3D Webpages

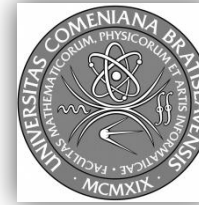**Peter Paulis ***
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Introduction and motivation

All current 3D web solutions are built on knowledge expensive (proprietary) technologies and are the domain of few professionals. Not only there is no-one to develop 3D web content, also many technologies luck on end-user runtime support. So from our point of view, we see a gap on the way from 2D into 3D, and this gap is caused by a missing technology, that would enable simple 3D web content creation by common users, but yet a technology that would stay robust and don't limit professionals.

In this work we first describe today's technologies for 3D on the web. Then we propose our solution which is an extension of the current webpage model (XHTML, CSS, JavaScript), into 3D. We introduce 3DMSD and 3DCSS, so as some function extensions to JavaScript. Our proposed model deals with the bottlenecks of current technologies and introduces new concepts - like the concept of "websurface" and "3D style". Allowing to create powerful interactive 3D content for everyone, even for people with a shallow knowledge of 3D, but yet extendable and flexible, to provide a mighty tool for people skilled in 3D computer graphics programming. At this time, no existing web based technology, known to us, provides a similar concept.

Cascade Style Sheet for 3D (CSS3D)

We propose a new style sheet language based on the CSS (Cascade Style Sheet) 2.1 model. The main purpose of this language is to provide separation, between the visual properties of the objects in the scene, their hierarchy, and event handling. This is an analogy to the HTML, CSS, and JavaScript model, used by today's webpages, where style is separated from the hierarchy declaration and scripting. This approach leads not only to better readability by humans, but also delivers a more versatile, flexible and intuitive way, how to control the style of a 3D scene visual output.

```
group.g1 .objclass #surface1234 {
        lightning: on;
        material-use-color: off;
        material-ambient-diffuse: rgb(0.5, 0.5, 0.5);
        material-specular: rgb(0.4, 0.6, 0.4);
        material-emission: #000000;
        material-shininess: 125;
        system(#LIGHT01):modify({
                light-diffuse:  rgb(1, 0, 1);
                light-specular: rgb(1, 1, 1);
        });
}
```
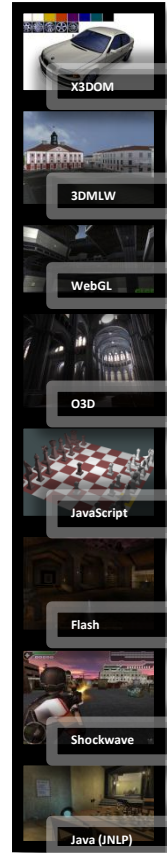
Fig. (Row) :
Representative
pictures
for each technology.

Fig. (Left) :
Part of a 3DCSS
code.

Labels in the image row (top to bottom): X3DOM, 3DMLW, WebGL, O3D, JavaScript, Flash, Shockwave, Java (JNLP)

3D Markup Scene Description (3DMSD)

3DMSD is our proposal for a new XML markup scene description language. This language is used to define scene geometry, scene graph object relations, scene metadata information, script and style bindings. Also it is used to define "systems", which represent abstract "effects", like : forces, emitting of light, shadow casting and even the camera model. 3DMSD can be used and declared inside a XHTML (Extensible Hypertext Markup Language) document, what leads to the extension of the current webpage model, into 3D. Also with the use of "websurface", any current webpage can be included into 3DMSD.

Websurface

The idea of websurfaces present a unique concept that has no equivalent in any existing 3D web technology and is very important to the overall concept of 3DMSD. This concept integrates the current presentation and interaction capabilities of webpage documents into 3DMSD. Our proposed model introduces websurfaces, which represent a way, how to present and interact with 2D data in 3D space. A webpage document, or XHTML code is presented in the form of a texture (webtexture) applied on 3D geometry (websurface). And not only visual presentation, but also interaction is provided as user input is linked from 3D space, to 2D webtexture space. Feedback on the user's interaction with webtexture content, can be send back to the 3DMSD scene in ways of JavaScript. So webtextures not only define a way of 2D data presentation in 3D, but also provides a communication mechanism between 2D web content and the 3D scene.

Fig. (Left) :
3D elements with
websurfaces - user
input is linked from
3D space, to 2D
webtexture space

User Interface Description

Our proposed model can be extended in ways of 3D user interface description, similar as the XUL language for 2D interfaces today. XUL (XML User Interface Language) is very similar to the (X)HTML, CSS and JavaScript model - so as 3DMSD. Therefore, instead of pointing to a web location or XHTML code, with the websurface element, we could point to a XUL interface file or directly to XUL code.