A

Seminar report

on

Virtual Reality

Submitted in partial fulfillment of the requirement for the award of degree of Electronics

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Preface

I have made this report file on the topic **VIRTUAL REALITY,** I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to ……..who assisting me throughout the prepration of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

INTRODUCTION

Virtual reality appears to offer educational potentials in the following areas: (1) data gathering and visualization, (2) project planning and design, (3) the design of interactive training systems, (4) virtual field trips, and (5) the design of experiential learning environments. Virtual reality also offers many possibilities as a tool for nontraditional learners, including the physically disabled and those undergoing rehabilitation who must learn (or relearn) communication and psychomotor skills (Pausch, Vogtle, & Conway, 1991; Pausch, & Williams, 1991; Knapp, & Lusted, 1992; Warner & Jacobson, 1992; Delaney, 1993; Trimble, 1993; Murphy, 1994; Sklaroff, 1994). Virtual reality offers professional applications in many disciplines --- robotics, medicine, scientific visualization, aviation, business, architectural and interior design, city planning, product design, law enforcement, entertainment, the visual arts, music, and dance --- and concommitantly, virtual reality offers potentials as a training tool linked to these professional applications (Goodlett, 1990; Jacobson, 1992; Hyde & Loftin, 1993; Hughes, 1993; Donelson, 1994; Dunkley, 1994). For example, just as virtual reality is used as a tool by surgeons, it can be used by medical students training to become surgeons.

Originally designed as a visualization tool to help scientists, virtual reality has been taken up by artists as well. VR offers great potential as a creative tool and a medium of expression in the arts. Creative virtual reality applications have been developed for the audio and visual arts. An exhibit of virtual reality art was held at the Soho Guggenheim Museum in 1993 and artistic applications of VR are regularly shown at the Banff Center for the Arts in Canada (Stenger, 1991; Frankel, 1994; Laurel, 1994; Teixeira, 1994a; Teixeira, 1994b). This trend is expanding (Krueger, 1991; Treviranus, 1993; Brill, 1995; Cooper, 1995). Virtual reality has been applied to the theater, including a venerable puppet theater in France (Coats, 1994). And virtual reality has a role to play in filmmaking, including project planning and special effects (Smith, 1993). This has important implications for education, as demonstrated by Bricken and Byrne's (1993) research (described later in this chapter) as well as other projects.

One of VR's most powerful capabilities in relation to education is as a data gathering and feedback tool on human performance (Hamilton, 1992; Greenleaf, 1994; Lampton, Knerr, Goldberg, Bliss, Moshell, & Blau, 1994; McLellan, 1994b). Greenleaf Medical has developed a modified version of the VPL DataGlove™ that can be used for performance data gathering for sports, medicine and rehabilitation. For example, Greenleaf Medical developed an application for the Boston Red Sox that records, analyzes and visually models hand and arm movements when a fast ball is thrown by one of the team pitchers, such as Roger Clemens. Musician Yo Yo Ma uses a virtual reality application called a "hyperinstrument," developed by MIT Media Lab researcher Tod Machover, that records the movement of his bow and bow hand (Markoff, 1991). In addition to listening to the audio recordings, Yo Yo Ma can examine data concerning differences in his bowing during several performances of the same piece of music to determine what works best and thus how to improve his performance. NEC has created a prototype of a virtual

reality ski training system that monitors and responds to the stress/relaxation rate indicated by the skier's blood flow to adjust the difficulty of the virtual terrain within the training system (Lerman, 1993; VR Monitor, 1993). Flight simulators can "replay" a flight or battletank wargame so that there can be no disagreement about what actually happened during a simulation exercise.

In considering the educational potentials of virtual reality, it is interesting to note that the legendary virtual reality pioneer, Jaron Lanier, one of the developers of the DataGlove™, originally set out to explore educational applications of virtual reality. Unfortunately this initiative was ahead of its time; it could not be developed into a cost-effective and commercially viable product. Lanier explains;

I had in mind an ambitious scheme to make a really low-cost system for schools, immediately. We tried to put together something that might be described as a Commodore 64 with a cheap glove on it and a sort of cylindrical software environment (quoted in Ditlea, 1993, p. 10)

What is Virtual Reality?

- Simply put, VR is a computerized simulation of natural or imaginary reality. Often the user of VR is fully or partially immersed in the environment. Full immersion refers to someone using a machine to shield herself from the real world. Partial immersion happens when a person can manipulate a VR environment but isn't tucked or locked away in a machine. However, virtual reality doesn't necessarily have to be "full immersion" to be considered a true VR simulation. Games like Second Life on the PC and control devices like the Nintendo Wii remote are VR-based products. These items let users interact with a VR environment that is a computer simulation. These VR environments can be anything from a typical game, such as Super Mario Brothers, to a fully detailed city reconstitution or a fictional fantasy land. The only limit to a VR environment is the imagination and the resources that the creator has available.

Virtual Reality History

The concept of virtual reality has been around for decades, even though the public really only became aware of it in the early 1990s. In the mid 1950s, a cinematographer named Morton Heilig envisioned a theatre experience that would stimulate all his audiences' senses, drawing them in to the stories more effectively. He built a single user console in 1960 called the **Sensorama** that included a stereoscopic display, fans, odor emitters, stereo speakers and a moving chair. He also invented a head mounted television display designed to let a user watch television in 3-D. Users were passive audiences for the films, but many of Heilig's concepts would find their way into the VR field.

Philco Corporation engineers developed the first HMD in 1961, called the **Headsight**. The helmet included a video screen and tracking system, which the engineers linked to a closed circuit camera system. They intended the HMD for use in dangerous situations -- a user could observe a real environment remotely, adjusting the camera angle by turning his head. Bell Laboratories used a similar HMD for helicopter pilots. They linked HMDs to infrared cameras attached to the bottom of helicopters, which allowed pilots to have a clear field of view while flying in the dark.

Types of Virtual Reality

There are many types of Virtual Reality, including the following:

- Enhanced Reality
- Desktop Virtual Reality
- Telepresence
- Immersive Virtual Reality
- QTVR

Virtual reality applications can be divided into:

1. The simulation of real environments such as the interior of a building or a spaceship often with the purpose of training or education
2. The development of an imagined environment, typically for a game or educational adventure

Areas in which Virtual Reality applications are commonly used are:

- Design Evaluation (Virtual Prototyping)
- Architectural Walk-through
- Planning and Maintenance
- Concept and Data Visualisation
- Operations in hazardous or remote environments
- Training and simulation
- Sales and Marketing
- Entertainment and Leisure
- Enhanced Realities

There are a number of popular products available for creating virtual reality effects on personal computers. QuickTime Virtual Reality (QTVR) allows the creation of applications without coding. It is a photography-based VR, an "immersive" technology with easy to use software.

Some Applications of Virtual Reality

Imagine the following academic fiction:

Eighteen professors from five departments decide to work together and submit a request for a virtual reality system. Suppose further that the administration actually believes that this is a wonderful idea and approves the proposal, provided that the virtual reality system is put to use in the classroom. The faculty eagerly agree to this condition, and to their amazement they acquire the funds to purchase an SGI Onyx 2 Reality Engine and 10 SGI Indigos.

The above scenario is not some introduction to a John Grisham suspense novel, but a real story at Clemson University. Recently Steve (D.E.) Stevenson from the Department of Computer Science at Clemson University came to the Geometry Center and talked about applications of Geometry with computers. Steve mentioned briefly how various departments had been using the virtual reality system they acquired, and showed specific examples of what they had done with them.

The departments using the system range from those which traditionally might use virtual reality, such as the Computer Science department, the Mechanical Engineering department and the Architecture department, to fields not generally associated with the technology such as the Biomedical Engineering department and the Performing Arts department. All these disciplines' projects use the technology in ways that create images and objects that otherwise would take a long time to construct, or not be feasible to construct at all.

In particular, software is currently under development for Mechanical Engineering students that extends CAD/CAE software to virtual reality. Instead of clicking keystrokes to try to alter perspective views, a user is able to wear a helmet and by moving their head around are able to view an object as if it were before them. Moreover one is able to look through different layers of an object to view how the device is operating internally. Although these are all things that CAD/CAE software allows, the virtual reality system gives a user a more natural way to view an object, which accordingly allows one to easier ask the question, "what if?"

Some of the other projects involving engineering are simulation-based design, multipurpose design optimization and visualization in High Performance Computing-Computer Formulated Design structures. Lastly one professor dreams of creating a simulation of the famous Tacoma Narrows bridge collapsing so that Civil and Mechanical Engineers can fully appreciate the consequences of their errors.

In the Biomedical Engineering department some of the projects mentioned are use of virtual reality for viewing of X-RAY's and MRI's, using stereolithography to make prototypes of joints, and even having students perform test surgery.

In the Computer Science department some of the projects range from creating a toolkit for non-computer science designers, rendering and 3-D lighting, viewing non-euclidean geometries, and modeling for resource management.

Advantages

- Although the disadvantages of VR are numerous, so are the advantages. Many different fields can use VR as a way to train students without actually putting anyone in harm's way. This includes the fields of medicine, law enforcement, architecture and aviation. VR also helps those that can't get out of the house experience a much fuller life. These patients can explore the world through virtual environments like Second Life, a VR community on the Internet, exploring virtual cities as well as more fanciful environments like J.R.R. Tolkien's Middle Earth. VR also helps patients recover from stroke and other injuries. Doctors are using VR to help reteach muscle movement such as walking and grabbing as well as smaller physical movements such as pointing. The doctors use the malleable computerized environments to increase or decrease the motion needed to grab or move an object. This also helps record exactly how quickly a patient is learning and recovering.

Disadvantages

- The disadvantages of VR are numerous. The hardware needed to create a fully immersed VR experience is still cost prohibitive. The total cost of the machinery to create a VR system is still the same price as a new car, around $20,000. The technology for such an experience is still new and experimental. VR is becoming much more commonplace but programmers are still grappling with how to interact with virtual environments. The idea of escapism is common place among those that use VR environments and people often live in the virtual world instead of dealing with the real one. This happens even in the low quality and fairly hard to use VR environments that are online right now. One worry is that as VR environments become much higher quality and immersive, they will become attractive to those wishing to escape real life. Another concern is VR training. Training with a VR environment does not have the same consequences as training and working in the real world. This means that even if someone does well with simulated tasks in a VR environment, that person might not do well in the real world.

Principle

The Virtual Reality System works on the following principle - It tracks the physical movements in the real world, then a rendering computer redraws the virtual world to reflects those movements. The updated virtual world is sent to the output (to the user in the real world).

In this case, the output is sent back to a head mounted display. Hence, The user feels "immersed" in the virtual world - as if she was in the virtual world itself as all she can see is her rendered movements in the virtual world.

However, to really be able to relate to the concept, we need to look for something from our real lives that works on this concept. In 2010, Microsoft introduced Kinect for Xbox 360. This is essentially a virtual reality system which does not need any equipment on the user - no head mounted display, no equipment on hands or body to track movements. Everything is done by a camera & a microphone on the device itself.

If you're not familiar with Kinect, please watch the following video before you continue to read:

This should definitely remind of the film Ra One where Ra One was meant to be a Virtual Reality System (as a game) but it eventually gets integrated into the real world using holography. So, they've basically tried to combine VR & Holography.. But failed to impress.

Conclusion

In conclusion this project was a big success to us. When we started in April, we didn't even know what existed on the market.

Much literary research and questionnaire of pupils and teachers was done that led to the concept we have just implemented.

This would not have been possible without the constructive supervision by Prof.Dr. Bernd Fröhlich and Dr. Anke Huckauf.

We also got great support from graphic tablet companies: Aiptek International GmbH Europe tried to help us with a prototype and Wacom Europe supplied us with the tablet used in the current version.

We would also like to thank the schools, in person Uwe Köhler, principal of the ILMASI-Schule Garbsen and Gerd Bohl, principal of the Wilhelm-Schade Schule, Hanover, who supported our ideas and helped us with education science questions. Last but not least, all those funny and cheerful kids, who tested and played with the system were so great and just lovely to watch.

References

Roof calculator-software,calculates & tracks materials, estimates
Put a roofing estimate together in under 2 minutes and get a complete roof material list !

3d Animation UK Studios creating Virtual Reality Pictures
UK 3D Animation company has a Computer Graphics portfolio that includes UK Architectural Rendering, UK Product Visualisation, 3D Virtual Tours.

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