards group, officially adopted U3D as an open international design named standard ECMA-363 Universal 3D File Format. This standard was developed in collaboration with the 3D Industry Forum (3DIF).

3.7.1 The 3D Industry Forum

Intel, along with other 3D industry organizations, has launched a forum to create a standard file format and sample libraries designed to support the resourceful reuse of 3D data in conventional applications. The 3D Industry Forum emerged from meetings that Intel carried out both with end users of 3D data and leading 3D graphics hardware and software developers. The meetings explored the potential profits and implications of establishing a common standard for sharing 3D content via the Internet, as well as in typical business applications.

The 3D Industry Forum (3DIF), nowadays, includes more than 30 members. It aims at:
designing of general standard for sharing easy 3D content with high visual quality (in cooperation with ECMA International)

- supplying of the devices and information needed for adoption and integration of the Universal 3D standard file format
- promotion of industry growth and ecosystem development for the 3D graphics market
- education of business and end-user communities as to the value and benefits of 3D usage models

- coordination of efforts with other organizations that support similar and/or complementary initiatives

Figure 5. Universal 3D

3. COMPARISON

It is very difficult to name the best technology or product able to bring the 3D to the web. Visualization of products may not always be appropriate because e-commerce may require a real interaction between users and objects. However, the choice between providing real 3D immersive worlds or 3D mutually acting objects within web pages depends on several matters. Immersive environments engage problems such as navigation metaphors, computational power for rendering, and bandwidth for transmissions, but they are able to present new tools for e-commerce due to the fact that purchasing experiences can be simulated and users can interact with each other. Also choosing between plug-in and plug-in-less technologies is a very complex task. Plug-in-less technologies are generally based on Java or Javascript and entail downloading the applet and the 3D content; the software is usually slower because it is running in Java. By and large, solutions requiring plug-ins involve less bandwidth and accelerated graphics cards can be supported; however, the downloading of a plug-in may dishearten users who enjoy 3D content on a Web site.

4. CONCLUSIONS

Designers have a lot of opportunities today to introduce the third dimension into their web sites. Both full immersive technologies and 3D interactive objects can be chosen to offer the best feeling to users. The major problem is to find an exchange among a set of parameters: model quality, rendering times, latency delays due to 3D content downloading; efficiency of human interface, and so in addition, a choice between proprietary technologies and open solutions needs to be done. The proprietary technologies could provide more efficient systems, but costs might discourage, above all, small and medium stores to develop 3D web pages. However, the latter sometimes lacks effectiveness and this could discourage customers to browse these kinds of sites.

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