TERM PAPER ON

APPLICATION OF VIRTUAL REALITY TO THE CURRENT WORLD

BY

GROUP 6

COMPUTER GRAPHICS AND VISUALIZATION

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DEPARTMENT OF MATHEMATICS

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Abstract

Virtual reality (VR) is considered as an important technology, giving scope for a great leap for adverse fields. Virtual reality is sometimes referred to as immersive multimedia, is a computer-simulated environment that can simulate physical presence in places in the real world or imagined worlds. This paper brushes the importance of this stimulated reality stating how VR has gone through advancements giving us a cutting edge technology. It correlates a brief history of VR and elaborates the current stand of this technology in the society. It illustrates the technology misconceptions with its aspects of being fully developed and how we can overcome it. People rivet on VR mainly for entertainment but their real impacts are in arts, business, communication, design, education, engineering, medicine and many other fields.

1. Introduction

Virtual Reality refers to a high-end user interface that involves real-time simulation and interactions through multiple sensorial channels. VR is able to immerse you in a computer-generated world of your own making: a room, a city, the interior of human body etc. With VR, you can explore any uncharted territory of the human imagination.

Brief history of virtual reality, In 1950s, flight simulators were built by US Air Force to train student pilots, in 1965, a research program for computer graphics called “The Ultimate Display” was laid out, in 1988, commercial development of VR began and in 1991, first commercial entertainment VR system "Virtuality" was released.

The rest of the paper is organized as follows; section 2.1 types of virtual reality system, 3.1 technologies of virtual reality, 4.1 architecture of virtual reality, 5.1 application of virtual reality, 6.1 advantages of virtual reality, 7.1 future work, 8.1 concludes the paper.

2.1 Types of Virtual Reality System

Windows on World (Wow)

Also called Desktop VR, uses a conventional computer monitor to display the 3D virtual world.

Immersive VR

Completely immerse the user's personal viewpoint inside the virtual 3D world. The user has no visual contact with the physical world. Often equipped with a Head Mounted Display (HMD).

Telepresence

A variation of visualizing complete computer generated worlds. Links remote sensors in the real world with the senses of a human operator. The remote sensors might be located on a robot. Useful for performing operations in dangerous environments.

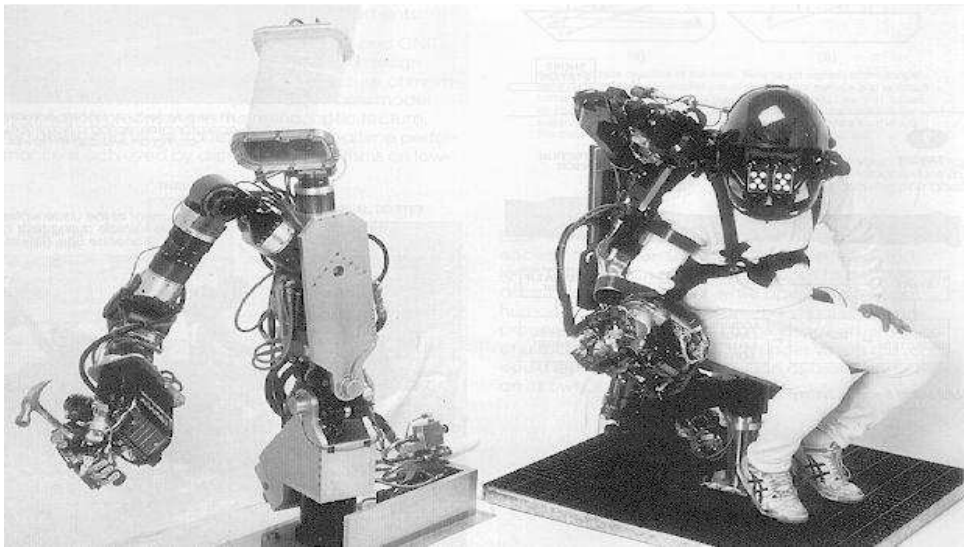

Figure 1: Telepresence

Mixed Reality(Augmented Reality)

The seamless merging of real space and virtual space. Integrate the computer-generated virtual objects into the physical world which become in a sense an equal part of our natural environment.

Figure 2: Augmented Reality

Distributed VR

A simulated world runs on several computers which are connected over network and the people are able to interact in real time, sharing the same virtual world.

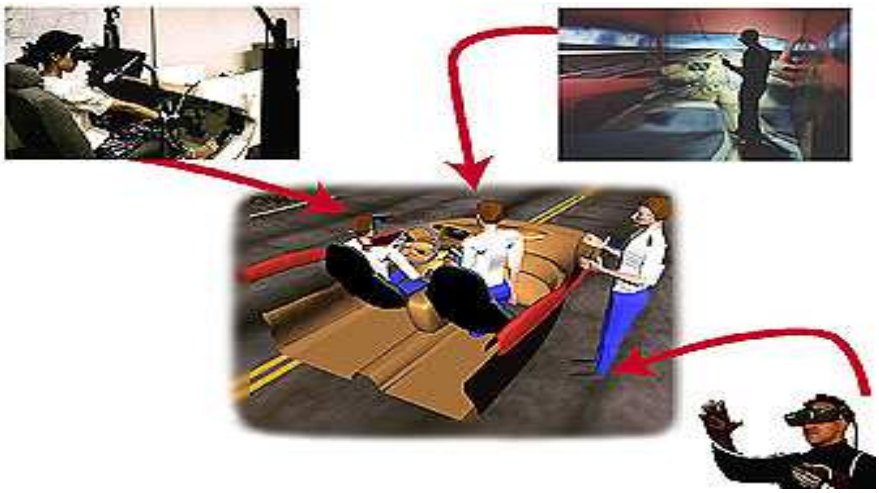

Figure 3: Distributed VR

3.1 Technologies of Virtual Reality

Hardware Technologies

Head-Mounted Display (HMD)

A Helmet or a face mask providing the visual and auditory displays, use LCD or CRT to display stereo images and may include built-in head-tracker and stereo headphones

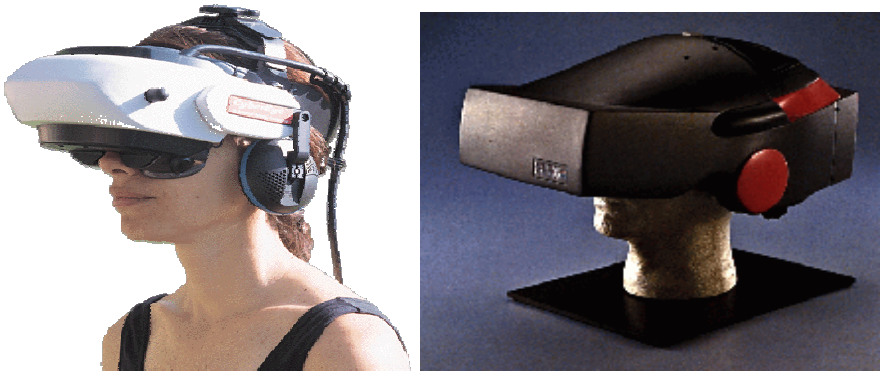

Figure 4: Head Mounted Display (HMD)

Binocular Omni-Orientation Monitor (BOOM)

Head-coupled stereoscopic display device, uses CRT to provide high-resolution display, it is convenient to use with fast and accurate built-in tracking.

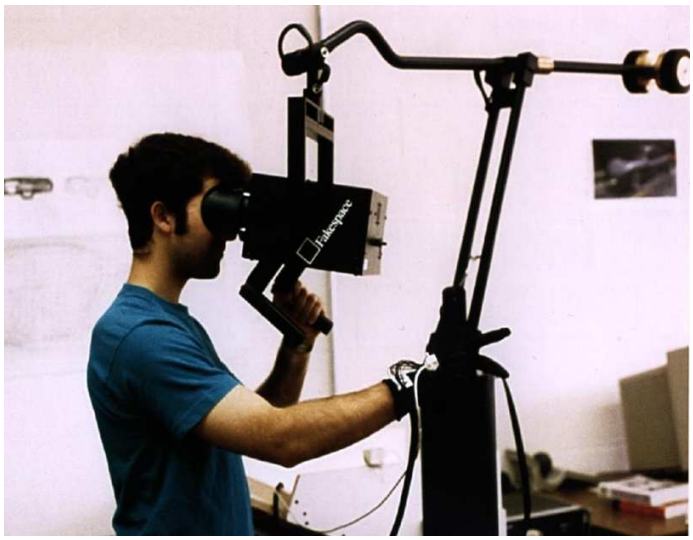

Figure 5: Binocular Omni-Orientation Monitor (BOOM)

Cave Automatic Virtual Environment (CAVE)

Provides the illusion of immersion by projecting stereo images on the walls and floor of a room-sized cube. A head tracking system continuously adjust the stereo projection to the current position of the leading viewer.

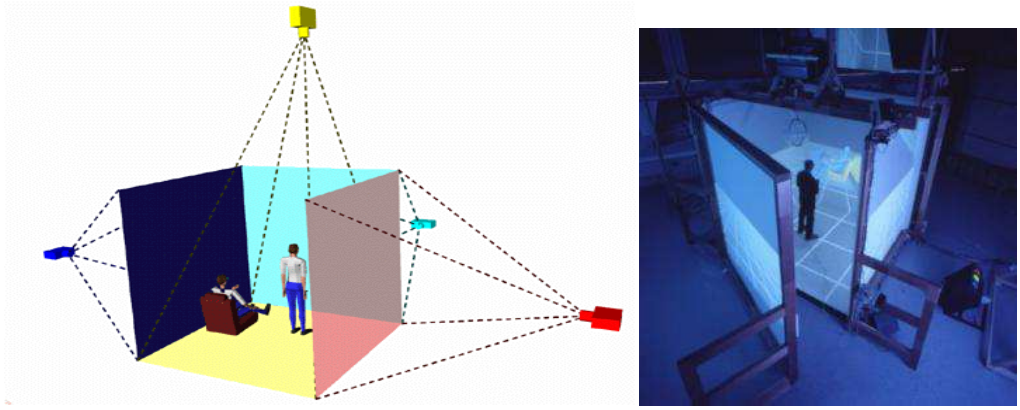

Figure 6: Cave Automatic Virtual Environment (CAVE)

Data Glove

Outfitted with sensors on the fingers as well as an overall position/orientation tracking equipment. Enables natural interaction with virtual objects by hand gesture recognition.

Figure 7: Data Glove

Control Devices

Control virtual objects in 3 dimensions.

Figure 8: Control Device

Software Technologies

Toolkits

- Programming libraries.
- Provide function libraries (C & C++).

Authoring systems

Complete programs with graphical interfaces for creating worlds without resorting to detailed programming.

Software packages available in market

- Multiverse (Freeware)
- Virtual Reality Studio ($100)
- Sense8 World Tool Kit (WTK) (over $1000)
- Autodesk Cyberspace Development kit (over $1000)

VRML (Virtual Reality Modeling Language)

Standard language for interactive simulation within the World Wide Web, allows to create "virtual worlds" networked via the Internet and hyperlinked with the World Wide Web. Aspects of virtual world display, interaction and internetworking can be specified using VRML without being dependent on special gear like HMD.

VR models can be viewed by Netscape or IE with a browser plug-in.

4.1 Architecture of Virtual Reality System

Input Processor, Simulation Processor, Rendering Processor and World Database.

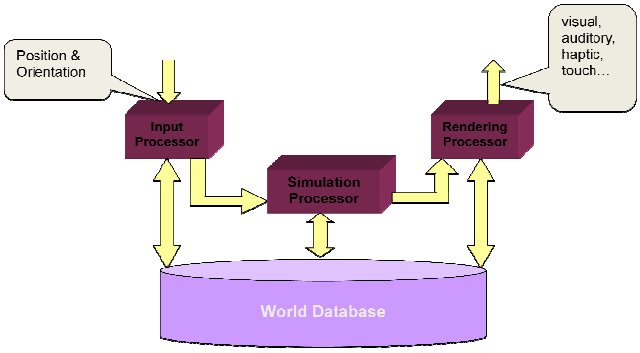

Figure 9: Architecture of VR System

4.2 Components of VR system

Input Processor

Control the devices used to input information to the computer. The object is to get the coordinate data to the rest of the system with minimal lag time. E.g. keyboard, mouse, 3D position trackers, a voice recognition system, etc.

Simulation Processor

Core of a VR system, takes the user inputs along with any tasks programmed into the world and determine the actions that will take place in the virtual world.

Rendering Processor

Create the sensations that are output to the user, separate rendering processes are used for visual, auditory, haptic and other sensory systems. Each renderer takes a description of the world, start from the simulation process or derives it directly from the World Database for each time step.

World Database (World Description Files)

Store the objects that inhabit the world, scripts that describe actions of those objects.

5.1 Application of virtual reality

Healthcare

Healthcare is one of the biggest adopters of virtual reality which encompasses surgery simulation, phobia treatment, robotic surgery and skills training. One of the advantages of this technology is that it allows healthcare professionals to learn new skills as well as refreshing existing ones in a safe environment. Plus it allows this without causing any danger to the patients.

Education & Training

Education is another area which has adopted virtual reality for teaching and learning situations. The advantage of this is that it enables large groups of students to interact with each other as well as within a three dimensional environment. It is able to present complex data in an accessible way to students which is both fun and easy to learn. Plus these students can interact with the objects in that environment in order to discover more about them.

- Driving simulators.
- Flight simulators.
- Ship simulators.
- Tank simulators

Entertainment

The entertainment industry is one of the most enthusiastic advocates of virtual reality, most noticeably in games and virtual worlds. But other equally popular areas include:

- Virtual Museums, e.g. interactive exhibitions
- Galleries
- Theatre, e.g. interactive performances
- Virtual theme parks
- Discovery centres

Military

Virtual reality has been adopted by the military – this includes all three services (army, navy and air force), where it is used for training purposes. This is particularly useful for training soldiers for combat situations or other dangerous settings where they have to learn how to react in an appropriate manner. A virtual reality simulation enables them to do so but without the risk of death or a serious injury. They can re-enact a particular scenario, for example engagement with an enemy in an environment in which they experience this but without the real world risks. This has proven to be safer and less costly than traditional training methods.

Film

Virtual reality is a very common theme in science fiction movies, where it is often used a way to turn the fantastical into something that seems totally real.

TRON, for instance, was one of the first movies to use virtual reality as a plot element. The main characters were taken from reality and transported into a virtual world inside a computer. This is not 100% like the virtual reality we know today but the concept of another reality inside of a computer reminds the same.

Some of the most popular movies of our time use concepts of virtual reality. Some of these movies, which you've probably heard of, include:

- TRON & TRON Legacy
- The Matrix series
- Vanilla Sky

The list continues indefinitely. We can certainly expect such a list to continue growing in the future as the ideas behind virtual reality are fully explored in film.

6.1 Advantages of Virtual Reality

Advanced training: Realistic environment is induced by VR to provide training for the service members. VR takes into consideration of tasks at the beginner level progressively moves up to professional level. It contributes toward helping leaders when they must make a quick decision and can provide appropriate responses based upon good and bad decision making.

Better operational awareness: Commanders make use of virtual workbenches which coordinates the system to allow the army on the area to indicate their precise location onto a map back at headquarters where the commander can make decision which is based upon accurate real time information from the battlefield.

Cost savings: VR is tedious to implement and manage with the current scenarios but the advances in processing capabilities and graphics display will continue to drive down the cost of these.

Safety: The main benefits of VR in military field are to save lives. Many injuries are induces while training before soldiers in the training environment. VR can stimulate scenarios like parachuting, shooting and urban combat can greatly reduce the risks to soldiers.

7.1 Future Work

- High-fidelity system
- Cost-saving
- Collaborative
- High-level contact between participants in distributed VR

8.1 Conclusion

Visualization of complicated, large data is helpful for understanding and analysis. VR offers us a new way to interact with computer, enables us to experience the virtual world that is impossible in real world and is changing our life, eventually VR will increasingly become a part of our life.

References

http://vr.isdale.com/WhatIsVR/frames/WhatIsVR4.1.html.

http://www.vrs.org.uk/virtual-reality

Augumented and Mixed Reality, http://www.mic.atr.co.jp/~poup/research/ar/.

http://vresources.jumpgate.com/applications/applications.shtml.

K.-P. Beier. Virtual Reality: A short Introduction. http://www-vrl.umich.edu/intro/

Franchi,J. Vertual Reality: An Overview. ERIC Digest, June 1995