ENHANCING E-LEARNING USING VIRTUAL REALITY FOR CREATING THREE DIMENSIONAL WEB CONTENT

ABSTRACT

Computers can generate graphical displays that show an object or scene in three apparent physical dimensions. Such three-dimensional (3D) graphics or images are extremely useful for visualizing real-world objects, scenes, or processes. When polygons, surfaces, and other 3D graphical elements are combined into a computer-generated scene that resembles a real environment, the scene is called a “virtual world” and the computer is said to display “virtual reality”. Computer programs are available for defining, editing, and displaying virtual worlds using a personal computer or a graphics workstation. The wide use of Internet, WWW, HTTP, and URL which form the basis of Web Technologies enables for enhanced e-learning through virtual reality. The Virtual Reality Modeling Language (VRML) provides a way to integrate virtual reality technology with World Wide Web technology. VRML is the industry standard description language for storing and delivering 3D information over the Internet. Using VRML, virtual worlds can be defined in human-readable text form and in a device independent manner.

The virtual world is defined in a text file that is interpreted at runtime, like a scripting language. The text format of virtual worlds defined using VRML uses significantly less storage space than a graphical representation of a virtual world. The browser is provided with a VRML interpreter, generally a “plug-in” to the browser. An example of a VRML interpreter is the Cosmo Player plug-in available from Silicon Graphics, Inc. The term “Virtual World” refers both to textual source code and the display resulting from interpretation of the source code by a computer using the VRML interpreter. A web server is required and client server architecture is used for the implementation of a virtual world.

The browser which is the client requests a virtual world by providing its URL to the server. The server locates the selected virtual world and returns it in text file format to the client machine. The browser reads the virtual world, interprets the VRML commands, opens a browser window or frame on the computer display, and generates a graphic display. Thus, the server generates the virtual world and the browser renders the world. VRML97 allows the description of dynamic worlds that can change with both the passage of time, and user interaction. The power of VRML
is extended so that it is used not only for defining shape models, but also for creating structures for behavior. This results in a set of VRML prototypes that serve as dynamic model templates.

A novel 3D simulation modeling system is used to build structures that serve as surrogates for other objects with respect to simulating and emulating machine behavior on the Internet. Script nodes are used to model the behaviour. Desktop and web-based e-learning applications offer industrialists new tools to raise maintenance-related knowledge and competence. Simulated learning through virtual 3D animations let employees comprehend the internal mechanisms of the equipment and the correlation between the different parts. The evolution of Web technologies in recent years has enabled the use of VR modelling for visualization of manufacturing processes creating a Virtual Environment. The VR modelling language (VRML), is used to control, interact and monitor manufacturing processes visually thus imparting training from a desktop computer. This thesis work deals with the simulation of the production of steel beams and columns presented to the subcontractors from a parent company and a model of the construction of a factory.

Work is done on the mechanisms and methods for storing, dynamically reconstructing, and navigating a three-dimensional virtual world using a database. The characteristics of the world are represented in database tables. In an embodiment, nodes and fields of the world are associated with database queries. When the world is to be displayed, values in the database schema are recomposed into a source text. The database queries are executed against a database, yielding values, in real time based on the current state of the data in the database, for the nodes associated with the queries. Thus, a large virtual world is efficiently displayed and easily modified, and the size, shape or other aspects of the elements of the virtual world can change as data in the database changes.

The effectiveness of using desktop virtual reality for learning is also addressed. Cognitive outcome was measured through academic performance whereas affective learning outcomes were measured through perceived learning effectiveness and satisfaction. A desktop VR-based learning environment is compared with a conventional classroom learning practice. An evaluation was conducted to investigate the learning effectiveness of desktop VR-based learning, and to investigate the effect of learners’ aptitudes on learning. It was found that desktop VR system is capable of enhancing and improving the quality of student learning.