Spatial Presentation on the Internet

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Summary

Recent development in the field of the spatial presentation on the Internet offers new dimension for providing three-dimensional data on the Web. The VRML become standard in 1997, but expected wide usage isn't follow expectations. Recent improvement of the graphic capabilities of personal computers and growing throughput of the Internet infrastructure enable wider usage of these new possibilities. This fast growing field of various applications is until now supported by few basic technologies, which are under constant development. Technology such as panoramic images, web 3D objects and 3D scene for the Web are basic classification under which different developers intensively build they specific approach.
This field is also interesting to education because visual aspects of the subject presented, to the architecture as presentation tool, and also as collaboration tool for the Internet.
Some of the recent authors works from educational to commercial that are using these technologies are elaborated. From virtual building, furniture presentation and interactive design to the merchandise tools and assembling assistant for Swatch AG, Swiss are presented in this work.

Keywords

Web 3D, VRML, QTVR, VET, X3D

Biography

Roberto Vdović, fellow assistant at Faculty of Architecture University of Zagreb. Born on 30th November 1967 in Zagreb, Republic of Croatia. After finished gymnasium in Zagreb, started study on Faculty of Architecture and graduated in 1993. In 1998, enter postgraduate study "Urban Planning, Urbanism and Landscape Architecture" on Faculty of Architecture. He is cofounder and coordinator of the Computer Lab at Faculty of Architecture from 1996. Published scientific and professional works in field of use computers in architecture. Working as collaborator on different multimedia projects. During study and profession develop special interest for problem of the spatial visualization, development of multimedia tools and use of the Internet in education and architecture.

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Introduction

Since start of the Internet almost 10 years ago we are witnesses of different improvement in interactive presentation f the contents. Some of those improvements were not significant for further development and application of the Internet. In 1997. first standards for three-dimensional contents was available VRML97, but expected use and practical application wasn't confirmed in following period. More then a year ago some of the reasons for such situation was changed and basic elements for intensive use and practical application were ready to lunch this new field, Web3D. Some elementary facts start new field in Internet developers industry dealing with computer graphics in some way. Today we have successor of the VRML in Extensible 3D (X3D). In the meantime some of a companies who make significant research in Web3D field already have their own solutions.

Our interest as architects is in these open standard but also nonstandard solutions that can be applied to specific needs of architectural and design professions. Although VRML was and is used in architectural field for demonstration, practical and professional usage was oriented on more realistic, but not always real 3D technology like Apple Quick time VR objects and scenes.

Facts for rising popularity of Web3D

In last two years growth of the number of Internet users and hosts doesn't increase as in period from the beginning. Latest information is talking about 459 millions users of the Internet. Total traffic on the Internet is also in stagnation, however it is still twice from the year before. Reason for this also in improved and quick infrastructure that offers quicker transfer of the graphical intensive and multimedia enriched contents on the Internet. Security on the Internet and improved core structural technology would result with safe and reliable media for communication after Internet2 is widely implemented. Such improvements are necessary for wider usage in e-commerce. Improvement in speed and quality of the connections on the world level open possibilities to implement three-dimensional contents in everyday pages on the Web not only for entertainment but also for professional and education.

Entertainment industry and game development require very high overall performances for home computers and game usage. Those performances overcome necessary requirements for quality use of Web 3D contents. Development of a graphical unit only (graphical processor, graphical memory, resolution, speed, 3D performance) in last 18 months more then a double Moors law which offers best illustration today's graphical computer performances. On the other side overall performances are also more then adequate for three-dimensional spatial manipulation. Recent research in processor development would accelerate core performances of the computers in years that come.

Other assumption that was also available in same time was start of the use of Internet in e-commerce. Various businesses to business and business to client's solutions need improvement in presenting products on Internet. Get in touch or 'try and buy' for consumers where products can be explored, change its characteristics of color or even simulating its use on Internet offers new values to present web sites. Very useful database driven site with all calculation didn't fulfill expectation and hit rate of their owners. In the other hand three-dimensional interactive front-end of such database driven side was more efficient for clients.

Various approach for presenting spatial information

There are various approach and techniques available that are used for Web 3D application. However some of them aren't Web 3D, and some of them aren't even three-dimensional.
GE Lighting use only HTML and images under its "Virtual Lighting Designer". Latest version is also implemented 360° images for better perception of the changes done by different light systems (Fig2). They were and still are also very efficient way to present three-dimensional contents for some of the applications and simple to use for peoples on Internet.

Usage of the Apple Quicktime technology for QTVR objects and panoramas is very easy to use and can provide same effects as real 3D contents if it is presented good. Figure 1. show simple demonstration to show assembling procedure for Swatch Cylinder Kiosk using QTVR objects.

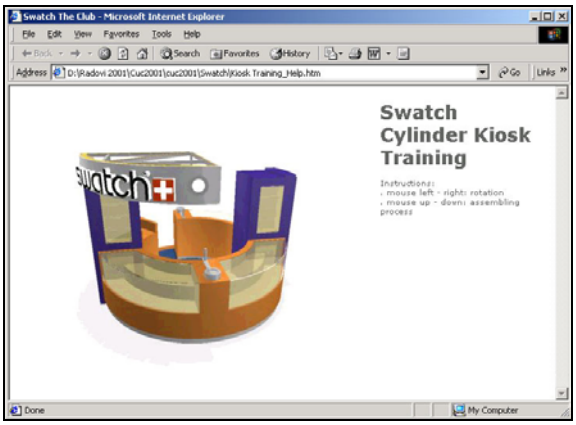

Figure 1 & 2. Swatch Cylinder Kiosk assembling tool using QTVR and GE Virtual Designer which is only HTML and panoramic images.

Other very popular approach is using Flash for different examples. Those solutions integrated with panoramic images or even Shockwave 3D models are very got to elaborate simple problems. Use of the Flash is also practical in integration with real 3D tools to produce complete on-line applications.

Above-mentioned techniques are predators of real Web3D solutions which classifications is described below.

Current real Web 3D can be divided in two basic class. Web 3D objects and Web 3D scenes. Web 3D objects are very useful to present various simple products from electronics to furniture. Basically those objects can be rotated, scaled and explored from different sides. Almost every CAD or other 3D software got their own 3D engines to explore and exchange their native formats on the web. Web 3D objects can do even more. Web contents creation and publishing of products such as electronics and furniture requires changing their characteristics like color or texture. Additionally user can explore use of the object by open it and test its functions. But you always get an object on the background and manipulations are limited. But this is on the half way to real complex Web 3D scenes.

3D scenes created with available authoring tools or technology like Viewpoint could have whole virtual worlds included. In this case other characteristics are necessary, like various physical characteristics, different shadows, transparency, reflection and other virtual world characteristics. Also various material definition and textures are available in such 3D engine.

Except VRML, which is optionally installed inside Internet Explorer or Netscape, all others solutions require there own plug-in to explore, that files. Recently is common that on first link to such object plug-in is loaded and installed automatically.

Figure 3 & 4. Cult3D technology inside Macromedia Director for Swatch .beat & The Club demonstration

State of the art technologies

In the time of the writing of this paper author were on the worlds well know conference for computers graphics and interactive media, Siggraph, where was able to fulfils its knowledge information about Web3D State of the Art technologies available today.

Cult3D by Cycore Inc. was first visual authoring tool which is more client oriented and doesn't requires programmers skills. For ambitious users Cult is also open to Java and various application are possible. Cult3D as leader in Web 3D objects authoring solution offers integration with image based modeling application from Realviz Imagemodeler. This combination is very efficient to quickly create realistic contents of large number of the products. Cult is also presented new compression for 3D models that provide very good quality for complex models. Latest option in Cult3D offers presentation with stereo images what makes 3D model even more real and make perception of a 3D models more attractive. Unfortunately at the time of release of this paper this option was unavailable to the author.

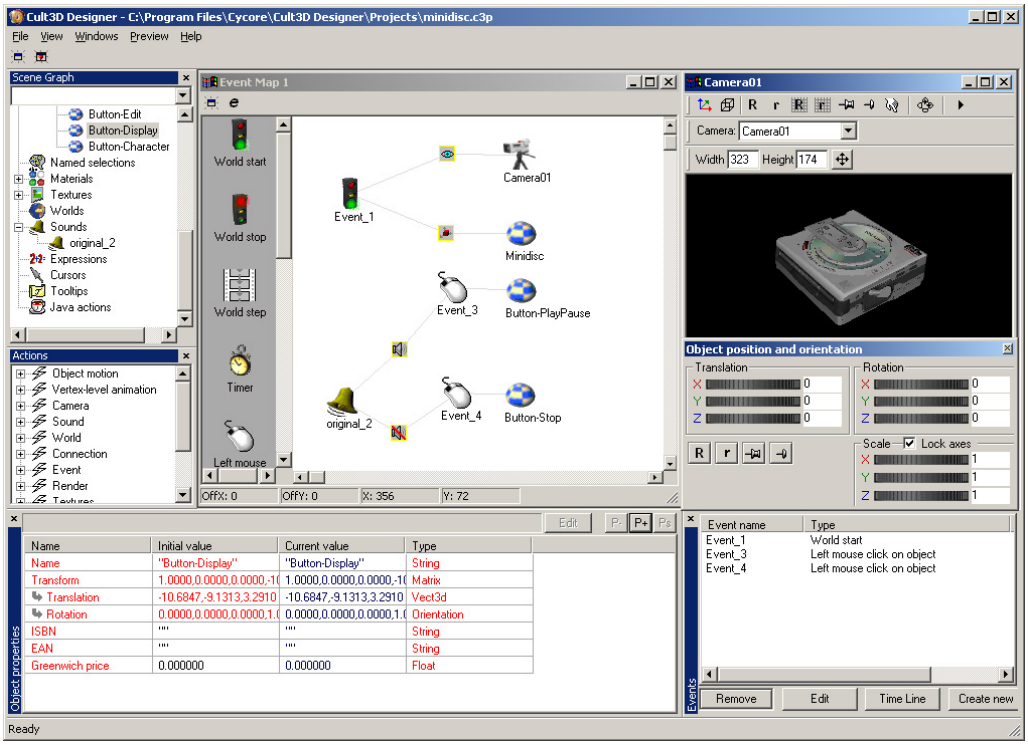

Figure 5. Cult 3D Designer working environment

Eon Reality Inc. offers solutions to build real complex and sophisticated virtual scenes. Their solutions are also related to Virtual Reality systems and Web3D is only one branch of their activities. Latest Eon Personal Designer is filed with different physical actions and it is more users friendly. Eon 3D engine from the beginning offers whole range of characteristics necessary to build virtual worlds not only for Internet but also for immerse systems. Its authoring system is also visual but loaded with lot of functions it is hard to start. Scene is represented with hierarchical tree of a scene which follows their modular concept of technology (Figure 6). For those who aren't satisfied with those functions like collision detection, or gravity and bunch of logical, graphical and physical function Eon is open to external procedures done in some program language.

Latest importers for Lightscape, radiosity-rendering application for architecture, and collaboration with Graphisoft Inc., opens real possibilities for us of this technology in architectural application. This collaboration is recent and practical improvements would be available in the future.
Import of a Lightscape solution file is great for visual quality of a whole scene. For even real walk collision detection is necessary to prevent walk through the walls.

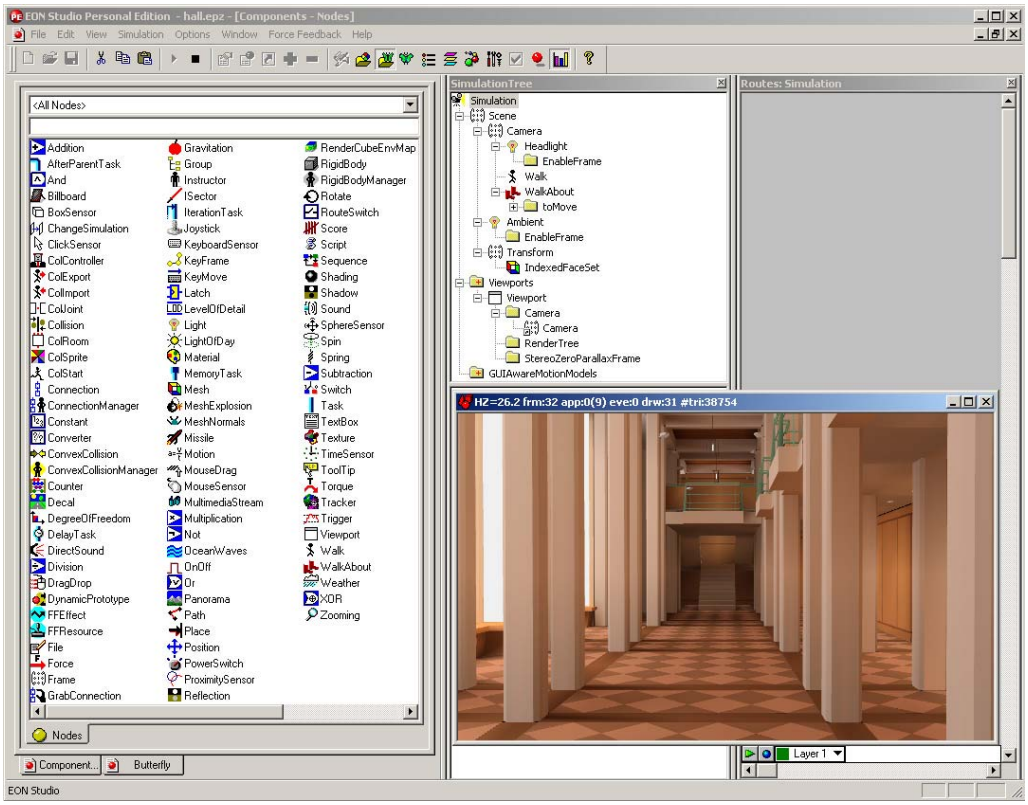

Figure 6. Eon Studio Personal Edition working environment

Large number of triggers and actions enables description of even real complex scenes possible. If we mention force feedback connection to various devices, which is also implemented in Eon, we are aware of a high level of a reality that we can produce in virtual world.
Eon's scenes aren't smallest but its connection to the Flash and controls from HTML are well done. Integration inside Macromedia Director is also possible for both on-line and off-line presentations.

Eon is very powerful solution for all field of a three-dimensional presentation, and marketing, architecture is only some of a explained usage. Eon Reality web site offers case studies for different professions and target markets. Those case studies are base for further development and research in Eon.

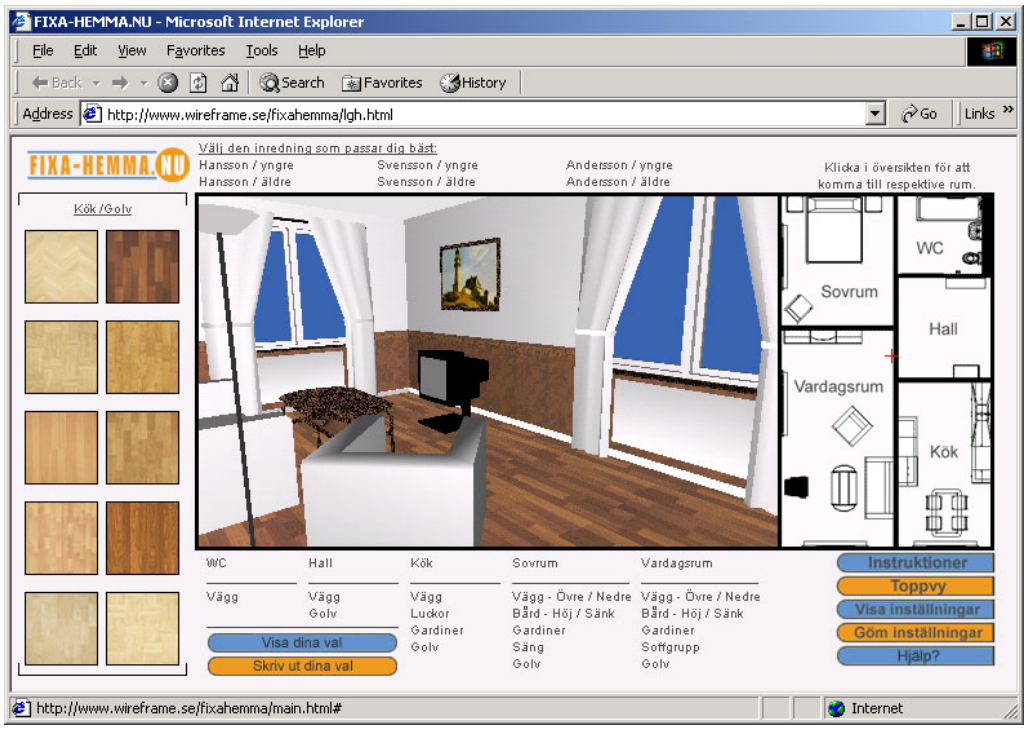

Figure 7. On-line architecture for Fixa-Hemma by WireFrame using Eon Reality

Probably most interested and most significant development in last year was made by Viewpoint Inc. Company know by its 3D models start its activity in Web 3D in a first place to present their models on Internet. Today they have most powerful core 3D engine open for developers and programmers. All recent rendering techniques are available in this engine. That is also a reason why lot of programmers choosing VET for its developing Web3D platform. Soft shadows, light maps, deformations are some of the options not shown in other solutions.

Basic idea of the VET is much more close to VRML. MTS file is scene file with 3D content controlled by XML. This makes integration and control from HTML and connection to existing sites very flexible. VET is also a rich media platform that visually integrates many so called “media atoms” in scene. Media atoms are different media contents like 3D, 2D, Flash, video and sound and other media formats, which number is rising each day. Whole Viewpoint contents is integrated into a HTML page through single plug-in, the Viewpoint Media Player, hub application. This means that you can use VET for existing high-resolution images or 3D models.

Many companies are chousing VET not only for web creation but also for programing applications. One of the most known is Adobe with it Atmosphere, latest application for building virtual worlds that adopts VET format. Lot of 3D applications are able to export their models to Viewpoint, but programs like 3D Max from Autodesk or Carrara studio from Enovia are able to export even animations that can be used in VET scene. List of various exporters are available on www.viewpoint.com.

Fast download is also very important. Through its proprietary technology VET makes size of the files as efficient as it is possible for even dial-up connections. New options includes also progressive or on-demand compression formats that are very efficient with slow connections.

Following diagram is showing content creation procedure based on web site creation for Eddie Bauer Corporation, courtesy of Viewpoint Inc. We are able to recognize main parts of Viewpoint integration. It is also possible to imagine open principle of the Viewpoint technology.

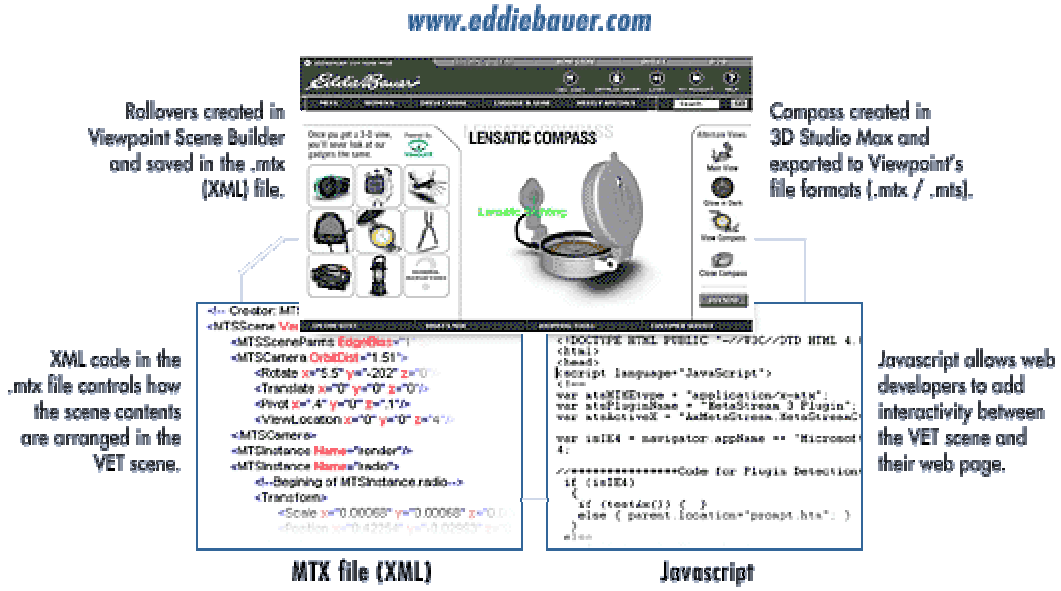

Figure 8. Content creation procedure based on web site creation for Eddie Bauer Corporation, courtesy of Viewpoint Inc.

Some of the latest gadgets implemented in latest VET version were stunning. HyperView enlarge object from the Internet Explorer window all away to Windows desktop with all shadows on desktop, or ZoomView function for on-demand download offers very practical application for placing large high resolution images on the Web.

Interactivity is characteristics of all mentioned solutions, but because XML scene descriptions this make VET ideal for very interactive even programmable interfaces especially if we thinking about educational usage. Of course complex scenes requires programmers skils.

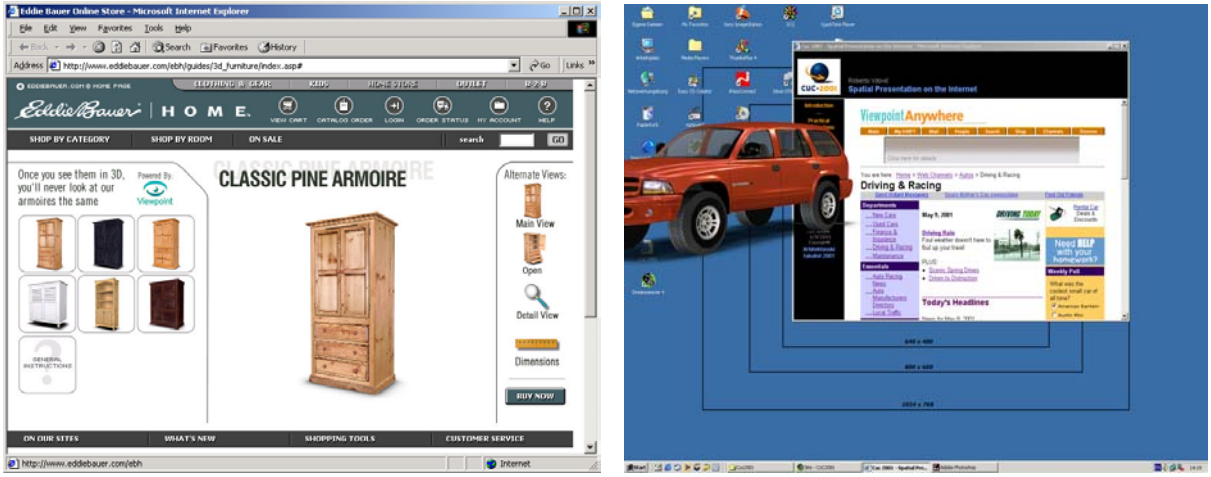

Figure 9 & 10. Eddie Bauer database driven site with implemented VET and HyperView capability of the new Viewpoint that enables manipulation with models over desktop

Problem of compression is also very important for Virtue3D patented technology that can already optimize model to 1% of its original size. This solution offers for components to enable easy integration of the 3D content to the Web. Virtue Optimizer, Player are basic components. 3D Max Plug-in and Dreamweaver Extension make connection to import 3D models and export Web3D contents on the Internet. They also offer very good example of "Virtue 3D Room Designer" completely on-line application with different possibility to configure or even design interior (Figure 11).

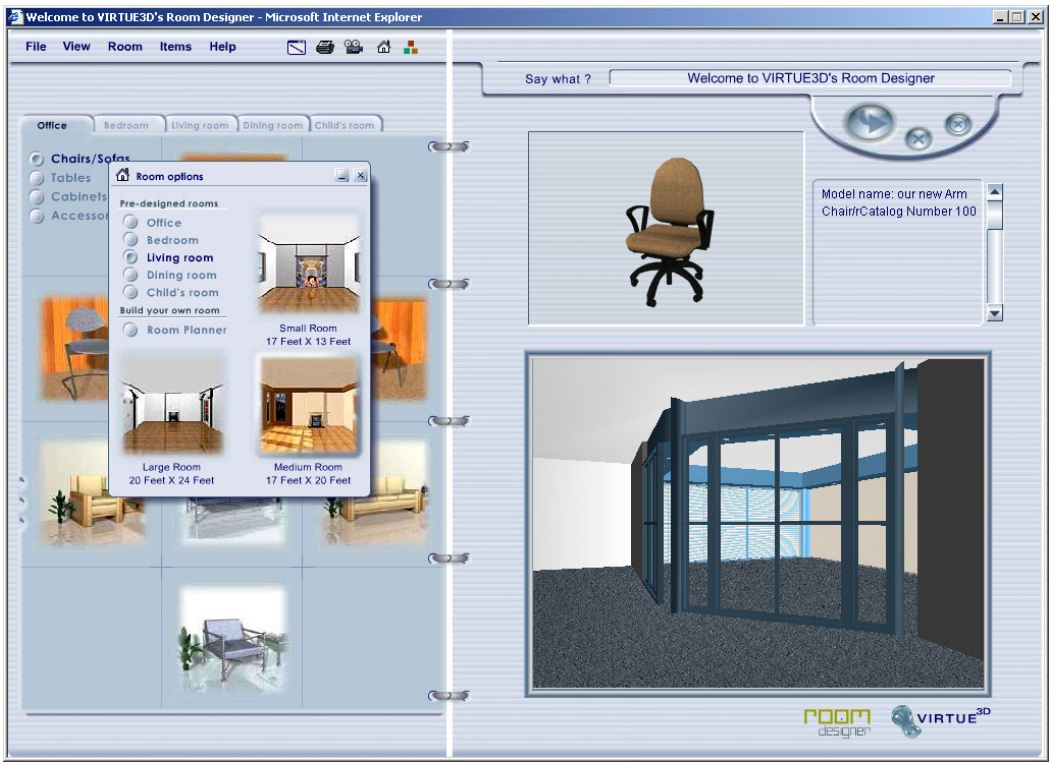

Figure 11. On-line room designer by Virtue3D

Future of the Web 3D

This last years various applications and new technology were announced. Web 3d were in the field of Internet market probable fast growing and it is still under continuous and intensive development. There is still struggling for standard in this area. Like it was mentioned before there are various target research in future technology development like on-demand 3D streamed contents or various compression methods for 3D models.
Beside all this technical improvements most important question is not should we use it but how to most efficiently and profitable use such technology. That was also main topic on this year round table for Web 3D at Siggraph Conference in Los Angeles. 25 leading developers and solutions providers were trying to give idea how to most efficiently use 3D on the Web.

Here suggested classification is also fragile in this fast growing field of various applications. Supported by few basic technologies, which is under constant development this area is changing and evaluating on daily base. Technology such as panoramic images, web 3D objects and 3D scene for the Web are basic classification under which different developers intensively build they specific approach.

Conclusion

Practical application for mentioned technology is really wide. From merchandise, marketing, research, distance learning, communication and other Internet based application. If we take architectural field using Internet as collaboration tool those technology offers new values. Another interest field is education that offers interactive and associative, self-exploring tool for distance learning.
E-commerce is of course most important field on which is depending future development and applications. Again in field of architecture solution can be used to provide simple presentation for real estate (Figure 12) or architectural presentation.

Visual aspects of the subject presented, interaction that is very important and multimedia contents could be linked together and distributed worldwide.

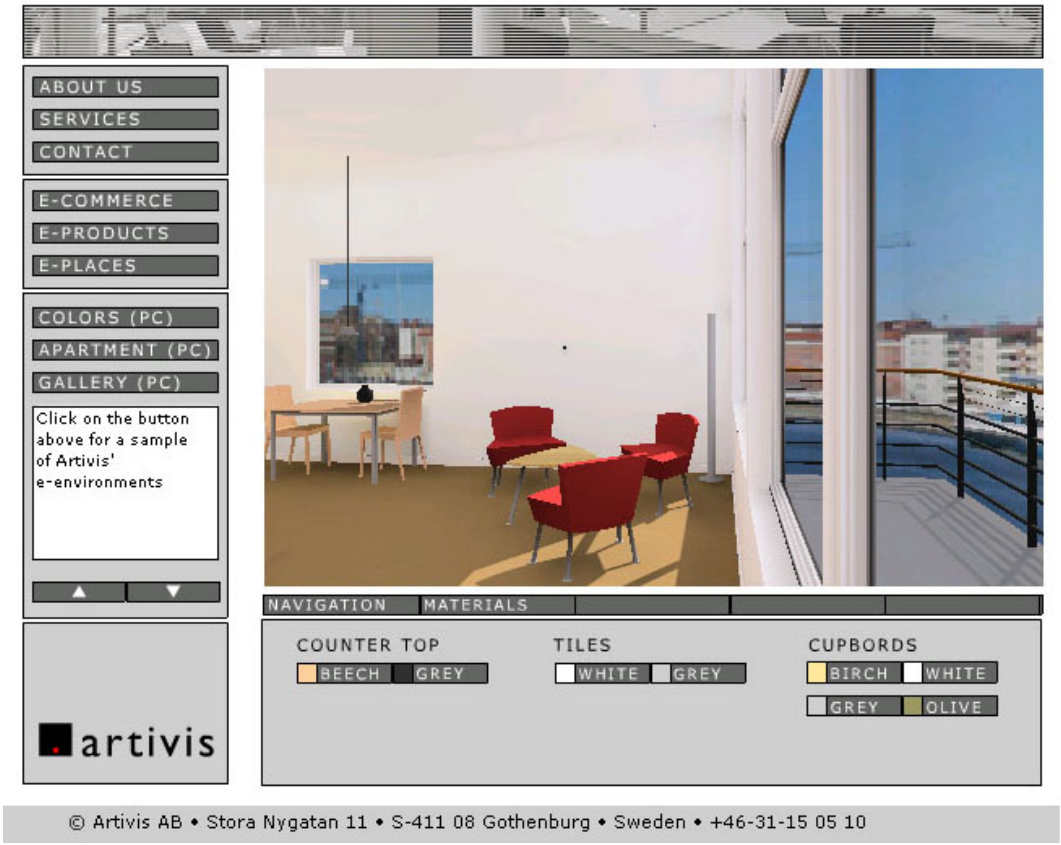

Figure 12. Eon Reality in real estate market by Artvis AB, Sweden

In global scale of trends on the market we could expect use of augment systems linked to global telecommunications. By developing 4G telecommunication networks quick connections would enable also for such systems that would offer new fields of activity in mixed real and virtual environment.

This paper shows recent works from educational to commercial that are using these technologies are elaborated. From virtual building, furniture presentation and interactive design to the merchandise tools and assembling assistant for Swatch AG, Swiss are presented in this work.

Important resources:
Extended 3D and web3D community, www.web3d.org
Viewpoint Inc. , www.viewpoint.com
Eon Reality Inc., Eon Personal Studio, www.eonreality.com
Cycore, Cult 3D Designer, www.cult3d.com
Apple Quicktime, QTVR, www.quicktime.com
Virtue3D Inc., www.virtue3D.com
Macromedia Inc., www.macromedia.com
Kaon Interactive Inc., www.kaon.com

Spatial presentation on Internet Showcase

www.arhitekt.hr/rvdovic/cuc2001