VIRTUAL REALITY ENHANCED INSTRUCTIONAL LEARNING

By

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ABSTRACT

Virtual Reality (VR) is a creation of virtual 3D world in which one can feel and sense the world as if it is real. It is allowing engineers to design machines and Educationists to design A. V equipments in real time but in 3-dimensional hologram as if the actual material is being made and worked upon. VR allows a least-cost (energy wise) and non-invasive mechanism to achieve all our objectives. VR sometimes can be even more powerful than the real world since it allows almost anybody to feel and sense the otherwise forbidden world.

In the most popular applications of VR technology, any student viewer simply tours various historical and geographic sites in a three dimensional space; even virtual surgery is also possible. Even in our history VR class, we will be able to visit different historical events. Simulation Based Learning (SBL) is an approach which enables learners to view, touch, hear, and interact with life-like objects in real time.

The different types of VR devices are; Head mounted Displays, Data Gloves, VR Simulators, and VR Therapy, Hap tics (Convulsive), Head Trackers, Motion Trackers (MT), 3D Controllers, Stereoscopic Displays, VR Domes, 3D DVD, VR wear, Video Eye ware and VR Software/Kits. Virtual reality can be classified into five modelling types viz., (i) simulation-based; (ii) avatar image-based; (iii) projector-based; (iv) desktop-based; and (v) true immersive based VR. This paper also discusses the six factors for designing educational VR software. The disadvantages of VR are (i) the cost of multiple image-generation systems, (ii) space requirements for rear projection and (iii) reduced contrast and color saturation due to light scattering.

Keywords: Virtual Reality, Instructional Learning.

INTRODUCTION

Today's technologies have greatly enhanced more learning environments.Virtual reality learning means to see an imaginary world, rather than the real one. Once Antonin Artaud (1938), an actor described in his book about the "virtual reality" for the first time in the world. Then, Damien Broderick (1982) used this word in his science fiction novel. In 1981 the name was popularized through the films. Virtual Reality book was newly published in 1991 by Howard Rheingold and followed by Randell packer in 2001.

Virtual Reality (VR)

Virtual reality (VR) is a technology which allows a user to interact with a computer-simulated imaginary environment (Brooks, Jr.F.P. 1999). Most current virtual reality environments are displayed either on VDU or through special displays. For e.g., it is easier to learn how a human heart works by actually going inside by a heart display and used in dangerous chemical reactions and complicated surgical techniques. VR provides a firsthand approach to learning without the hazards of dealing with the real environment. Even in the history VR class, the users will be able to visit different historical events.

The Virtual Reality software like Virtools, allows users to imagine, share and experience highly interactive 3D content. It enables easy development of virtual learning experiences such as acting, doing, driving and flying etc., Some of the universities now they were using VR in their classrooms viz., Georgia State University, Atlanta, GA; University of Edinburgh, Scotland; and University of Hamburg, Germany and Technical university of Vienna.They were used Multipurpose Virtual Multimedia Selector (MVMS) software and to select, play and change audio, visuals and multimedia presentations.

Working Environment

Users can interact with a virtual environment through the keyboard and mouse, or through wired glove (multi model device). In practice, it is currently very difficult to create a high-fidelity virtual reality experience, due to largely technical limitations on processing power, image resolution and communication bandwidth. The different concepts of Virtual Reality are simulation, interaction, immersion and artificiality.

In the most popular applications of VR technology, any student viewer simply tours various historical and geographic sites in a three dimensional space; even virtual surgery is also possible. A group of medical students, wearing special glasses, have their eyes fixed on the display (Sativa, R.M. 1995). The teacher controls the movements of the surgical robot with a computer mouse to determine where exactly the incision in the patient's skin should be made. The student watch as the robotic instrument sinks into the patient's body in virtual space. When another button is pressed, the skin disappears, and the instrument is now between the ribs, just above the heart. The students check if no mistake was made in surgery planning class.

The screen of the Multimedia player allows the user to select audio tracks, videos or presentations from a dynamic list. The 'User Selection Tools' allows the presenter to select what type of media they would like to show to their audience. Just as filmmaking, all characters and settings have to follow a well-defined script to go through till the end. An Educationist could play the role of a director to make the virtual system keep storyline forward. This includes where and when virtual figures are placed, what kind of events would be triggered, and their corresponding reactions.

Real experiences

Educators will learn how to combine 3D technologies within education and training curriculum and to create immersive environments. This approach, called Simulation Based Learning (SBL), enables learners to view, touch, hear, and interact with life-like objects in real time. In 3-D Modelling, if you are in a big school, you can explain "I could go into a School and sit in a class seat and see the desk and bench around me, it would be like being inside the classroom. I could look at the finish of the labs, the position of the equipments, the material used on the benches, etc". A science specimen is multiply on a 3D model, which when viewed would show not only the texture but also its appearance under different types of illumination from different angles.

Web Development

To bridge the gap between reality and virtual reality we need methods to quickly convert objects from physical reality into digital models and back. Hi- resolution satellite images of urban areas are being incorporated into MSN Virtual Earth. Google is quietly doing similar stuff. Photosynth is an upcoming technology from Microsoft to recreate 3D environments. To create a realistic virtual environment one would only need to clean up the raw data a bit, combine the air photos for rooftops and large buildings with ground level images for details, add virtual materials and traffic on streets.

Types of VR Devices

Today's digital educators can teach anything from social to language skills and don't get tired, bored or irritable. The different types of VR devices are; Head mounted Displays, Data Gloves, VR Simulators and VR Therapy, Hap tics (Convulsive), Head Trackers, Motion Trackers (MT), 3D Controllers, Stereoscopic Displays, VR Domes, 3D DVD, VR wear, Video Eye ware and VR Software/Kits.

Head Mounted Displays (HMDs) are devices that typically look like a helmet, which have a small video screens placed at a short distance in front of your eyes or in some cases miniature projection devices that project images directly onto each retina.

Gloves contain various types of sensors or a tactile feedback device to allow a user to interact with the visual VR environment. The software coordinates the interaction of the gloved hand and the visual display. Using such gloves a user can see an object in the virtual world and, be able to pick up the object and place it somewhere else.

VR Simulators are already being used in the film and television industry. These devices trace the body

movements through small dots attached to a body suit at joint positions (e.g., wrists, ankles, elbows, knees, head, face, etc.) of an student actor. A pair of video units detects the movement of these dots by the accompanying software and linked to the similarly placed dots on a computer-generated virtual person. With sophisticated software the virtual person can then be very realistically animated using various clips of the recorded movements of the student actor.

In VR Therapy, the optical design and high resolution micro-display technology combine to deliver a giant screen image with superb clarity for VR therapy patients. Thousands of dentists, hygienists, doctors and nurses are using the head mounted display systems through the Patient Distraction and Video Entertainment of V-Real Viewer.

Hap tics/Convulsive material, the VR Motion Chair can be used with a joystick as well as with a steering wheel and will work with any PC game. If anybody takes a seat in a VR Motion Chair and fly into the future of home video gaming, the feeling is out of this world. The Video Eye wares are fully adjustable, lightweight and comfortable and it will also connect directly to an iPod Video. Table 1 describes the variety of models available in Virtual Reality Devices.

One of the basic features of virtual reality is the provision of a sense of actual presence in and control over the simulated environment. This feature is achieved to greater or lesser extents in the various applications of virtual reality, depending upon the need.

No.	VR Device	Different VR Device Models
1.	HMD 3D Stereo	HMD Pro 3D, Z800 Duel Pro, ARV-3D & nVisor SX
2.	HMD 2D Stereo	i-Cine Hi-Res, i-Trek, Myvu Crystal & SunVisor
3.	HMD Monocular	Proview S035-A, M3 Monocular, ET-Centra & I-Port
4.	Head Trackers	Minuteman, GyroTrack Pro, TrackIR Pro & Cymouse
5.	3D Controllers	X-Gun, SpaceBall 5000, SpaceTraveler & Wanda
6.	M.T - Inertial	GyroTrack, Inertia Cube 2, Hy-Bird & 3D-Bird
7.	M.T - Magnetic	Minuteman, Patriot, Wintracker & microBIRD
8.	M.T - Optical	Hy-BIRD, laser BIRD 2, Face Traker & IMPULSE
9.	M.T - Capture Suits	MotionStar Gypsy 5, CypsyGyro-18 & Torso
10.	Gloves	5DT Glove 14, 5-V Hand, Pinch Glove & Cyber-II
11.	Hap tics	Motion Chair, Shadow Hand, CyberGrasp & Cushion
12.	Stereo Displays	SVI MU 19, 17 SX/21SX, VisBox-HD & VisDuo
13.	VR Domes	Vision Station, Vision Dome 2, Vd3 & VD5
14.	3D DVD	IMAX 3D DVD, Sci-Fi , H-3D DVD 2 & DVD3
15.	VR wear	VR T-Shirt, VR Women's Top, Sleeveless & Shorts
16	VR software & Kits	VR Racer, VR pilot, NuView 3D & Visualizer

Table 1. Different types of VR devices with examples

Types of VR Models

Virtual reality can be classified into five modelling types viz., (i) simulation-based; (ii) avatar image-based; (iii) projector-based; (iv) desktop-based; and (v) true immersive based VR.

Simulation based VR (Semi-immersive type)

An operator console is used for monitoring system operation and system integration, and the data transfer with synchronization. The driving simulators have been used effectively for human factor study. There are attached 3-D display devices that augment on existing objects. To keep the feeling of authentication is to use part of real objects. A number of vehicle control simulators, such as car driving, ship steering and airplane controlling use this kind of environments to practice manipulating skills. E.g. pilot seat in an air flight

Avatar image-based VR (fully immersive type)

Students can join the virtual environment in the form of real video. The proposed image according to wen-Hsi chang, (2008), VR system can handle two types of users. One can participate in the 3D distributed virtual environment as a form of either conventional or a real video. An avatar refers to the personality connected with the screen name. For example, Krishna is the eighth avatar (incarnation) of Vishnu for Hindus in India. A user can select his/her ones' own type of participation based on the system capability. Users with camera may select a video avatar while others select a conventional computer graphics-based avatar.

A user who wears particular display devices is a part of the virtual environment. Display devices like head-mounted display and stereo spectacles; provide a 3-D virtual space in user's vision. The user never feels himself as an outsider or audience in the virtual environment. It is necessary to block any other visual contacts from the real world for approaching absolute immersive. E.g. walk on the moon

Projector-based VR

Modeling of the real environment plays a vital role in various virtual reality applications. Usually, camera is used

for modeling small objects at a short distance. A system projected 3-D images to a glass-beaded draper on the wall from different directions, which can serve a group of people view the same content simultaneously. Xia, J.H., (2000) explained that, sometimes, it can allow multi-screens to surround users for obtaining better visual effects. E.g. surgical techniques

Desktop-based VR

It involves displaying a 3-dimensional virtual world on a regular desktop display without use of any specialized equipment. A system merely displays a virtual environment on the screen of a user's monitor. Here, it is more important to collect user's requirements than to apply a fancy technology. E.g. computer games

True Immersive based VR (Artificial Intelligence type)

Hypothetical virtual reality is as immersive as consensus reality. Most likely to be produced using a Brain-computer interface. e.g. remove sickness by virtual medicines.

Factors to Design VR Software

There are six factors for designing Educational VR software. They are:

Verbal Linguistic

In the real world, only concise semantics are able to express sophisticated mind. Textual messages may not be a key point for implementing a VR system, but it would be unavoidable to convey some complicated concepts. Especially in archives, most of collections are textual records. Therefore, less or more, it cannot help using words to present certain intents. It is useful for enhancing system's accessibility to refine verbose description. E.g. put subtitles into parts of scene.

Logical Deduction

All events and propositions have to be inferable logically in virtual scenes. It would make users feel more realistic in the cyber world. Basically, it is difficult to define event patterns to express events even in spoken languages. All events in themes have to be reviewed by educationists for sure. E.g. develop pattern making methods.

Spatial Allocations

All objects in virtual reality are represented in 3-D modes. Therefore, all messages among objects should be considered a spatial interactive relationship. Therefore, allocations of characters and triggered events would influence accessibility and friendliness to users. E.g. visualize science reactions.

Bodily Kinaesthetic

Default object procedures should be designed by reasonable manipulation schemes. The closer movements of real objects feel realistic. Even certain actions of an avatar could be much better than what an ordinary person can do. E.g. develop cartoon likes pictures.

Musical

Dub in appropriate background music could make the system more attractive. A good incidental music always accompanies with a perfect atmosphere. E.g. produce new synchronized rhythms; and

Interoperation

It is difficult to define general interoperated reaction rules with respect to individuals. In principle, the defined behaviours among users and avatars have to follow regulations in human societies by default. For generating reasonable results, all interoperated behaviours have to be designed and validated in advance Edward, J, (2001). Subsequently, essence of large size contents is beneficial for education; it should be encapsulated in related themes during the phase of designing. E.g. visualize virtual products.

Now-a-days the Virtual Reality used as a computer simulations of scans can simulate how a 'tumor' might shrink or change, during an extended period of medical treatment, presenting the passage of time as a spinning view of the visible human head, as the tumor changes. Likewise in Education field also the VR usage can be designed and validated.

Conclusion

The reasons for employing virtual reality technologies in education are:

- Simulation is cheaper than constructing a real thing;
- capability of offering rich services that are not

provided in a real classrooms;

- a virtual system could partly substitute during explanation of non-available ones;
- online visitors can browse and retrieve records in a virtual 3-D space without restrictions such as transportation, opening hours and so on;
- it is easy to change exhibits arrangement in a virtual things without schedule conflicts for different themes and
- a user can play any roles in educationist such as making of his own online class/ exhibition.

The disadvantages of VR are:

- the cost of multiple image-generation systems,
- space requirements for rear projection and
- reduced contrast and color saturation due to light scattering.

Future developments in Virtual Reality are; large-volume-tracking sensing methods, better visual displays, neural interface monitors, image gloves, and advances in modeling tools. Even today an individual at will can go to Disney World; can visit some of the finest museums of the world; or go to various instructional classes without moving out of the VR room. In short, a person can fulfill substantial portion of his/her desires through VR at almost zero cost and energy. VR cannot substitute for real human contact. Nevertheless it may allow vast majority of students from the educational world to enjoy the educational concepts in an interactive mode and may help them to move on to higher goals.

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