

WEB 3D TECHNOLOGIES - A REVIEW

- *Methods and technologies* -

Presentation

ABSTRACT: Nowadays, the Web 3D technologies are an imminent part of the multimedia Web experience. Thanks to the recent development of both hardware and software, we have come to the point where Web 3D content no longer involve complex and heavy plugins to operate fluently.

The proposed paper will present a review of the state of the art Web 3D technologies, as a part of a dissertation research on the topic of Interactive Web Media as an Aspect of Digital Preservation and Presentation of Historical Architecture.

Starting from the 1990s, virtual reality modelling language (VRML) was a pioneer in the field of Web 3d technology. VRML was the first step to standardize the format for representing 3-dimensional (3D) interactive vector graphics, specifically created for the World Wide Web. A decade after, it has been superseded by X3D - an opens source standard for representing 3D computer graphics. Nevertheless, the 3D visualisation was still passed on to external software, at least until 2011, when the Khronos Group released the WebGL, a remarkable innovation. WebGL (Web Graphics Library) is a JavaScript API (Application programming interface) for visualisation of interactive 2D and 3D graphics within any compatible Web browser without the use of plug-ins. WebGL was the beginning of a new era in Web 3d technologies. After this point, further solutions are developing into two alternative paths; The systems such as X3DOM and XML3D, extending the X3D by following the declarative programming method, based on scene-graph model; The systems using imperative programming method, such as WebGL associated libraries, that range from scene-graph based interface, as Scene.js and Three.js, to more programmer- friendly examples as WebGLU and SpiderGL. Neither the declarative or imperative programming method is better than the other one. It can be said that the declarative method had a bigger impact on the research community, while the imperative method is mainly used by the programming community.

Finally, when it comes to the presentation of Web 3d content, there is a wide range of frameworks, mainly divided into categories to deal with specific needs and demands of different user groups. One of the most standard

platforms for developing both 2D and 3D video games and simulations for computers, consoles, and mobile devices is Unity, a multi-platform game engine. Unity is extremely powerful and it is providing high-quality rendering, sound, physics, interaction and fast development of visualisation. One more game-engine example would be Unreal Engine 4 (UE4) with similar capabilities. Another well-known platform for publishing, sharing and discovering 3D, VR and AR content on the Web is Sketchfab. Sketchfab provides a viewer based on the WebGL and WebVR technologies that allow displaying 3D models on the Web, to be viewed on any mobile browser, desktop browser or Virtual Reality headset. Widely used, it supports the import of a variety of 3D file formats. Some similar examples to ones mentioned above are also: Blend4Web, an open source framework for creating and displaying interactive 3D computer graphics in Web browsers; and PlayCanvas, an open source 3D game engine/interactive 3D application engine alongside a proprietary cloud-hosted creation platform that allows for simultaneous editing from multiple computers via a browser-based interface. On a more specific note, 3DHOP (3D Heritage Online Presenter) is a framework for the creation of advanced Web-based visual presentations of high-resolution 3D content. More precisely, a tool that deals with the visualisation of a high-resolution single object (especially with dense models coming from 3D scanning) or, more in general, a simple static scene composed of complex models.

In addition, the paper will include a discussion regarding the advantages and disadvantages of the reviewed frameworks, and categorization in relation to specific needs and demands of different user groups.

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