VIRTUAL REALITY MODELING LANGUAGE

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The theme for VRML for today is islands. The narrative voice and visual setting explains the situation that participants (ESL students) in shipwreck arrive on a deserted island. To survive over there, they should build a new community, design their environment and set up the rules by which they will live. Students select their own identities (objects) that represent themselves. They communicate in English with voice chat or text chat: how and who will get the water and woods, hunt for food, cook, etc. During the discussion, they can express their emotions by using face icons such as smile, anger, or cry and they can dance, bow, and walk. They can write rules, send rescue letters, or whisper with others.

Description

Virtual Reality Modeling Language (VRML) is a standard language for three-dimensional objects, or scenes delivered across the Internet. A VRML file is a regular text file that describes a virtual model using a standardized syntax and is being viewed interactively through the use of a VRML plug-in application available for all common Web browsers such as Internet Explorer or Netscape with high RAM and fast operating system and Internet connections (Cromby, Standen, & Brown, 1995).

When clicking a VRML file on the Web, the file is downloaded on the user's computer and the plug-in is activated so that it displays an initial view of the virtual model on the computer's monitor. The plug-in provides standard navigational and communication tools such as walking, flying, dancing, or showing facial expressions (Durlach, & Mavor, 1995). Navigation as well as interactions are usually controlled via the mouse input device. It can also allow for interaction and manipulation of the objects or scenes and examination of them from all viewpoints (Bricken, 1991). VRML models can be animated and allow for the user to create an avatar or symbolic representation of him/herself. With functionality and dynamic behavior, students can control interactions in a 3D space to share virtual models and collaborate with remote users.

Background

VRML was created in 1994 by Mark Pesce, Anthony Parisi, and Gavin Bell. They designed the specifications for the first 3D Modeling language (Johnson, Moher, Ohlsson, & Gillingham, 1999). VRML had to be platform independent to be implemented on the Internet. Also, the language had to be able to place objects in 3-D space, as well as include attributes such as shape, color, and size. VRML 1.0 was introduced in May 1995. A more clarified version, VRML 1.0c, was issued in January 1996. Now, VRML 2, called "Moving Worlds", is used.

The major differences that VRML 2.0 has are that it is more interactive and more realistic than VRML 1.0. VRML 1.0 had static worlds that are no interaction, and no movement. With VRML 2.0, instead of just looking at an unexciting house, users can see the windows flutter, the doors open, cars entering and exiting the garage with music. Also, users can do some behaviors like opening the door, using an elevator, or flying through space (Cromby et al., 1995).

Current Application

With real-time interactive control and a user-centered perspective, this technology, especially VR, is actively being used in health care to visualize surgical processes, in architecture to visualize large- and small-scale design processes, and in training air forces by visualizing virtual air fights. For example, surgical training is largely a matter of close supervision on the apprenticeship model (Burns & Gentry, 1998). There is a growing requirement in training to practise techniques and operations in a way which does not put patients at any risk and one way this can be done is using virtual reality modeling of the procedure.

VRML is relatively new in education. However, there may be significant potential for VR applications to assist in alerting young students to some of the more disturbing aspects of today's society. With this technology, young students can visit places that would otherwise be impossible, impractical or too dangerous (Crookall, 1990). For example, with VR applications, users can experience crossing the road, escaping from fire, burglaries, accidents and so on to primary and secondary school children.

Currently, we can find many sites that helping users picking a free browser, visiting virtual communities, building our own worlds, sharing with other users, and developing

curriculums with VRML. For example, *VRML at the Teacher's Resource Bank* (http://3dgraphics.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fwww.teacherresourcebank.com%2FVRML%2F) provides many resources for teachers that want to use VRML in the classroom with teacher training and lesson plans/classroom activities. *VRML works* (http://hiwaay.net/~crispen/vrml/) explains how to view and build 3D virtual world in detail. *The VRML Repository* (http://www.web3d.org/vrml/vrml.htm) contains software, sample worlds, documentation and links to projects and worlds. Also *The VRML Repository tutorials* (http://www.web3d.org/vrml/tutv.htm) provide specific instructions with each example of 3D virtual worlds.

Because 3D virtual worlds are relatively new, there has been little research about effectiveness of educational use, especially, of language learning. Most research to date has tended to focus on the technical aspects of design. It is likely that many or most schools would presently not be equipped with the hardware to be able to make use of VRML to complement instruction. At the same time, the majority of VRML sites are not designed for educational purposes, rather for entertainment such as video games.

The future educational use of VRML can involve simulations such as interactions of chemicals, growth of cells or crystals, 3D representation of worlds in space or underwater. VRML also presents the possibility of collaborative spaces for student interaction, seminars, tutorials and informal gatherings that might be provided by virtual classrooms and universities (Johnson et al., 1999).

VRML in Language Learning

Richards and Rodgers (1986) examine three theoretical views of language: structural, functional and interactional. VRML follows from the interactional view, where language is seen as a vehicle for the realization of interpersonal relations and for the performance of social transactions between individuals. For example, before being in interview to get a part-time job, ESL students can be in an interview setting for a native employer in VRML. ESL students answer the possible question in the similar settings, so they can have confidence and practice before they are in the real setting.

Many ESL students learn the language exclusively from textbook explanations and examples. But with the increasing availability of computers and the Internet in classrooms, VRML will be a viable supplement to traditional textbook instruction. ESL

students will learn languages more interactively in less time without embarrassment. VRML may provide a less formal experience than real worlds, but it is entertaining and certainly more realistic than mere pictures and dialogues in an English textbook. As learners begin to work, study and communicate in VRML, they may learn not only the target language, but new ways of thinking and structuring information (Cromby et al., 1995).

The customization and interactivity may permit users to shape their interpersonal and collaborative electronic experiences. For example, if one ESL student is puzzled by an observation or fails to understand the meaning of a mutually shared video stream that they have been watching together, they will find it very natural to ask questions of others who share the same virtual world at that time. This meaningful interaction motivates learners to learn interpersonal skills as well as their target language naturally. In no other way can teachers provide learners with more authentic language without communicating with the native speakers of the target language. However, with VRML, at a relatively little expense, and 24 hours a day, learners can be in contact with native speakers from a tremendous variety of cultural and linguistic backgrounds. While textbooks do the important job of providing lists of vocabulary and outlines of grammar, VRML help ESL learners to internalize language structure within the broader contexts of dialogue and culture.

Gains/ Loses for Language Learners

Scarcella and Crookall (1990) review research to show how VRML facilitates second language acquisition. Three learning theories which they discuss are that learners acquire language when: (1) they are exposed to large quantities of comprehensible input, (2) they are actively involved, and (3) they have positive environments such as desires, feelings and attitudes. Comprehensible input is provided in VRML because students engage in genuine communication in playing their roles. Active involvement stems from participation in worthwhile, absorbing interaction that tends to make students forget they are learning a new language. Students have the opportunity to try out new behaviors in a safe environment, which helps them develop long-term motivation to master an additional language (Scarcella & Crookall, 1990). Apart from encouraging genuine communication with target language, active involvement, and a positive attitude, the

simulated real life problems help students develop their critical thinking and problem solving skills with other participants.

VRML language learning overcomes time and space limits and gives learners the sense of their presence. Students are given control over critical elements of the environment. They are able to manipulate the environment such as languages, place, and time variables. They can freely play with any situation and they can run the simulations as many times as they wish, taking time to focus on different side of the simulation each time (Christopher & Smith, 1990).

VRML is extremely cost effective since the required networked computers exist in urban or suburban areas and the viewing software such as VRML plug-in, is available to everyone for free. Anybody who has the Internet access can download from the Net. However, today's limitations are dictated by network capabilities due to download times for large VRML files describing complex virtual models and the speed of the user's local computer that is responsible for real-time rendering and interactions (Johnson et al., 1999). It limits the real-time transmission of data in sufficient quantity, making it difficult to include motion video and audio of sufficient fidelity to make them useful for language learning applications. The traditional HTML model of static page display with hypertext branching is limited in its ability to provide such simple interactions as answer judging as we often see in interactive materials today (Singhal & Zada, 1999). The current development trend towards high capacity networks and more powerful desktop and laptop computers with 3D graphics acceleration will remove these limitations gradually in the near future.

Another important thing that we should consider is the socioeconomic gap. According to Pastore (2000), the biggest gap in Internet adoption rates in the US exists between the rich and the poor, not between ethnic groups. He points out that ethnic background alone does not explain the existence of a digital gap. Although a combination of factors determines if a consumer is online, income is the strongest predictor. Across all groups, online penetration rises as income rises.

VRML are much less expensive than VR. However, there are still many students and school districts that do not have sufficient equipment, and use slow modem networking . Thus, the financial situation of school districts may be critical to provide the rich learning

environment with VR or VRML. Naturally, the rich districts will provide better chances for students to learn their target languages or other learning with VRML. Furthermore, there will be private VR institutes that may provide extra opportunities to learn after school. It may cause economic gaps between students depending on parents' wealth. Students who have rich parents or are in the rich districts may learn the target language faster and eventually facilitate school learning with better access to the VR.

Additionally, the quality of VRML is not really effective. For example, Active World (http://www.activeworlds.com/) has the limits and lack of user control over avatars. Users were limited to selecting an avatar from a predefined library. Avatar is difficult for ESL students or teachers to create and require knowledge of 3D modeling as well as the appropriate software. The premade avatars represent young western Caucasians. Also there were more males with a greater variety of age and body types than females. These limitations perpetuate values that may not correspond with those of the user.

While the lack of user control over avatars was seen as problematic there were other aspects of representation where the user maintained a great deal of control.

Users could choose their own unique names and control over the amount of information they wished to reveal, including whether to make their presence in a world known to others. Users also had the option of whispering and sending telegrams, and muting other users. The availability of unique names does aid in the development of communities because it aids in both creating trust and accountability among users (Stone, 1997).

Lastly, although the conversational pace with text chat is slow compared to a face-to-face conversation, this gives learners a little time to think through what they want to say because it is fast in terms of typing. If ESL students don't have enough typing skills in English, it is difficult for them to concentrate in English while their fingers continually make spelling mistakes. Also, even though ESL students need to see authentic language, the communication in VRML will include mistakes in grammar and form, bad typing skills, and informal conversation of other users that can hinder the learning process and frustrate the learner who need to learn formal academic language.

Summary

The medium of virtual reality represents one step closer to a social world where the lines between the symbolic and the real are merged. Currently VR is extremely expensive,

VRML or other web-based VR applications are very portable for everyone. Through a careful analysis, the problems of virtual environments may be anticipated and perhaps prevented. Educators and researchers should try to identify and address potentially harmful side effects related to the use of VR technology. VRML cannot replace experiences with native speakers of target language. It cannot infuse a student into a real environment that has all the culture and feeling the real location and people has. What VRML can do is create experiences that help students understand places, people, language and processes better. Therefore, we can use virtual reality to learn the target language to enhance our real social lives and understand others better.

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