

VRML and JAVA 3D: a Comparison

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1. INTRODUCTION

Today there are many 3D applications that are implemented on the web. Many companies put the 3D applications as an eye catching and also marketing strategy for their business goal. They believe 3D graphic can attract web visitor's attention since 3D graphic implementation is aimed to visualize the products offered in a realistic way. Other reasons are for easy interactivity on the web and also for fun to see 3D objects that can represent the real world (Intel Corp. 2002).

But there is one thing that should be considered before implementing 3D applications on the web: only use it to “**visualize physical objects** that need to be understood in their solid form” (Nielsen 1998). Since the 3D file size is normally bigger than the normal graphic file, it is wise to only use 3D graphic in appropriate application. Related to the big file size created on 3D application, web visitors should also be notified on pointed 3D files that need more than ten seconds to download (Hogan 2002).

The development of 3D applications is also related to the development of tools and languages that support it. This paper is going to discuss about the two popular languages that widely used in building 3D application on the web, VRML and Java 3D. This paper is organized into 5 sections; Section 1 is introduction of the paper, Section 2 is overview about VRML, Section 3 is description

of JAVA 3D, Section 4 is the comparison between those two languages and Section 5 concludes this paper.

2. VRML

Virtual is “being something in effect but not in actual name or form” (Vince 1999). In the computer related term, virtual comes with reality. The two words together, Virtual Reality (VR) means the reality of a particular world that is developed without physical existence of that world. In more general, it is about substitutes of objects or environment that is created to represent those objects or environments in the real world.

There are several characteristics of VR system, which are 3D, real time, first person view (Backman 2000) and navigation, interaction, immersion and presence (Vince 1999). Virtual reality system is about to use a computer with 3D pictures so that one can interact, move around and navigate the objects. The presence and immersion of user in the virtual world is a kind of feeling that someone is there to make it easier for him/her to understand and interact with the 3D world.

According to Backman (2000) VR can be categorized into 4 types such as Desktop VR (can be shown in a monitor, keyboard and mouse for interaction), Augmented Reality (mixture between real world, computer graphic, and sound), Telepresence (create an effect of moving someone to another place) and Immersive VR (user tracked in some sense, using interfaces devices). Among the other VR categories, Desktop VR is the most related to VR application on the web. One of the examples of Desktop VR is VRML. VRML is an abbreviation for Virtual Reality Modeling Language.

The reason why VRML is easily accepted in the web community is because it is “a simple and accessible way” to create 3D scenes and it is encoded in UTF-8 (Unikey) format, which similar with HTML encoded in ASCII (IRT.org 2002). Another reason is VRML can run in standard computer processor, so that one does not need to have a high-speed processor to run a VRML based scene (Daly 1998). Fisher (1997) thinks that by implementing VRML, it is something fun to really explore the objects and its areas.

VRML is different from video, where video stores the whole moving pictures, which will be transferred from web server to client browser to get the video played. But VRML, it does not store the whole detailed information about the picture. It only stores (Fisher 1997):

*“the points in a **geometric** object, information about the color and transparency of those object, information about how those objects simulate the refraction of **light** and information about any visual **textures**”.*

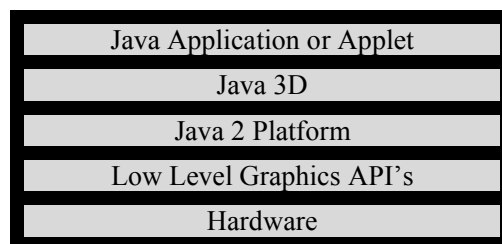
This means that once a person looks a VRML file, the browser search for those points in 3D file and then constructs a scene based on the movement of eye point (the spot in which 3D browser is looking at VRML world). The VRML file is normally end with .wrl extension, which means world.

3. JAVA 3D

Sun Microsystems, the company that develops Java platform participates in the development of 3D language. They call their language Java 3D. Java 3D consist of collection of Java classes that can be used for the development of Java 3D application. The main Java 3D package is javax.media.j3d and the other packages are javax.vecmath and com.sun.j3d (Sun 2002):

The illustration in Figure 1 below is showing the Java 3D layer to the Java 2 platform. Because Java 3D is the extension from Java 2 platform (extending Java's core capabilities to include 3D), someone cannot display Java 3D applet in standard browser like Netscape Navigator or Internet Explorer since those browser do not support the Java 3D classes in their Java Runtime Environment. Fortunately, Sun already cope with this problem by releasing Sun's Java Plug-in to be installed in the computer system so that the web browser can handle the Java 3D classes. So when there is a Java 3D applet, the Java Plug-in will create <OBJECT> or <EMBED> tag that bypass the browser's internal JRE and redirect it to the Java 2 JRE.

Figure 1. Java 3D layer, which is on top of Java 2 Platform (Walsh and Bourges-Sevenier 2001)



4. VRML VS JAVA 3D

This section discuss about the comparison between VRML and Java 3D are summarized in Table 1 and Table 2 below.

The table below lists the similarity features that are entitled by VRML and Java 3D.

Table 1. Similarity between VRML and Java 3D

Freely available
Cross platform available
Easily distributed
Extensible
Run on a web browser
Employ scene graph called nodes in its model

The VRML and Java 3D is free. Therefore, one can download Java 3D from <http://java.sun.com> and use VRML that is already plugged-in to the web browser. These two languages are also available in any platform program, except Java 3D for Macintosh (Walsh and Bourges-Sevenier 2001). The other features of them are easily distributed and extensible, because they are the open source type of program so that the web community can do the development continuously. Especially there is a Consortium Web3D organization that is working on Recommended Practice, standards and technologies applied to 3D on the web (www.web3d.org 2002a). So the new program that comes up for the user should be analyzed by this organization.

Either VRML or Java 3D is using node to represent its objects. These nodes are arranged in a way called scene graph (web3d.org 1997). It is a treelike data structure that can be used to store, organize and render 3D information. In VRML, each node consists of the properties such as: a type name (Box, Color, Group, Sphere, Sound, or SpotLight), the fields that specify how the node differs from other nodes, a set of events that specify the node state, the node's implementation and the node's name.

As for in Java 3D, a node is based on new object instance that will be add to the scene. The root node is called virtual universe, which consist of Locale object that in each Locale object can have another multiple scene graphs. Constructing the scene is more difficult in Java 3D since it needs much complex programming.

As for the difference between VRML and Java 3D can be summarized in the table below.

Table 2. Difference between VRML and Java 3D

	VRML	Java 3D
Released date	1994	1998
Simplicity	Simple language	Complicated language
Authoring tools	Available	Not available
Standardization	International standard	Still underway
Loading to browser speed	Quick	Take a long time
Application	Does not support for complicated practical application	Support for complicated practical application

The main difference between VRML and Java 3D is that VRML is an interpreted 3D development language and Java 3D is a programming language (Walsh and Bourges-Sevenier 2001). VRML file is similar with HTML file where it is a text based file that is human readable. But the Java 3D

file is only human readable in the development stage, as in the next stage it will be compiled into a bytecode so that it can be executed. The development of 3D application is easier using VRML because there are some authoring tools that available to generate the VRML file. Some authoring tools are Spazz3D, V-Realm Builder and Cosmo Worlds (Kahunanui.com 2000). But the problem of VRML is that it does not support complicated practical application (Emoto *et al.* 1999). Therefore it is necessary to combine VRML with other language.

Another opinion from Burton (*et al.* Heriot-Watt University) said that Java 3D applet takes amount of time to be loaded to the browser. It is because the compilation that should be done for the Java 3D code to get displayed on the browser.

Based on the comparison above, it is seen that VRML is can be used for 'lightweight' application and it also can be used by non-programmer to implement 3D world in one's page. Today, the combination between VRML and Java 3D becomes popular. The Web3D Consortium started to combine this two standards by their project called Xj3D. The future hope is that they can provide the web community with browser that compliant with VRML and Java 3D (www.web3d.org 2002b) that optimize the memory usage and speed.

5. CONCLUSION

The development of 3D application on the web is getting popular. That is the way people want to make their web site attractive to their visitor and their customer. The 3D applications allow the developer to create objects, which represent that object in the real life. The two languages that are widely used to develop this application is VRML and Java 3D. The paper describes about the similarity and difference features entitled on VRML and Java 3D. The core difference between this two languages is VRML is an interpreted development language (similar to HTML) and Java 3D is the programming language. Therefore VRML is easier to develop. But Java 3D is more powerful than VRML in term of developing complicated application. There is a working-group coordinated by Web3D Consortium that tries to combine these two languages and create a browser that optimize the memory usage and speed.

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