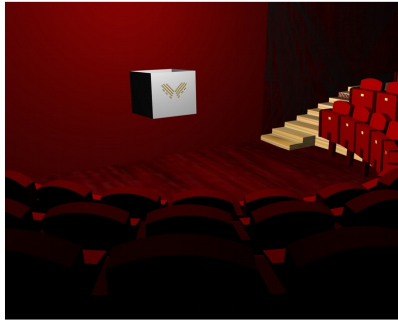
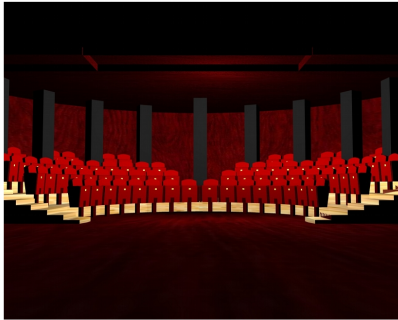


# 3D extension of web

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## ABSTRACT

In our work, we propose our application of 3D graphics inside the web browser. Nowadays, internet and web browsers are not only space, where user can read information, but it is space also for collaboration and experience. Therefore we propose new ideas how should browsing a modern web page look like with use of state-of-the-art technology and possibilities. Users expect from the displayed application more interesting features, not only display of static text. Standard layout of a web page is based on list of a newspaper or a book. This layout is obsolete and does not fit modern approach in new technologies. Our method of displaying content and information inside the web browser is with full 3D, not only embedding 3D as a special feature inside a small part of web page. In this article we also include virtual Theatre as a case study for this problem and explain possibilities of information display and reasons why is 3D better than 2D in this case.

**Keywords:** 3D web, VRML, X3D, browser

## 1 INTRODUCTION

These days there are more possibilities how to make interactive and interesting application for web pages. The web page, as we know is today 2D content derived from the news page. Although there are some possibilities to put 3D content inside a web page with the help of plug-in, most of the web pages are still 2D. In our work we are presenting some ideas how to extend 2D web page to a 3D space in novel way. We also provide a case study where we show that it can be really useful to use 3D space instead of standard 2D web page.

Our work is divided into 3 parts. In the first part we will focus on 3D interface for a web page and our way of transferring 2D interface from standard web page into 3D space. The second part describes the case study. This study shows that in case of cinema or theatre it is possible to use 3D space and also the user or visitor will have better experience and fun. Last section brings plans to the future and conclusion.

## 2 BACKGROUND AND RELATED WORK

In this section, we will discuss different ways of displaying a 3D content inside the web browser. First we have to say, that none of today web browsers have implemented direct support for 3D content, only with the use of plugin. The HTML version 4.01 and also XHTML specification do not have the support for 3D content [W3C99], [W3C00]. The same is for styling the document. Cascading style sheet (CSS) version 2

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have support just for styling 2D content [W3C09].

On the other hand, there are some formats, that are used to present 3D content inside web page. The oldest one is Virtual reality modeling language (VRML). Advantages are: it is an open standard, ready to be shared on the internet and have direct support for interaction [vBSF04]. Disadvantages are: it is old format and lacks some new features, plugin for the browser is needed.

Newer and popular formats, similar to VRML are COLLADA and X3D. Both are based on XML and divided in to a profiles for better usability and both do not support direct way of interaction [wDc05], [AB06]. First one is newer version of VRML and become a standard for 3D virtual space. VRML and X3D are the most used format for 3D on web [wDc]. Nevertheless direct interaction is not supported in X3D, it is possible to use combination of X3D and AJAX as AJAX3D [Par07]. Second one is primary used for data exchange and nowadays browsers do not have support for displaying it, there are no plugins. One option is Google's project O3D [Goo10], that adds interaction with use of JavaScript API and display COLLADA with use of plugin from Google.

Above mentioned formats need a plugin for a display. On the other hand, future will probably bring new options. WebGL is a new web standard for low-level 3D graphics. It is based on OpenGL ES 2.0 and uses the canvas element in HTML5 [W3C10], that means that you do not need to use any plug-in. However the HTML5 is not a standard yet, so the support for WebGL will be in the next generation of web browsers [Khr10].

Beside the mentioned technologies, there are a lot of other projects, which try to extend web page into 3D. One of them is X3DOM, where the authors propose to use X3D and integrated it in DOM tree. Then it is easy to manipulate with 3D objects [BEJZ09]. Another project is 3DMLW, which is a technology for creating and displaying 3D and 2D content on the web through common web-browsers [tR08]. Authors of [Pau10] proposed to use 3DCSS to separate visual properties from other properties in 3D scene. The 3DCSS is based on CSS 2.1. They also propose to use 3D MARKUP SCENE DESCRIPTION (3DMSD), which extends the current web page model in 3D.

Using 3D in the web page is not novel. Few of the projects in cultural heritage use also 3D content to present their exhibits at whole museum [Fer07] or [moL05]. Nevertheless, these projects and solution use 3D only as extension in part of the page, to show some scenes, or some objects. We would like to focus on 3D web pages, that do not display anything from the WSCG 2011 Poster Papers

content of the page outside of the 3D plugin.

### 3 3D INTERFACE

In this section we propose our solution how to create a 3D web page and how to create a simple web page interface in 3D. For our solution we use VRML or X3D, but in future we would like to convert it into WebGL.

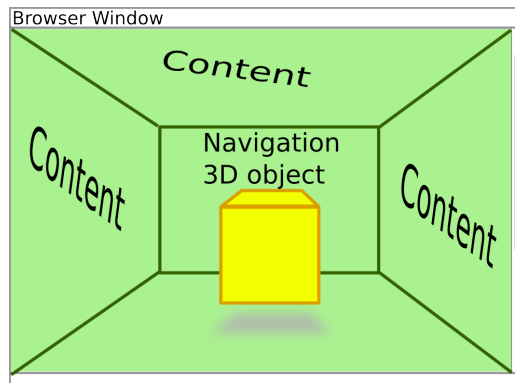


Figure 1: Our proposed solution of 3D web browser instead of 2D with navigation cube.

In 2D space the author of a web page has just one plane to use. Most of the web pages has the similar layout. If we extend the web page into 3D space we get much more space where to put information, content etc, see fig. 1. Screenspace is not changed, just the way how to display content. As the 3D web pages are not so spread, we would like to propose how the interface can look like. Instead of pages we can use room as a part of whole site. Unlike SphereXP by Hamar [Ham05] and Task Gallery [Rob09], our 3D GUI approach does not open multiple application windows.

Navigation in this kind of web page is also very important. Users are not so familiar with 3D on web, so the navigation should be clear enough and it should be based on real world or on common navigation in 2D web pages. We decided for the object similar to one in real world. For the site with more than one room, we can take analogy from real world and use doors as the links between rooms. However, the user has to have the information where the doors will take him. Our scene is different, we use only one room and the scene is dynamically changed. We use a cube, which contains all setting and whole menu for the site. The cube is the central point to navigate (see fig. 1). This cube can show also the text information or text content of the site. .

## 4 CASE-STUDY - THEATRE

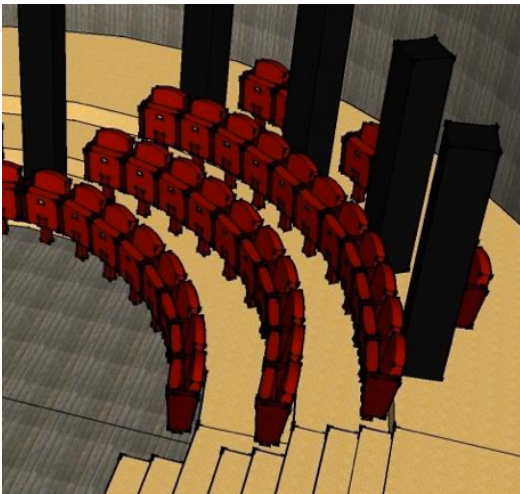


Figure 2: *The part of the John Palarik Theatre in Trnava, Slovakia. (Screenshot from our application.)*

In this section we will show you our solution in real data. In section 3 we discussed use of 3D vs. 2D. One of the good examples, where 3D page has more potential than 2D is a theatre, because for the user it could be interesting to have a feeling that he is inside, instead of reading a brochure about it (analogy to 2D page). Our theatre is created based on real John Palarik Theatre in Trnava, Slovakia (fig. 2.)

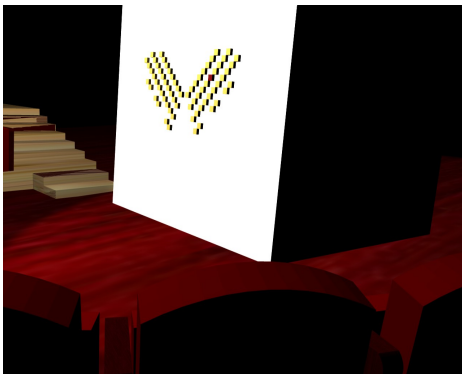


Figure 3: *User is looking at the scene from the selected seat.*

It is the room with stage and spectators (see teaser). On the stage you can find our cube mentioned before (section 3). In this case the cube represent the navigation menu and also it shows some information (see teaser). The user can interact with this cube. We choose rotation around up vector, that means we will use only 4 faces from cube. Three faces contain information about theatre as in 2D page, but fourth face is used specifically for 3D. On this face the user can find the WSCG 2011 Poster Papers

ground plan of the theatre with all seats available. Visitor can choose any seat and the view will be transformed into the position of that seat. This gives to the user the exact look into a scene as in the real theatre.



Figure 4: *Price displayed on the seats.*

The user is also able to click on each seat and avatar [vBSF04] will be also transported into that place (fig. 3). Afterwards user can find out the angle of the view and also if there are some barriers like columns etc. Even price for the specific seat could be displayed directly on the seat (fig. 4). When the view is satisfactory it is also possible to proceed to checkout and buy the tickets. We propose this solution in 3D, because user will have better idea of the building structure and possible view from the seat, which in plain 2D will not be satisfactory.

It is possible to use theatre in 3D not only for buying tickets, but for the show itself. We could add virtual performance, or video screen on the virtual stage and bring user real feeling from the theater. This could help user even more to choose a seat. Moreover also additional features are possible during show, which are not common in real theaters, but could be useful such as subtitles.

### 4.1 Other possible case studies

The virtual theatre is not the only one possibility when is better to use 3D instead of standard 2D web page. It could be used also in cinemas or e-shops. If the user came to the e-shop, products are displayed same way as in catalogue. But in case of 3D site, user get the opportunity to see the 3D model of that object and can also interact with it, can play with it. Shopping could be even more fun, similar to playing a game. This way could help shop to have more customers that like to spend some time in a shop and shopping is entertainment for them. A lot of people are visiting shops to get some inspiration, so the user can do that also in 3D e-shop.

The approach mentioned above is better theoretical and real user feeling need to be better evaluated. We created prototype, but to prove our assumptions we need to create deeper user study. This we leave to the future work by now.

## 5 CONCLUSION AND FUTURE WORK

In our work we show possibility of layout change for some modern web pages. We proposed solution, where 3D space is displayed in whole internet browser space instead of just part. Our case-study shows how this approach can be used for the better user orientation and comfort. Moreover, in this space even more information can be added. In future work we would like to convert our solution and case study into WebGL to get a direct support from the web browser, not only use of a plugin. Another important improvement would be better user study as is mentioned above sec. 4.1.

## 6 ACKNOWLEDGEMENT

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