Locomotion and Motion Sickness

Goals

1. Why motion sickness happens
2. Techniques to avoid it
3. Methods of locomotion

Definitions

VR Sickness: Physical discomfort that comes as a result of using virtual reality.

Locomotion: The act of movement.

Why does it matter?

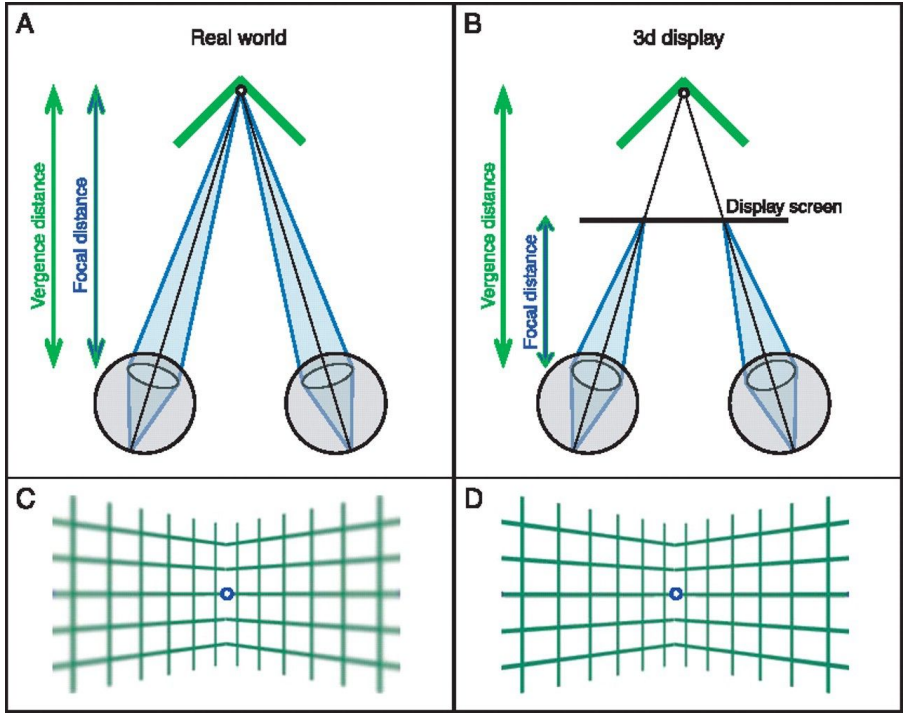
- Hurts the new user experience
- Makes sustained use difficult
- Gives VR a bad reputation

Causes of VR Sickness

Causes

- Eye strain
- Refresh rate lag
- Vergence-accommodation conflict
- Visual-vestibular mismatch

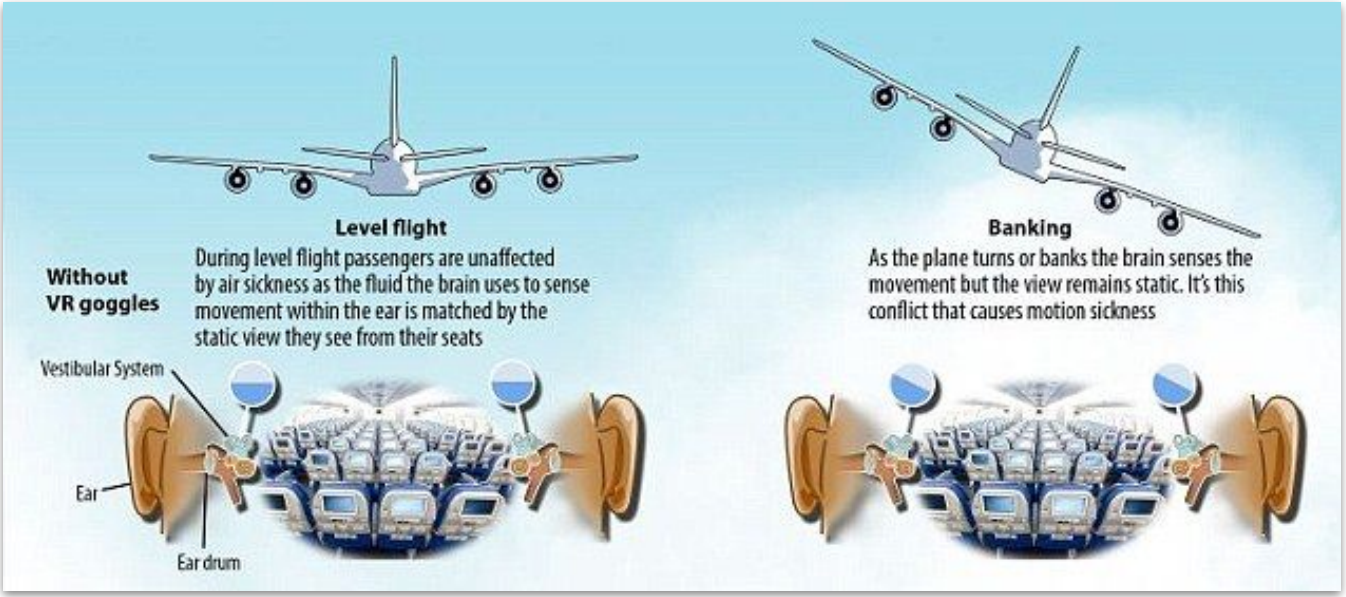
Vergence-accommodation conflict



Visual-vestibular mismatch

- Brain receives differing feedback from:
  - Eyes (visual)
  - Inner ear (vestibular)
- Happens in real life too!

Visual-vestibular mismatch



Potential Solutions

Causes

- Eye strain
- Refresh rate lag
- Vergence-accommodation
- Visual-vestibular mismatch

Solutions

Better displays

More powerful hardware

Multi-focal displays

???

How do we move the player without causing motion sickness?

Design Principles

Design principles

Get user consent

Avoid acceleration

Use vertical motion carefully

Restrict FOV during motion

Add static reference frames

Design principles

Get user consent

Avoid acceleration (positional)

Use vertical motion carefully

Restrict FOV during motion

Add static reference frames

Users feel changes in velocity, not velocity itself.

Design principles

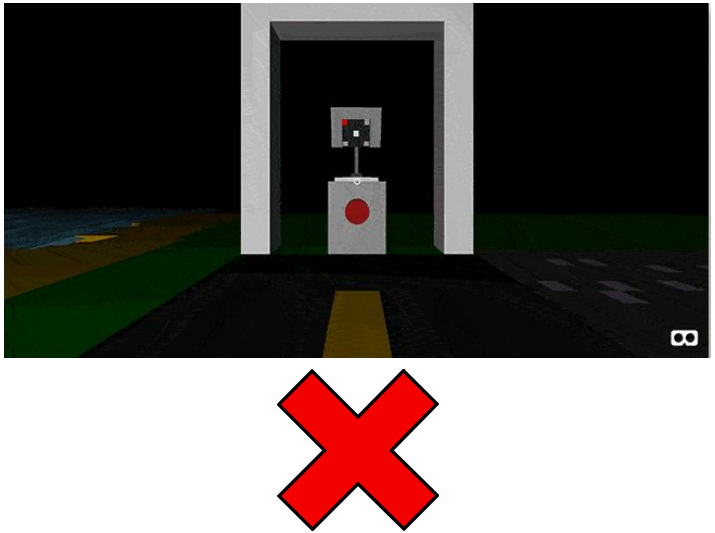
Get user consent

Avoid acceleration (angular)

Use vertical motion carefully

Restrict FOV during motion

Add static reference frames



Design principles

Get user consent

Avoid acceleration

Use vertical motion carefully

Restrict FOV during motion

Add static reference frames

Design principles

Get user consent

Avoid acceleration

Use vertical motion carefully

Restrict FOV during motion

Add static reference frames

Design principles

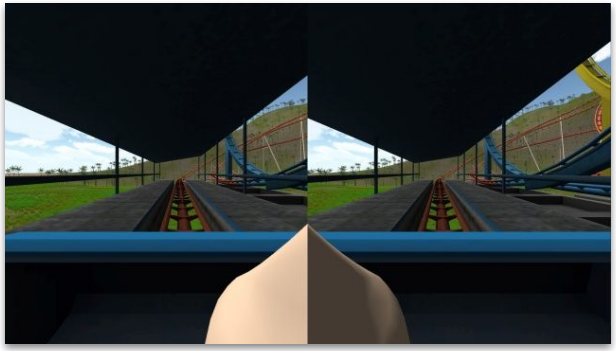
Get user consent

Avoid acceleration

Use vertical motion carefully

Restrict FOV during motion

Add static reference frames



Locomotion Schemes

Locomotion Schemes

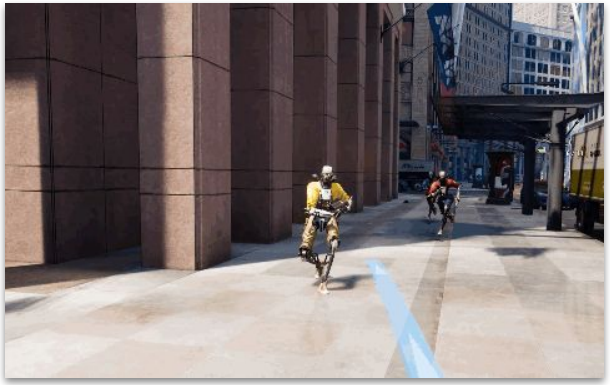
Teleportation

Joystick

Stationary / Room Scale

Gesture / Action Based

Specialized Hardware



Locomotion Schemes

Teleportation

Joystick

Stationary / Room Scale

Gesture / Action Based

Specialized Hardware

Locomotion Schemes

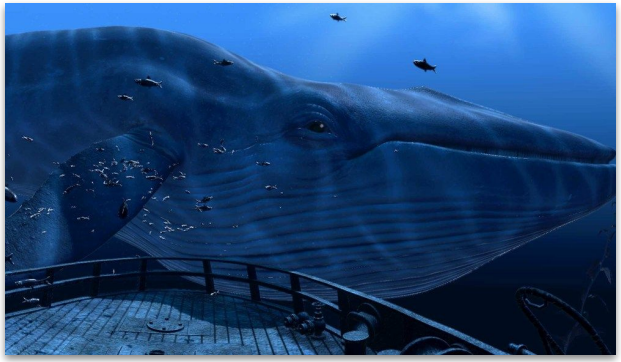
Teleportation

Joystick

Stationary / Room Scale

Gesture / Action Based

Specialized Hardware



Locomotion Schemes

Teleportation

Joystick

Stationary / Room Scale

Gesture / Action Based

Specialized Hardware

Locomotion Schemes

Teleportation

Joystick

Stationary / Room Scale

Gesture / Action Based

Specialized Hardware

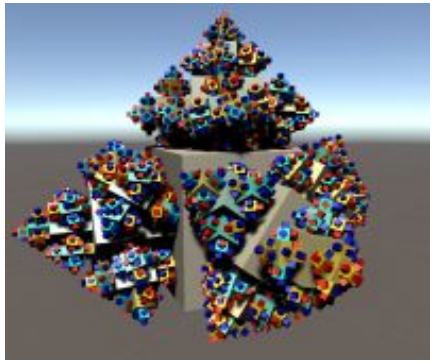
Closing Thoughts

Closing Thoughts

1. No rule is absolute
2. No single solution works for everyone
3. Be creative

Homework and Lab

- **HW3** has been officially assigned, due **the night of your next class.**
  - Build a visually appealing fractal generator!



- Find lab 2 at **xr.berkeley.edu/decal**
  - As usual, lab checkoff = attendance
  - If you don't finish lab, we'll check you off if effort was made
- **OFFICE HOURS:** Monday, Thursday 7-8pm.