Spring 2021

CSE 190

VR Technologies

Discussion 3

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UCSDCSE

ANNOUNCEMENTS

- Congrats on Finishing Homework 1
- Homework 2 Beta Release
  - Tentatively Due **Sunday (5/2)**
  - VR Headset Required
  - Extra Credit TBD
- VR Headset to be distributed this week
  - Pick up tomorrow on campus
  - Shipped to your doorstep
  - Contact us ASAP if you have not received any email

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AGENDA

Homework 2 Getting Started

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OBJECTIVE

Objectives

- Measurement Project
- Getting familiar with VR headset
- Measure and understand visual display characteristics
- Plan ahead and conduct planned experiments
- Get deeper understanding about stereo vision

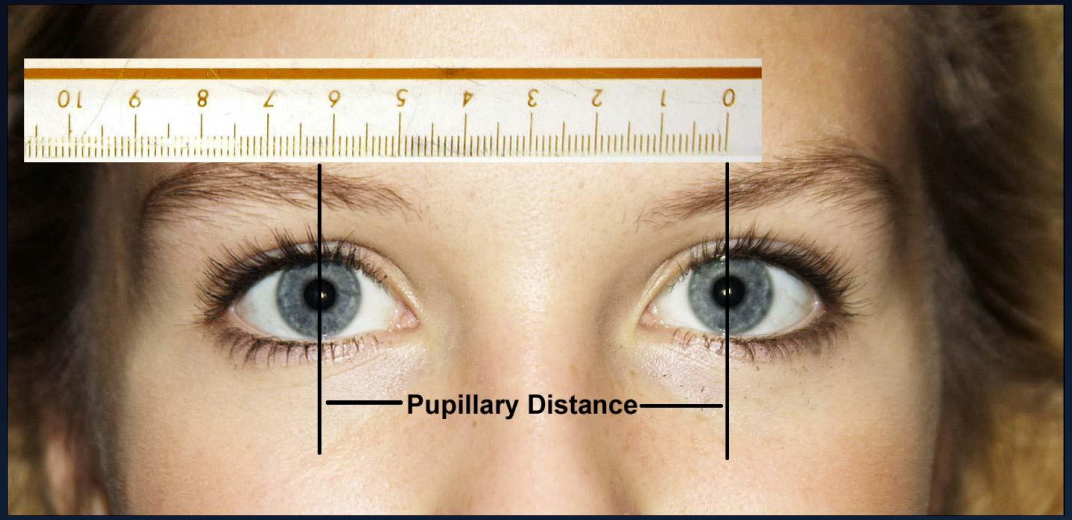
COMPONENTS

Components

- Eye Distance
- Field of View
- Spatial Resolution
- Controller Tracking & Pointing Precision
- Eye Convergence Closest Distance
    - Special Accommodation if you have difficulties seeing stereo image

EYE DISTANCE

Eye Distance (Inter-Pupillary Distance)



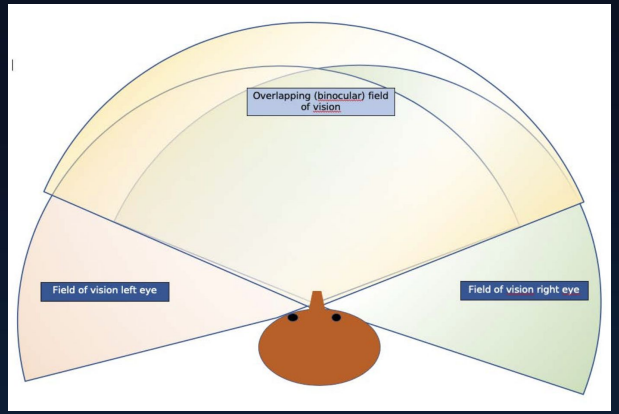
Eye Distance (Inter-Pupillary Distance)

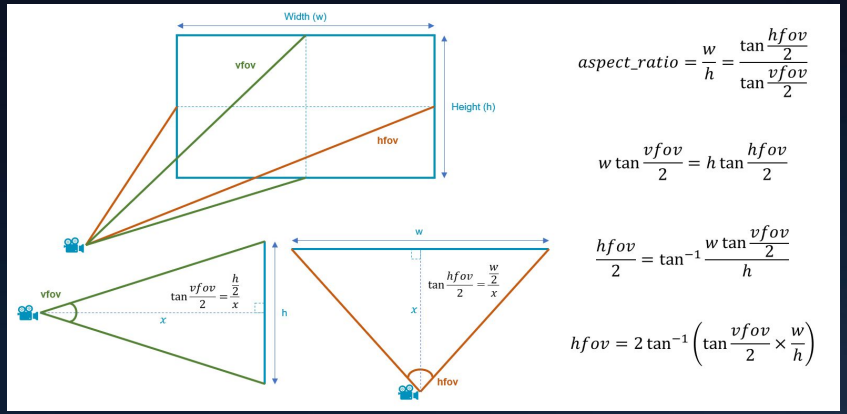
- The optical center of the lenses must be positioned corr
  in relation to the center of your pupils or undesired resu
  can ensue
  - eye fatigue
  - Headaches
  - Dizziness
- Correct IPD setting on VR headset provides maximum clarity and field of view
- IPD Can be changed on Oculus Quest 2 Headset

FIELD OF VIEW

Field of View

The total area in which VR images can be seen by a viewer at a particular time instant





$$aspect\_ratio = \frac{w}{h} = \frac{\tan\frac{hfov}{2}}{\tan\frac{vfov}{2}}$$

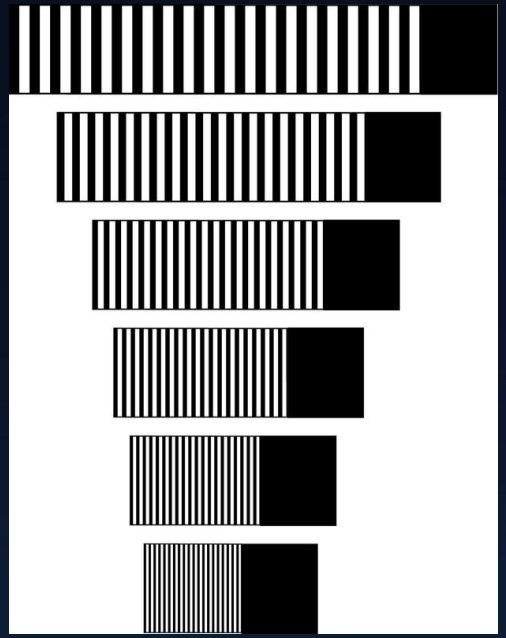
$$w\tan\frac{vfov}{2} = h\tan\frac{hfov}{2}$$

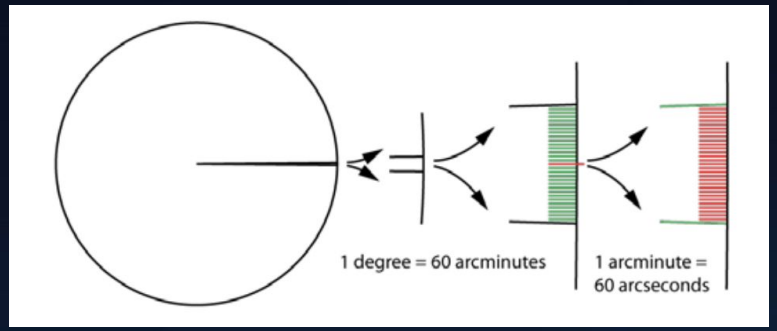
$$\frac{hfov}{2} = \tan^{-1}\frac{w\tan\frac{vfov}{2}}{h}$$

$$hfov = 2\tan^{-1}\left(\tan\frac{vfov}{2}\times\frac{w}{h}\right)$$

SPATIAL RESOLUTION

Spatial Resolution

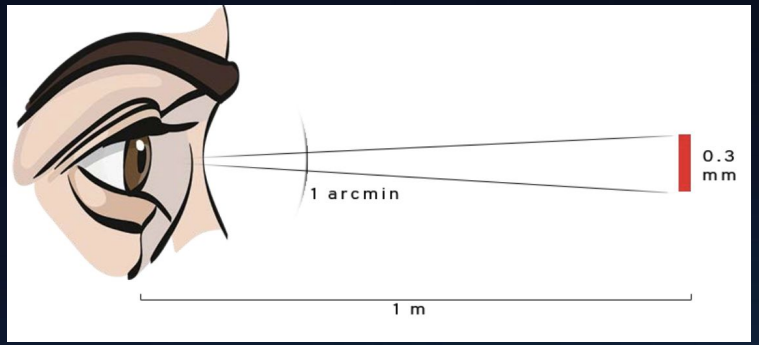




Spatial Resolution

y = r*tan(pi/180)/x

r: distance from eye to the line pair
x: spacing between line pairs



CONTROLLER PRECISION

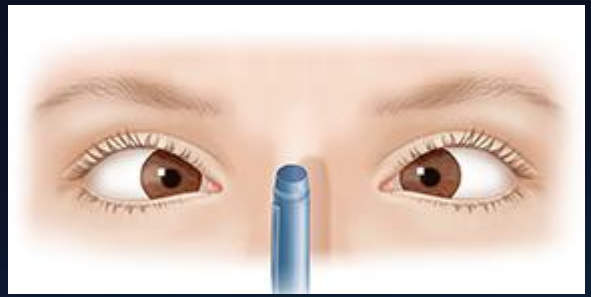
Controller Precision

- Controller Tracking Precision
  - Controller Stationary
  - Obtain Location/Orientation Data
- Pointing Precision
  - “Whack-a-mole” style measurement
  - Create a ~10cm sphere in the scene
  - 20 sec timer
  - Use laser pointer and hit the sphere 20 times
  - Count number of hits and calculate hit percentage
  - Move further away from the sphere, repeat until <50% hit rate

CLOSEST EYE CONVERGENCE DISTANCE

Closest Eye Convergence Distance

- Create an object that can be moved along the Z axis.
- Place the object 3 feet from eye.
- Move object closer with controller buttons or joystick until eyes can no longer focus on it.
- **Special Accommodation**: If you can't see stereoscopic 3D, you can recruit a friend or family member to do the test.



QUESTIONS?