

Virtual Reality

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Contents

1	Introduction	2
1.1	Definitions	2
1.1.1	Virtual Reality	2
1.1.2	Immersion	2
1.1.3	Telepresence	3
2	Related Work	4
2.1	Head-Mounted Displays	4
2.2	Software	4
2.3	Input Devices	5
3	Discussion	6
4	notes	8

Chapter 1

Introduction

Virtual Reality is the attempt to use technology, such as head mounted display devices, and computer generated graphics, to allow the user to experience a sense of presence in a virtual environment. This is used in a wide variety of cases, including but not limited to, entertainment, education, medical therapy, research, and visualization. Virtual Reality, or VR for short, has the potential to fundamentally change the way we experience, and interact with, data and software.

1.1 Definitions

1.1.1 Virtual Reality

Virtual Reality, or VR for short, is the field of computing that aims to create a virtual world, allowing the user to enter, experience and interact with it, via using specific devices to simulate the virtual environment and the feedback it would provide in order to make the experience as real as possible. [1]

1.1.2 Immersion

Immersion can be differentiated into three different forms. *Engagement*, which has to come from the subject, not the medium. *Engrossment*, which depends on how the software is designed, and is important to affect a subjects emotions, if that should be the intended goal. And lastly *total immersion*, or the sense of presence. Total immersion can be understood as what happens when someone is fully engulfed by a book, movie, or computer game. [2] It can also, in the case of VR, be taken more literally as the “extent to which

a person's cognitive and perceptual systems are tricked into believing they are somewhere other than their physical location" [5]

1.1.3 Telepresence

To have the experience that one is present at another location than his or her physical one. This name has been coined by Marvin Minsky in the 1980s. [4] While Minsky had in mind that one's actions have consequences at another physical location somewhere, Virtual Reality follows the same concept.

Chapter 2

Related Work

2.1 Head-Mounted Displays

Today, the most common form of how Virtual Reality is realized is via head-mounted displays. Goggles with a high density display in it, the same as used in phones. Utilizing special lenses and stereoscopic vision to create a believable view into the virtual environment.

Examples for headsets like these would be the Oculus Rift by Oculus VR and one under the working title Project Morpheus by Sony. [3]



2.2 Software

Programming software for virtual reality does not differ much from regular computer graphics programming. Most commercial vendors offer their own API that helps translating a virtual camera to a two camera 3D setup. It was

found however, that how the camera is used is imperative to not give the user of the virtual reality headset motion sickness. For example, moving the camera without the user moving their head was resulted in severely negative feedback from the test subjects.

The Oculus Rift Best Practices Manual states that "Acceleration creates a mismatch among your visual, vestibular, and proprioceptive senses; minimize the duration and frequency of such conflicts. Make accelerations as short (preferably instantaneous) and infrequent as you can." [6]

2.3 Input Devices

With headmounted displays, vision, the groundwork for a feeling of presence in virtual reality, is laid out. Headsets or surround sound systems have been shown to suffice for the audio representation of the virtual environment. Moving around naturally has proven difficult, however. While video game demos often use a gamepad, it is less than ideal for upholding a sense of presence. Products, such as the XYZ try to enable free movement in virtual reality.

Chapter 3

Discussion

Bibliography

- [1] Yuri Antonio Gonçalves Vilas Boas. Overview of virtual reality technologies. In *Interactive Multimedia Conference 2013*.
- [2] Emily Brown and Paul Cairns. A grounded investigation of game immersion. In *CHI '04 Extended Abstracts on Human Factors in Computing Systems*, CHI EA '04, pages 1297–1300, New York, NY, USA, 2004. ACM.
- [3] Ishan Goradia, Jheel Doshi, and Lakshmi Kurup. A review paper on oculus rift & project morpheus. 2014.
- [4] Marvin Minsky. Telepresence. 1980.
- [5] Emilee Patrick, Dennis Cosgrove, Aleksandra Slavkovic, Jennifer A. Rode, Thom Verratti, and Greg Chiselko. Using a large projection screen as an alternative to head-mounted displays for virtual environments. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '00, pages 478–485, New York, NY, USA, 2000. ACM.
- [6] Richard Yao, Tom Heath, Aaron Davies, Tom Forsyth, Nate Mitchell, and Perry Hoberman. Oculus vr best practices guide. *Oculus VR*, 2014.

Chapter 4

notes

Overview of VR - Definition of Virtual Reality, Immersion, Perception and Telepresence. "Virtual Reality development were mainly found in the military and academic research until technologies became more cost-effective." Oh yeah, also input devices are a big factor, shit. Gloves, wands (like the Wii or PS Move) and computer vision. Also, military wants VR too, woops.

Best Practices - VR is hard and every single minor detail is super fucking important so listen to us, fuckers! "Acceleration creates a mismatch among your visual, vestibular, and proprioceptive senses; minimize the duration and frequency of such conflicts. Make accelerations as short (preferably instantaneous) and infrequent as you can."

arm therapy - Use VR to distract patient from pain while their burn wounds are treated. Seems to work!

unwanted sideeffects - cybersickness or simulator sickness

supply chain education - use a VR game to teach

serious games for ancient manuscripts - making vr games about really old books ? Allowing people to experience... reading a really old book.