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# A Study On The Application Of 3D Technologies For Web

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***Abstract:***

*This paper presents solutions for objectives and presentations related to the exploration of 3D technology and the visualisation of 3D content on the web, as well as the implementation of approaches for 3D reconstruction of museum exhibits, the creation of models for three-dimensional imaging systems and geometric models of museum exhibits on the web environment, and the development of a web application for displaying three dimensional images and geometric patterns of museum exhibits.*

***Keywords: 3D Technologies, 3D Visualization, 3D Website, Stereoscopy, Computer Graphics***

## Introduction:

Analysis of information systems may be done on the basis of general concepts that define an environment that is dynamic and always changing. When employing a systematic method that involves human interaction as a social mechanism, synthesis and assessment of the system are crucial components that should be included. The design of the system need to include fundamental modules and the fundamentals of connection with other modules (Stanco, 2011). Definitions are provided for several granular classifications of depth perceptions. In order to develop a 3D visualisation application that includes all of its possible features, a number of different strategies and things to think about have been tried out throughout the process of selecting the technology for the software solution implementation. The CSS modifications do not integrate any of the capability of the rendering machines, hence they are included in the comparative technologies overview that is connected with figure 1. The use of WebGL as a content rendering option is provided by both O3D and Three.JS. Certain Java libraries and application programming interfaces are the only ones that contain some of the functionalities that have been discussed. Included in this comparison is the prominent example of an interplanar solution known as Unity3D, which is used to produce video games for several

platforms including personal computers, gaming consoles, and mobile devices. The visualisation of surfaces may be accomplished by a variety of scanning methods. An optimization phase need to be formed before the project's expansion is carried out. This is due to the fact that many comprehensive network surfaces are costly for data processing and include a great deal of redundant geometric information. The number of triangular surfaces on an item may be reduced using an optimization procedure, which does not affect the object's overall form or any other aspects of the network area.

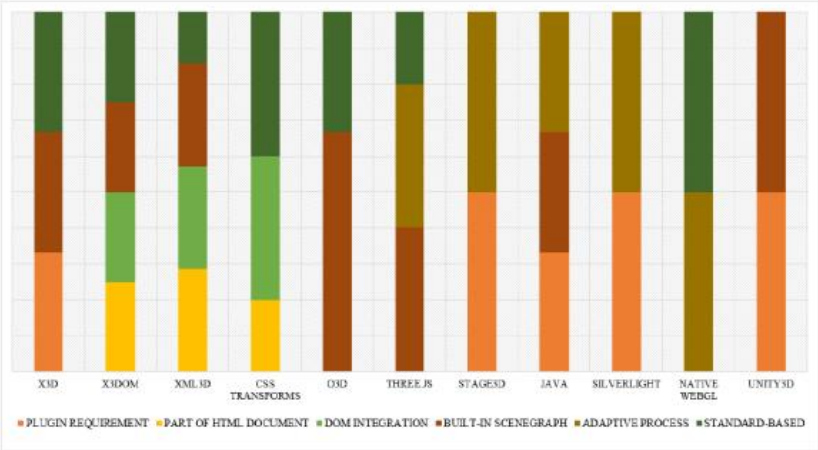


*Fig. 1. Comparison of web-based 3D visualizations.*

An advanced structured DAVID SLS-3 light scanning technology is used for assembling individual scans into a full-featured digital 360-degree model in order to provide a comprehensive and accurate 3D presentation of museum exhibits. This technology is employed in order to accomplish this goal.

**Approaches For 3D Reconstruction Of Museum Exhibits:**

Realization of a web-based information system for visualisation of stereoscopic images and three-dimensional models of museum exhibits, ideas and approaches for three-dimensional presentation of images and geometric models on web, preservation of museum objects via digital approach, methods for digitising 3D objects, processing, editing, and storing museum exhibits like 3D images on web, and three-dimensional visualisation in response to growing user demand are some of the topics that have been investigated (Hristov, 2015).

The quality filtering module of the DAVID 3D software implements the functionality of removing inaccurate data during the scanning process, representing probable edge-scanning and light-dark areas, with the value of the filter being changed for tracking the result of model scanning, feature for recording colour texture, and aligning each new layer with

the object scan that came before it. Polylines may be used for geometric processes and applications, surface analysis, and hardware rendering. They are a vital condition for the achievement of 3D real-time visualisation, and they can react to high-level detail object and scene presentation. In a broad variety of software applications, particularly those dealing with virtual reality, CAD modelling, scientific simulations, and e-commerce platforms, three-dimensional models are used extensively. Due to algebraic optimization, mesh surfaces are particularly suited to modelling for the purpose of processing large portions of surfaces using graphical hardware. This is a critical issue, particularly for end-users with limited network connectivity and technology storage capacity. Mesh surfaces are particularly suited to modelling for processing large portions of surfaces using graphical hardware (Luebke, 2001).

**Concepts of 3D Image Visualization Systems:**

In light of the fact that the HTML 5 standard includes tools for displaying three-dimensional objects, a method has been presented for performing comprehensive 3D model interaction inside a web browser. The present project makes use of the Three.JS library as an accessible 3D JavaScript library that renders 3D scenes in 2D perspective. This includes the rendering of the scene, camera, and lighting. Canvas, SVG, and WebGL are the three distinct components that are offered by it. Figure 2 presents a conceptual illustration of an information system architecture that includes mobile capability. This feature enables progressive data loading and comprehensive object visualisation (Hormann, 2008). The primary user interface for validating 3D models need to enable at the very least three procedures, namely object movement, rotation, and scaling. In order for the user to correctly assume the operation of a newly built software programme, the design of an intuitive user interface has to adhere to specific standards (Miller, 1992).

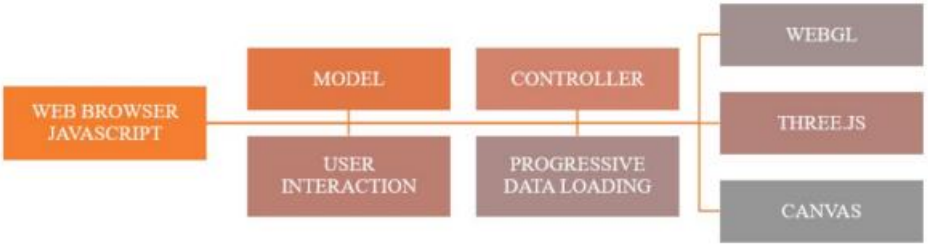


*Fig.2. Project scheme of information system architecture*

The Java 3D application and programming interface provide a broad variety of 3D scene descriptions by making use of graphical objects for the various components of the scene. These components include surfaces, transformations, materials, and lighting. The software solution that is being shown has integrated support for 3D input devices in addition to spatial sound rendering. Java 3D offers design unity by concentrating on 3D content description and OpenGL by unifying the features discussed above into a single application programming interface and offering an interface for the representation of points, lines, and triangles. The decision of the HTML technology standard to use, such as Canvas or SVG, should also be weighed in light of the project's goals, data range, level of interaction, ability to handle animation, DOM API control, and separation independent across a variety of devices (Xiaodong, 2002). Canvas is a pixel-based technology, thus the speed of the application after rendering should not be altered, unless the graphics resolution is increased. The existence of repeating components is yet another benefit brought about by technological advancements; this benefit contributes to an increase in overall productivity and makes it feasible to duplicate and reuse parts. Modularity in relation to the interactive capabilities of components is not relevant while working with Canvas. SVG and Canvas both provide a variety of functions, which makes choosing between the two potential options depending on the project. WebGL, one more standard for the creation of graphics, is mostly used for producing 3D effects, but in a 2D form, using operations that have been improved. The modification of the Document Object Model, in conjunction with a JavaScript framework like AngularJS, is a technique that is viable for the implementation of projects of a similar sort (Remondino, 2014).

Not only can users who are travelling to museums or cultural institutions situated in other cities benefit from the accessibility offered by virtual museums, but persons with disabilities who have difficulty accessing museum sites also take use of this cultural resource. Therefore, online museums may serve as a means of fostering social integration (Di Benedetto, 2014).

**Software Applications for Displaying 3D Models on Web:**

It comprises a list of spatial coordinates of vertices for a linked network consisting of a large number of triangles that are not particularly large in size. A platform for the depiction of three-

dimensional objects has been developed, and it satisfies needs such as the ease with which a website can be used, as well as the creation of a complete three-dimensional model of museum artefacts in terms of shape, texture, and resolution. Various 3D renderings of museum exhibitions are available:

- visualization of 3D museum exhibits without the need to install extra plugins via the use of the Three.JS JavaScript framework and accelerated 3D animations;
- integration of 3D museum exhibitions via the use of the X3D standard, which is used for expressing 3D picture sequences, extension, supporting multi-layer, lighting, and real-time architectural rendering;
- stereographic depiction of geometric models, accomplished with the help of the Java applet, J3D-VRML97, and the 3DS Java3D Loader; loading of the 3DS, OBJ, and WRL file formats;
- visualisation of anaglyphic pictures, each of which consists of two red and cyan images that have been filtered differently and are chromatically opposed to one another. This allows for a more comprehensive understanding of three-dimensional scene and composition.

Figure 3 is an illustration of the complete three-dimensional visualisation of the cup model, which includes the X3D standard for declarative representation of three-dimensional computer graphics, the possibility of functional movement of the object, and a detailed introduction with particulars of the museum exhibit. The output file makes it easier for tasks to be completed in a short amount of time, such as importing data about museum exhibits and combining the model and texture into a single file structure. This method keeps all of the information and interaction for the 3D online visualisation intact, and it does so without the need to install any extra software or plugins. The capabilities depict a 3D portrayal of a model with the highest possible levels of interaction, detail, and satisfaction for the user (Behr, 2009).

Two comprehensive strategies for the incorporation of 3D material into the web are made accessible via the standards X3DOM and Three.JS. However, the manner in which 3D data visualisation is implemented in each of these systems is somewhat different. The selection of the appropriate software programme is dependent on the particular goals and presentation. Because it delivers results quickly and adequately, X3DOM is a

viable option for incorporating 3D material into an HTML page because it is a practical solution. The Three.JS package provides a comprehensive selection of technical configurations and choices for personalising and displaying a 3D scene by means of DOM elements. X3D offers superior performance in comparison to other featured 3D visualisations in terms of compressed binary and JSON surface coding, as well as three-dimensional picture modelling architecture (Walters, 2010).

**Conclusion:**

Investigating the visualisation of 3D objects. The process of creating three-dimensional models using 3D graphics systems and specialised hardware has been described in a methodology that has been developed. This methodology also describes approaches for 3D object web visualisation, models of web-based systems, software applications and implementation methods, mesh surface modification and optimization, and concept models of virtual environments (Wunsche, 1998). The museum of St. Cyril and St. Methodius University in Veliko Turnovo, Bulgaria is in the process of developing a web-based information system that will allow for the three-dimensional representation of model exhibits. It is possible to do in-depth analysis, testing, anaglyphic and stereoscopic visualisation, as well as X3D and Three.JS visualisation on museum displays and modules. The use of three-dimensional models has applications that may be found in every aspect of life. For high-level detail presentations, the creation of 3D online models is becoming a need. This is tied to the growth of technology, the usage of visual software libraries, standards, and algorithms, all of which are introducing key parts of the exploratory work being done in this research.

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