Motion Sickness in Virtual Reality

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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
Today

- Massively improved hardware since the 1990s
- 2010 - Oculus shows its first prototype
- 2014 - Google releases Cardboard platform
- 2016 - Release of Oculus Rift, HTC Vive and Playstation VR
Current Limitations

- 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