

Motion Sickness in Virtual Reality

Michael Kreuzer, Peter Ziegler

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Overview

History of VR

Current Limitations

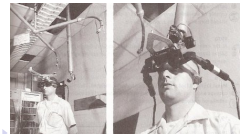
Motion Sickness

Possible Solutions

The Future

Very early Attempts

- ▶ First attempts on stereoscopic photos in the 19th century
- ▶ 1962 - Morton Heilig patents his "Sensorama"
- ▶ 1968 - Ivan Sutherland builds the first HMD named "The Sword of Damocles"



First VR Boom

- ▶ 1980s - Founding of the first VR focused companies
- ▶ 1987 - Appearance of the term "Virtual Reality"
- ▶ 1991 - Virtuality Group Arcade Machines
- ▶ 1995 Release of the Nintendo Virtual Boy
- ▶ Fast decline in interest as VR failed to meet expectations, mainly due to premature hardware

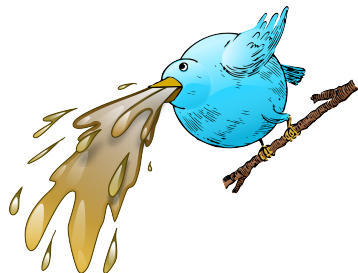


- ▶ Current Devices are still quite expensive
- ▶ Display resolution is still not good enough
- ▶ Some games still lack performance to reach at least 90fps
- ▶ Cables
- ▶ Limited space
- ▶ Usability and **Motion Sickness**



Motion Sickness in General

- ▶ Occurs due to disagreement between vision and balance
- ▶ Defense reaction against neurotoxins
- ▶ Different people have varying susceptibility
- ▶ Varies with daily mood and eating behaviour
- ▶ Brain can adapt to regular stimulation



Motion Sickness in VR

Causes

- ▶ Bad FPS, lags and latency
- ▶ Bad resolution
- ▶ **Artificial player movement and rotation**
- ▶ more immersive than non-VR games

Other Views

There is still uncertainty in research and other theories exist that focus on postural instability

Motion Sickness in VR

Countermeasures

- ▶ Get / Build better hardware and software
- ▶ Avoid moving the player
- ▶ Avoid acceleration
- ▶ Avoid rotating the player



Motion Sickness in VR

Consequences

- ▶ Give the user full camera control all time
- ▶ No cut scenes
- ▶ No fancy walking animations
- ▶ Space Limitation

Problem

What if we need artificial movement? (e.g. in Open World games)

Best Practices

- ▶ linear movement in view direction
- ▶ no strafing
- ▶ use stepped or very fast rotation
- ▶ provide a fixed reference
- ▶ dynamically reduce FOV

Teleportation

is the de facto standard in most VR demos, but is not suitable for every game.

Different Approaches

- ▶ Movement in zero gravity
- ▶ Treadmills
- ▶ Redirected walking



Demo

Where are we now?

- ▶ There are many short VR Experiences you can play
- ▶ Very few big titles for VR, often adaptations of non-VR games
- ▶ Tendency to provide different moving option in a game and let the user decide

What is next?

- ▶ Sykrim and Fallout VR Release announced for November / December
- ▶ Oculus Go
- ▶ All VR-Headsets are currently dropping in price
- ▶ First 8K HMDs from China
- ▶ TPCast Wireless Adapter for HTC Vive released

The End