CS 498 VR

Lecture 15 - 3/14/18

go.illinois.edu/VRlect15

Review

- What are the six kinds of eye movements?
- What are the two types of ganglion cells?
- Are Saccades voluntary or involuntary? What about Smooth Pursuit?

Depth Perception

Studying **perception** is studying how the brain makes conclusions about visual information.

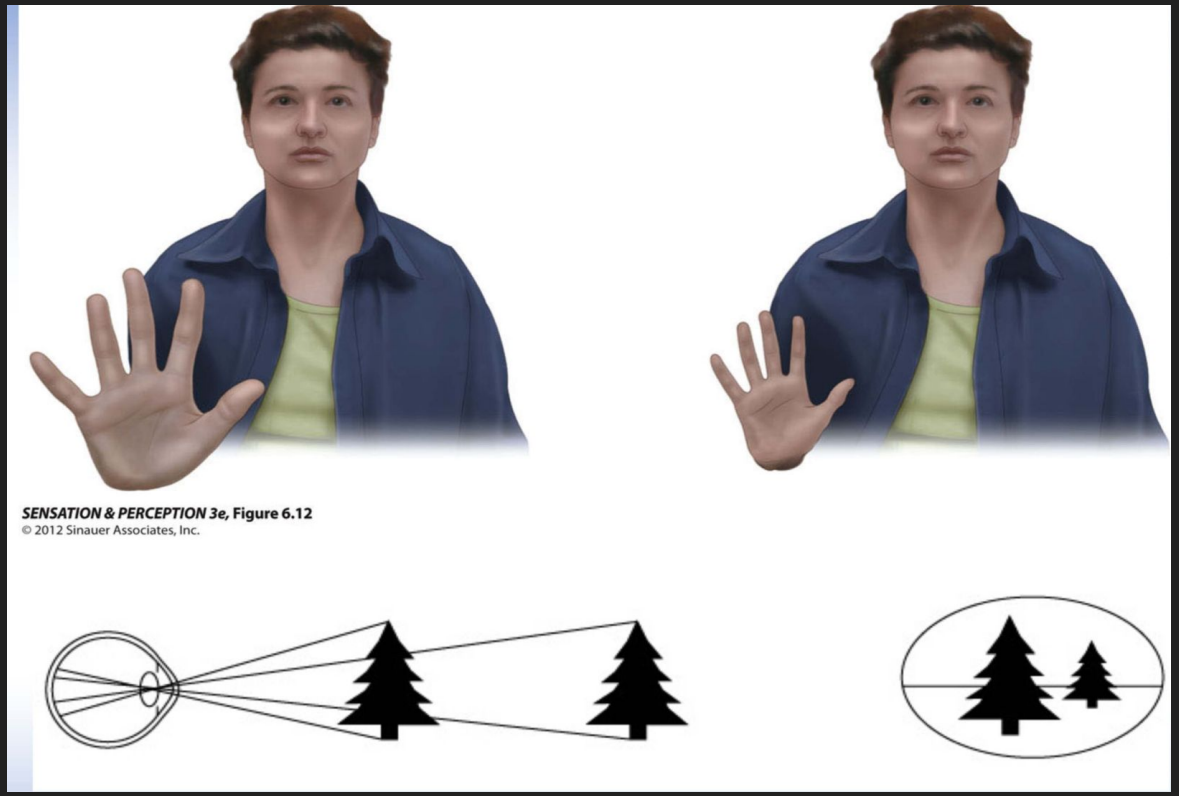
Cues are visual features that trigger the brain to make conclusion about visual concepts.

Two kinds of depth cues:

- Metric(Continues)
- Ordinal(Combinatorial)

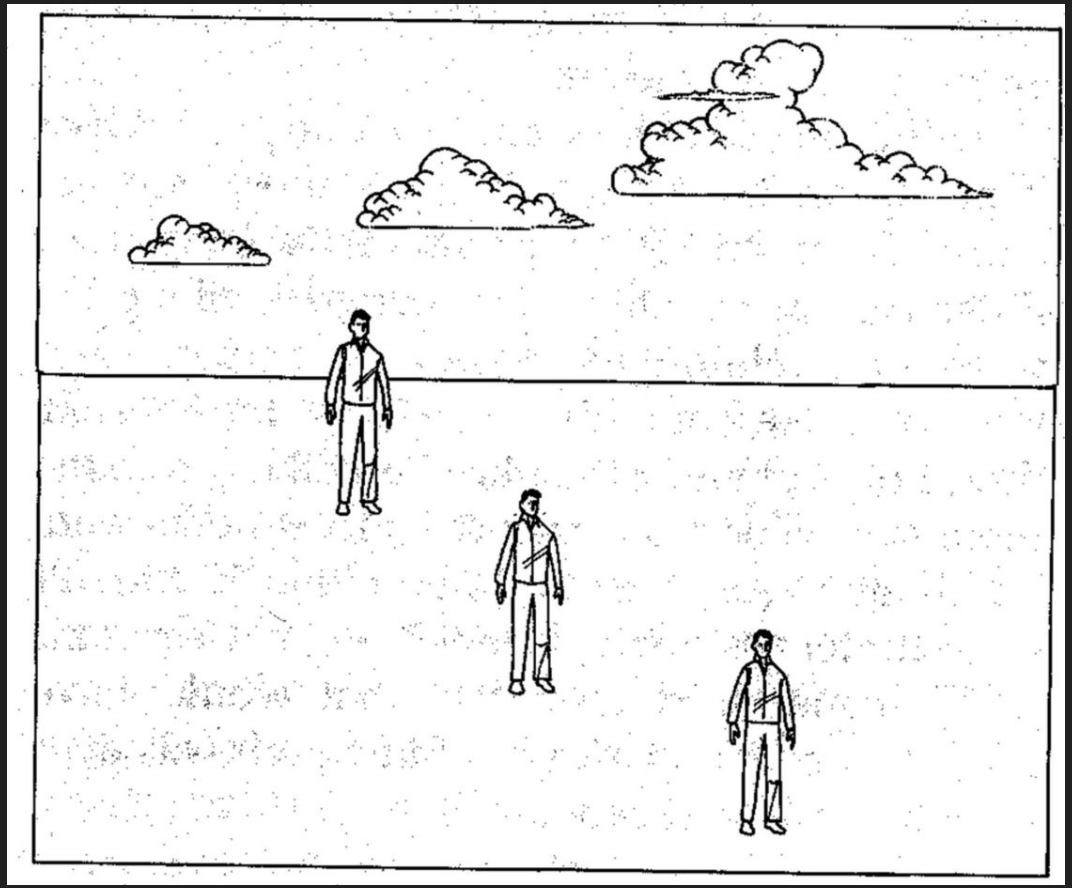
Importance to VR: If we present enough of depth cues to the brain, the computation can be done in the brain instead of expensive CPUs and GPUs.

Monocular Cues for Depth Perception

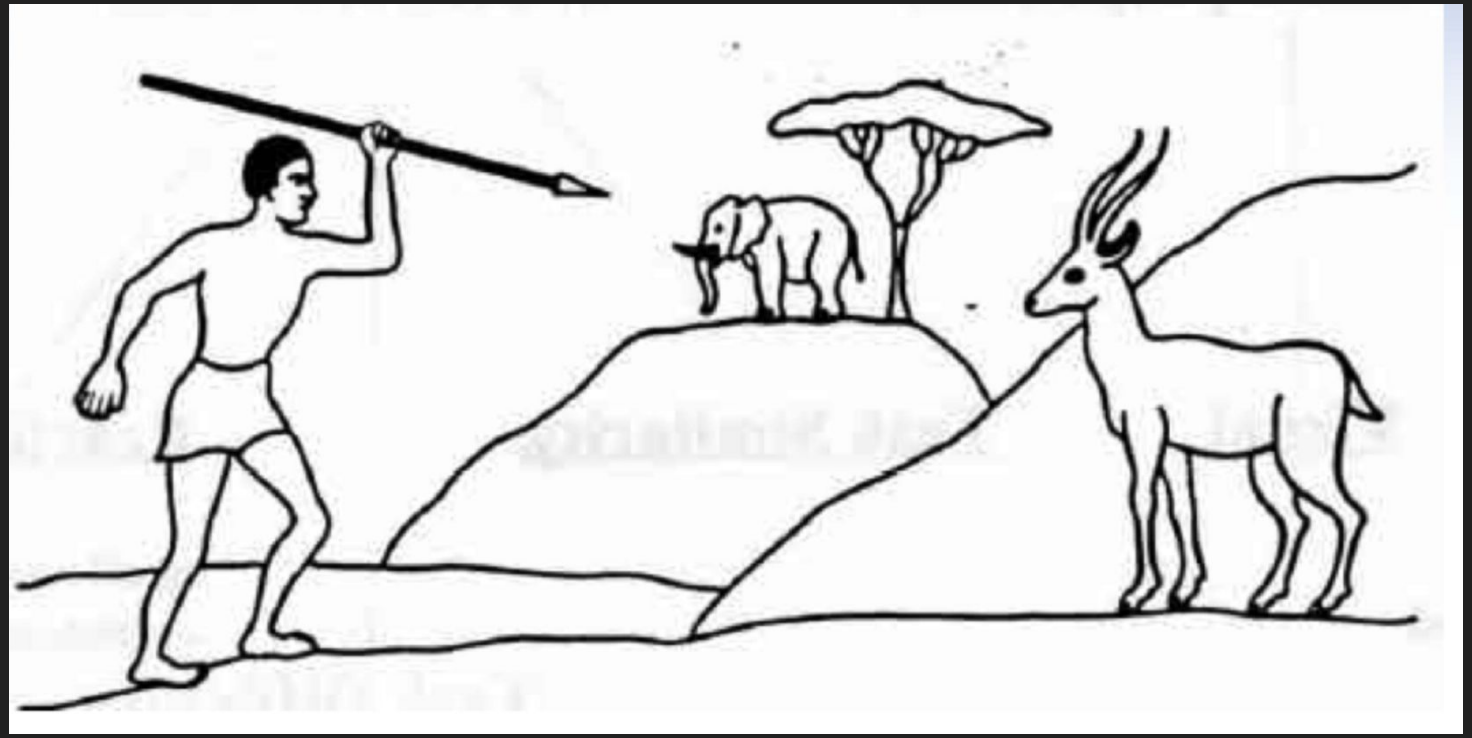


***SENSATION & PERCEPTION 3e*, Figure 6.12**

Depth Perception - which one is closer?

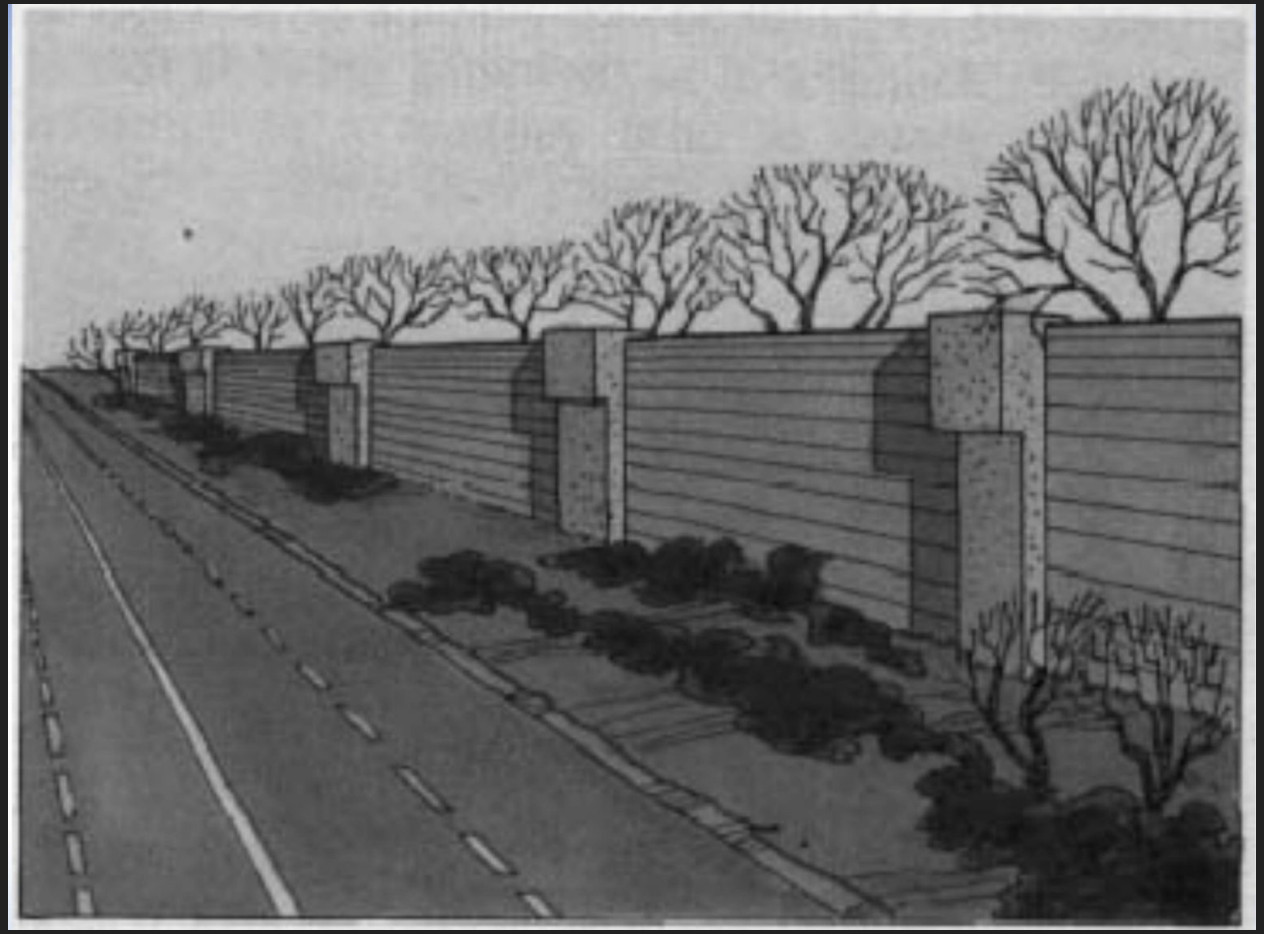


Depth Perception



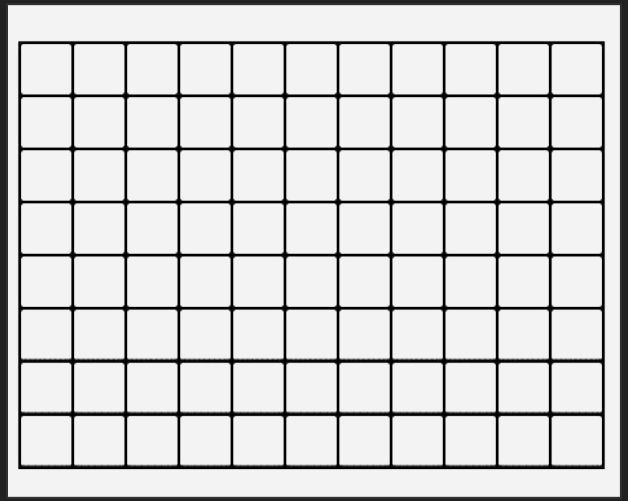
https://psych.hanover.edu/Krantz/art/rel_size.html

Depth Perception - which is tree closest. Why?

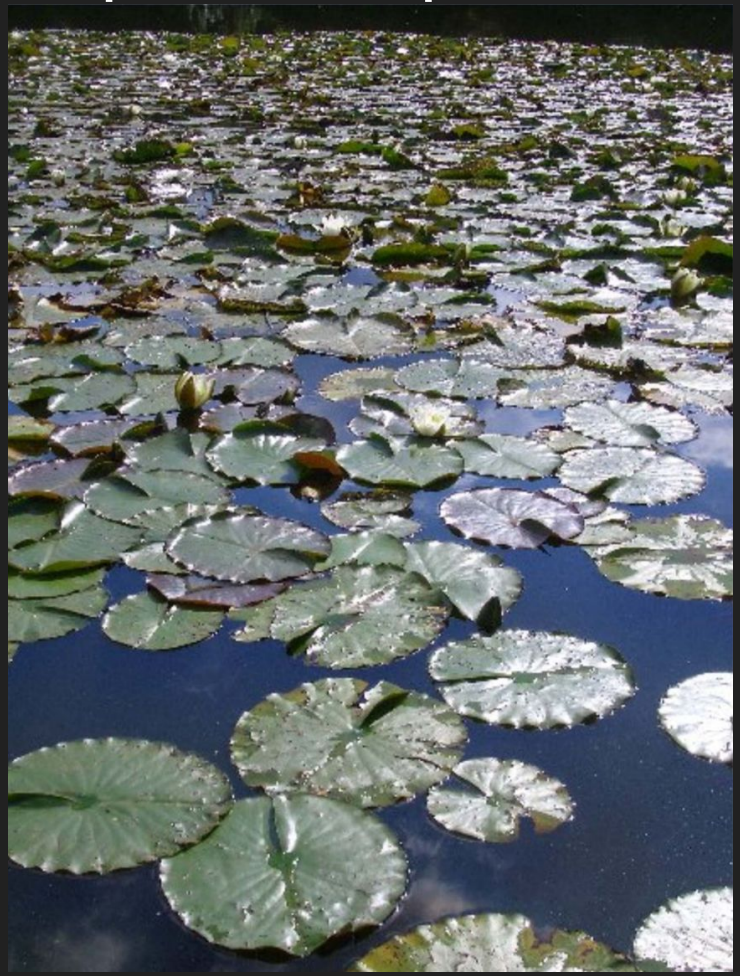


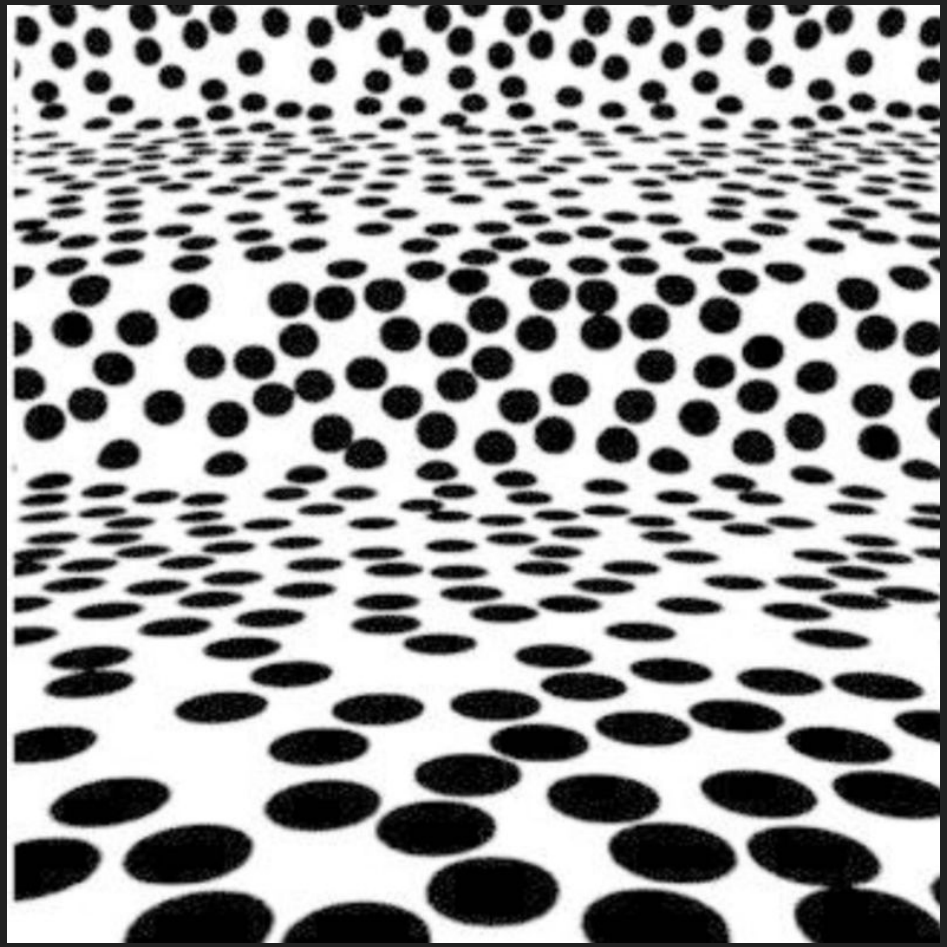
Depth Perception

http://psych.hanover.edu/Krantz/art/texture.html



Depth Perception





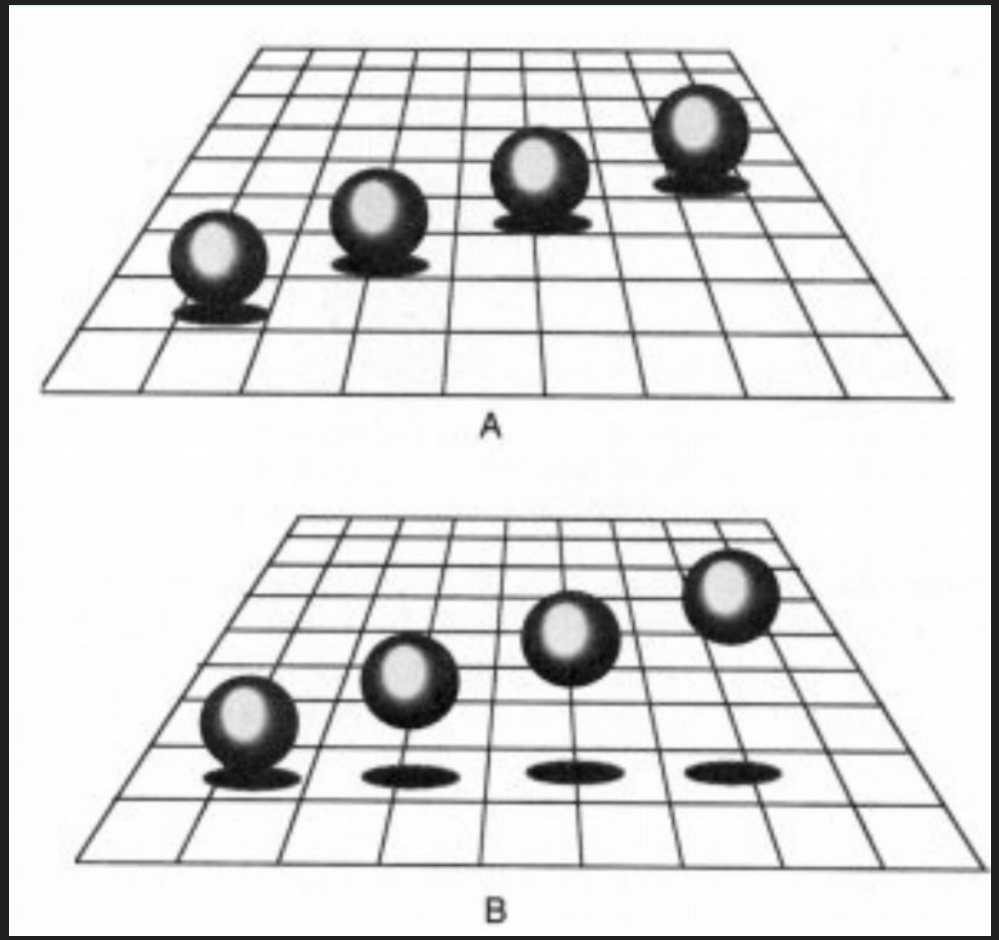
Depth Perception

Have you seen VR experiences taking advantage of this? Be the first one!

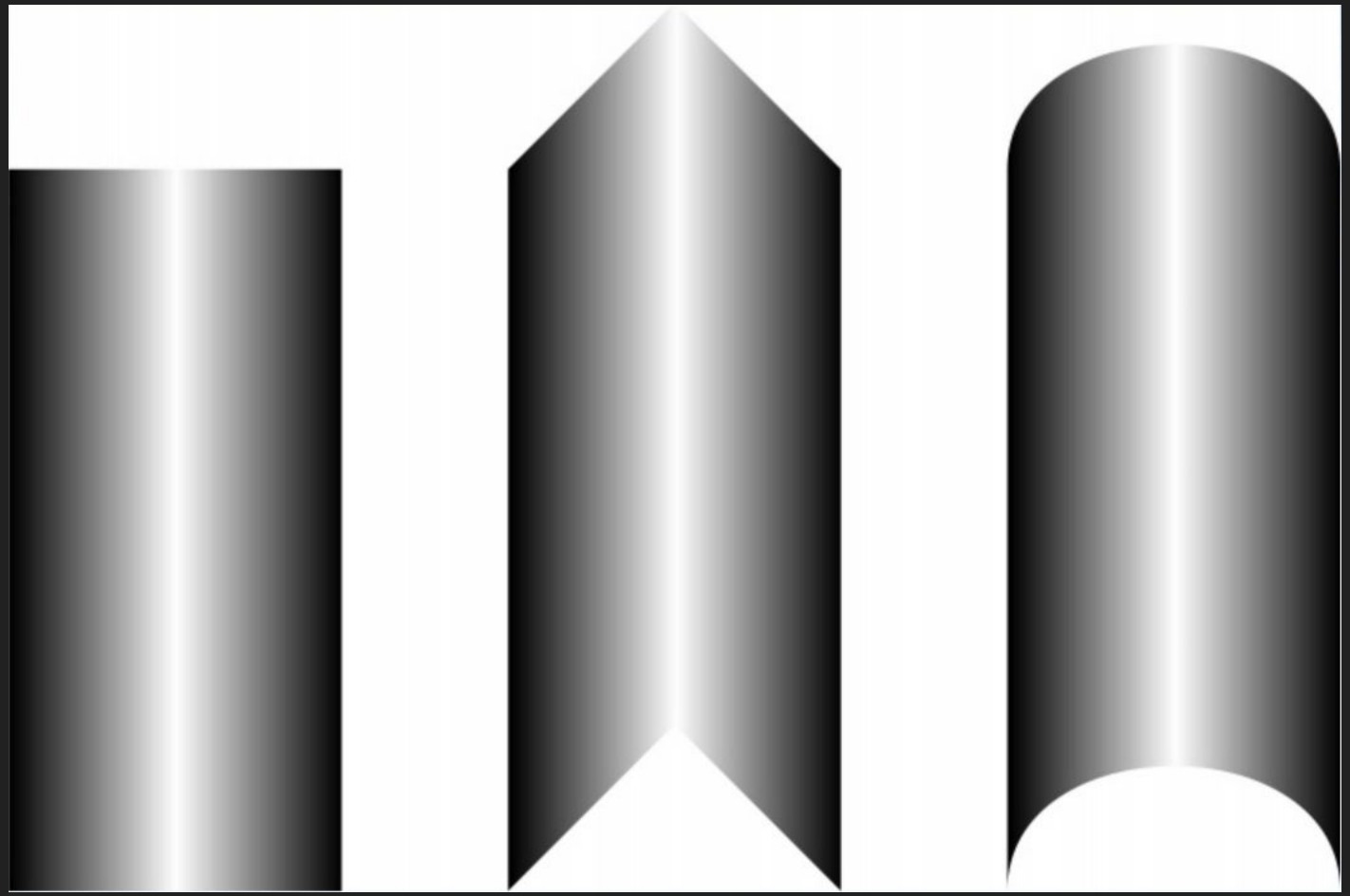
Depth Perception

Depth Perception

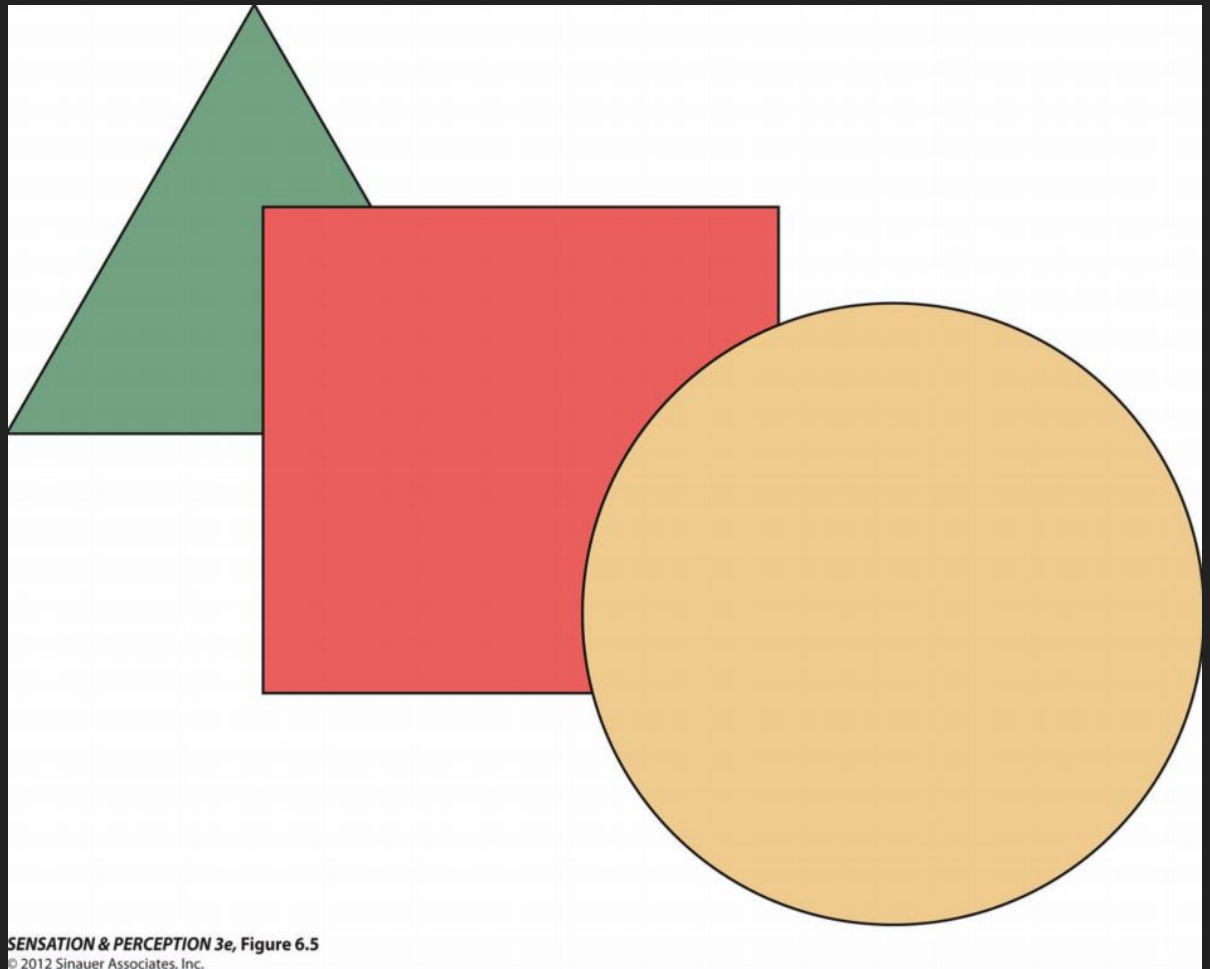
Depth Perception



Depth Perception

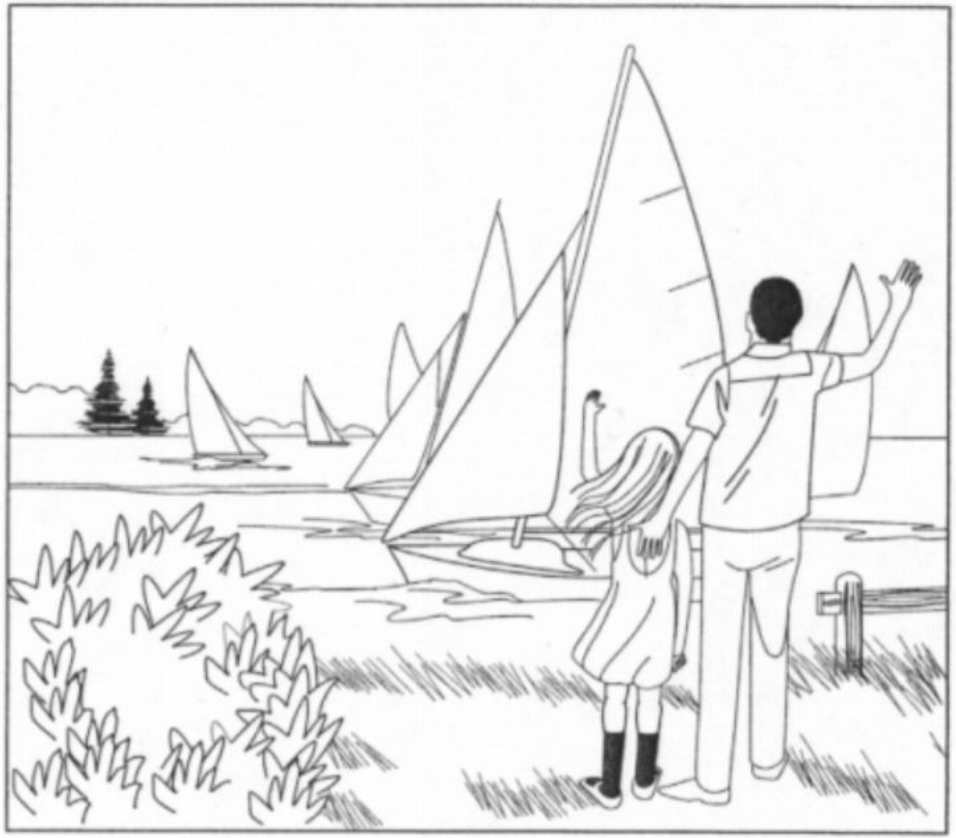


Depth Perception

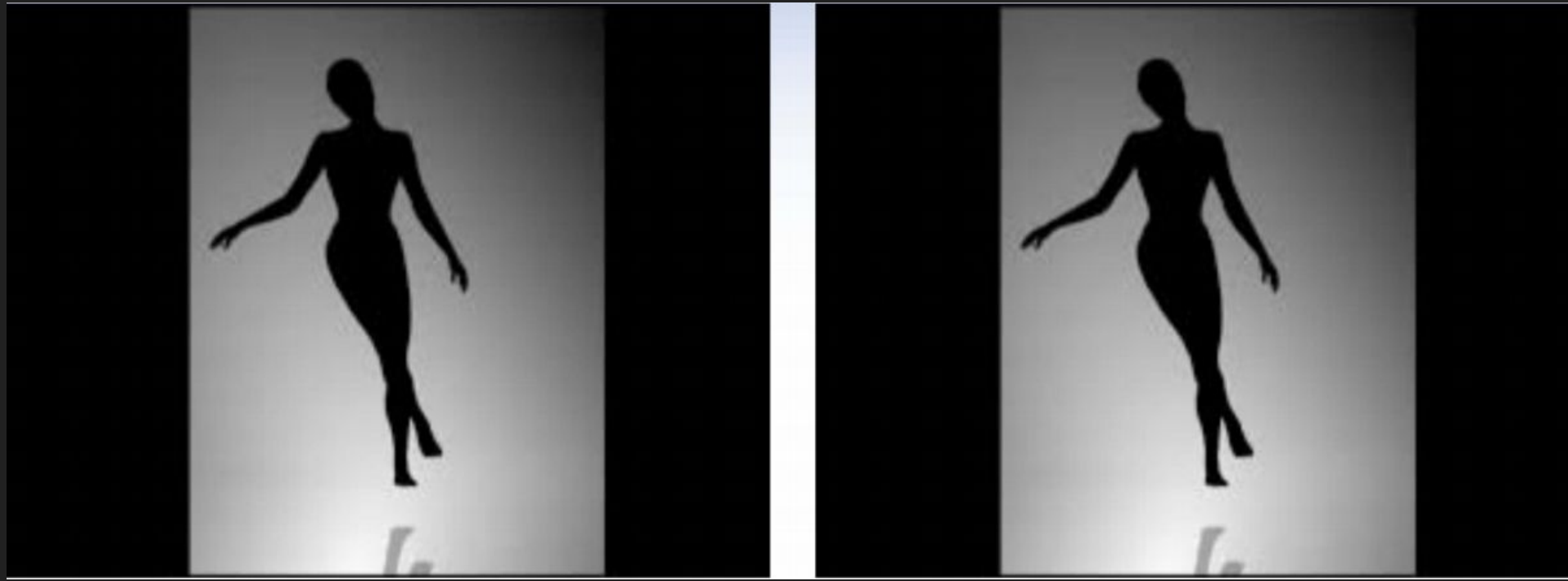


SENSATION & PERCEPTION 3e, Figure 6.5

Depth Perception

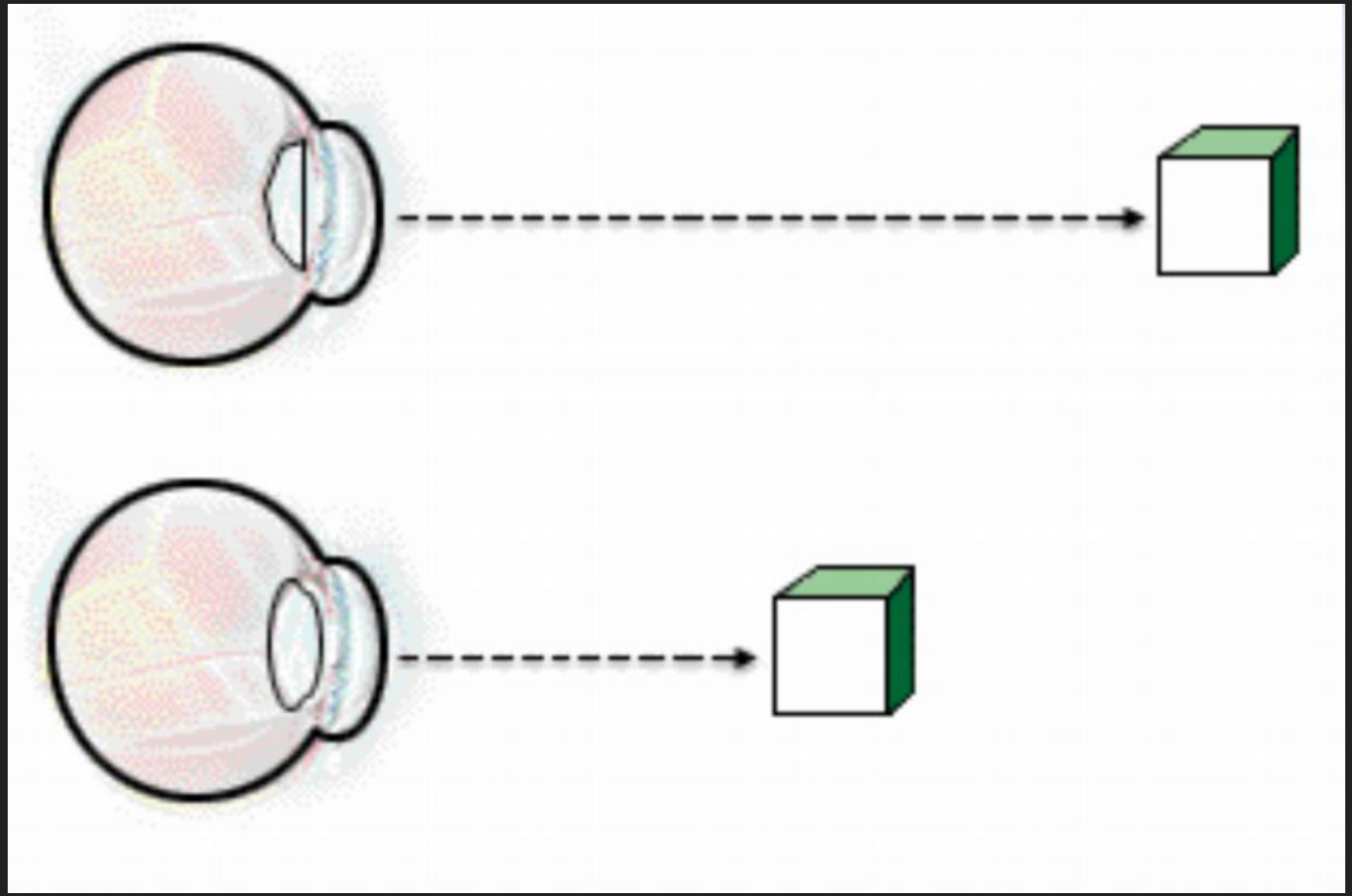


Depth Perception; which way is the dancer facing?

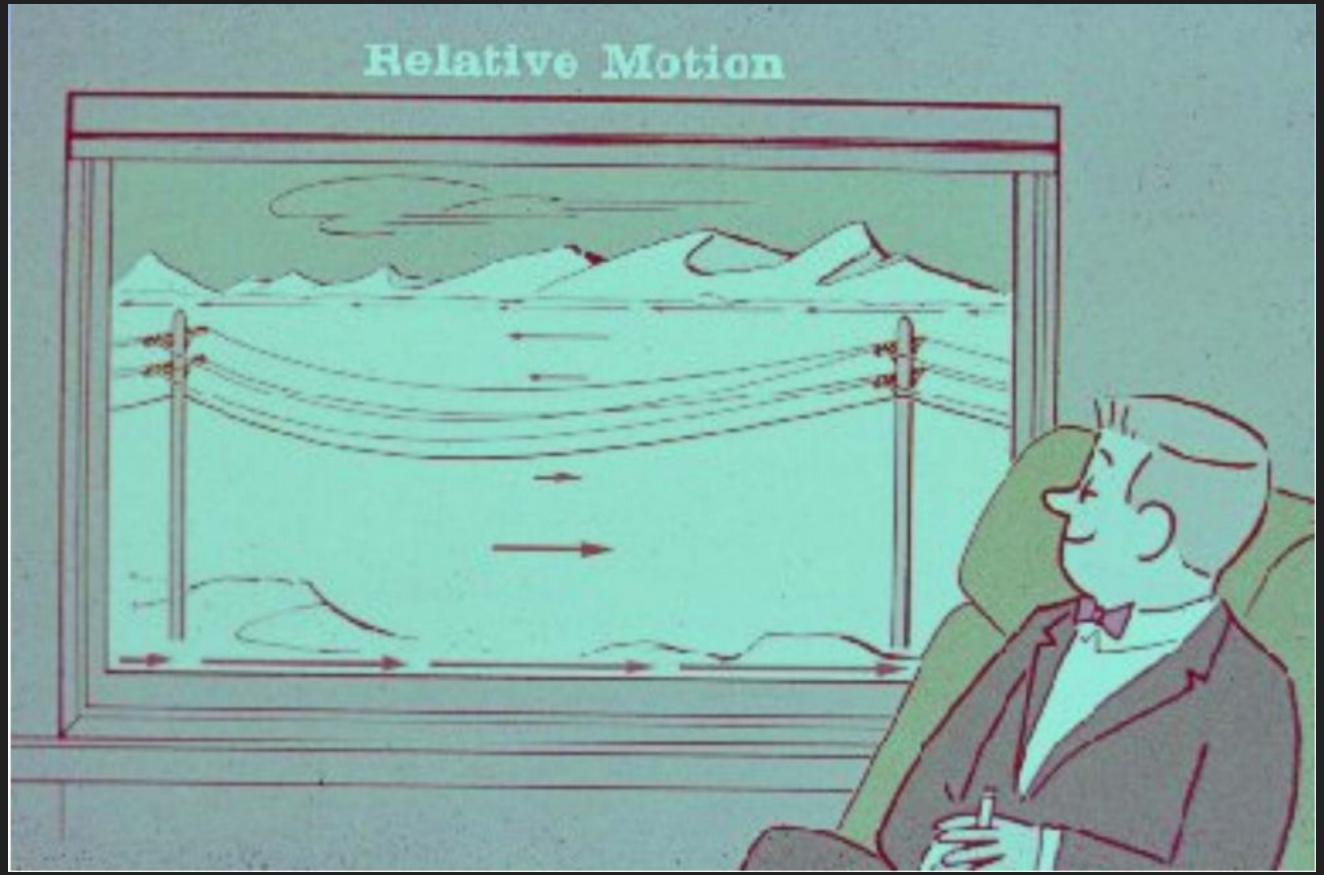


https://en.wikipedia.org/wiki/Spinning_Dancer

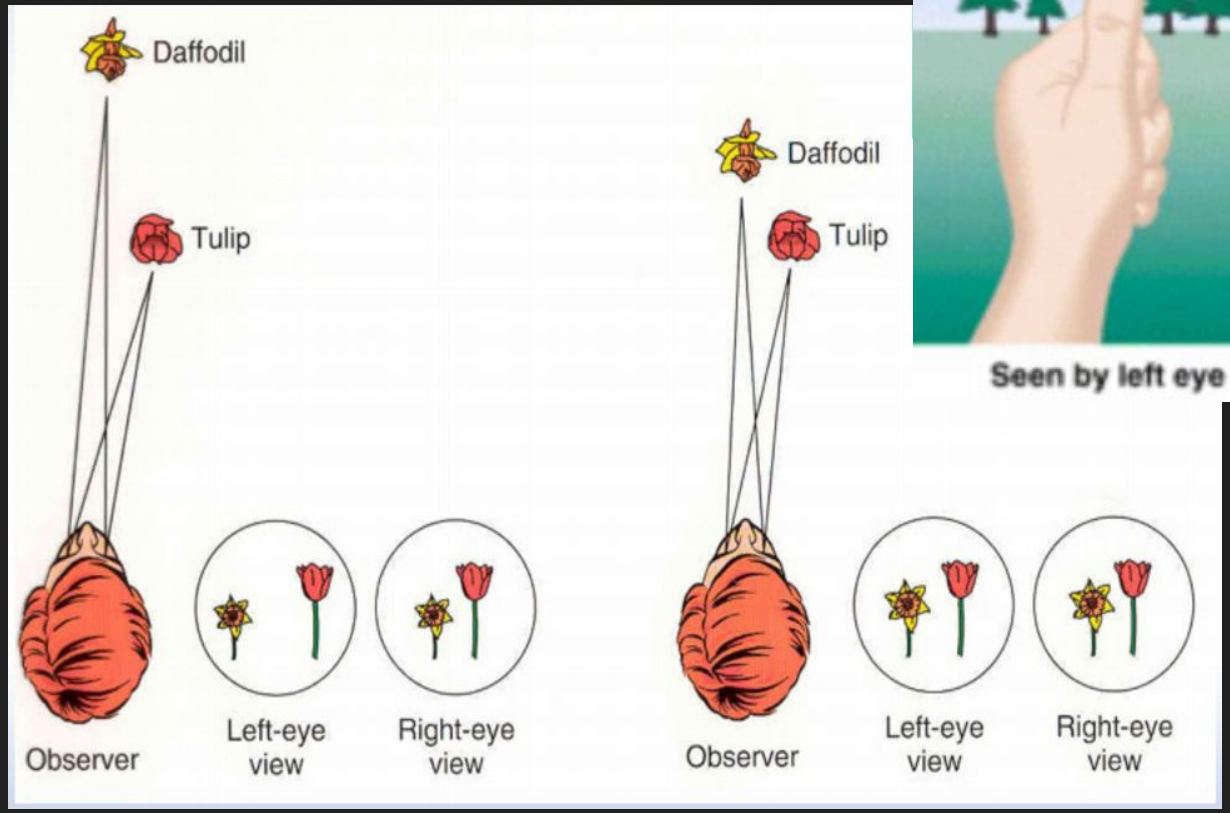
Depth Perception

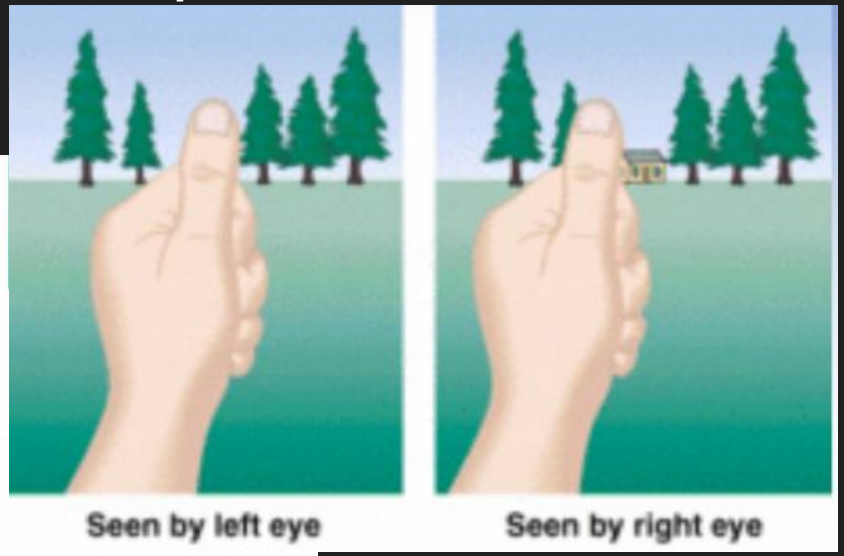


Depth Perception

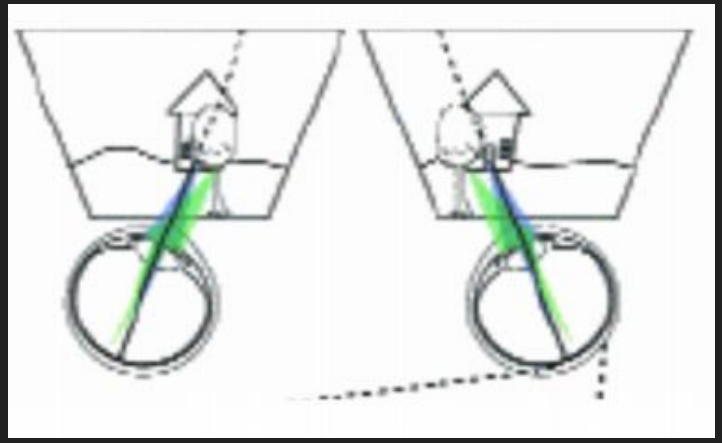


Binocular Cues for Depth Perception

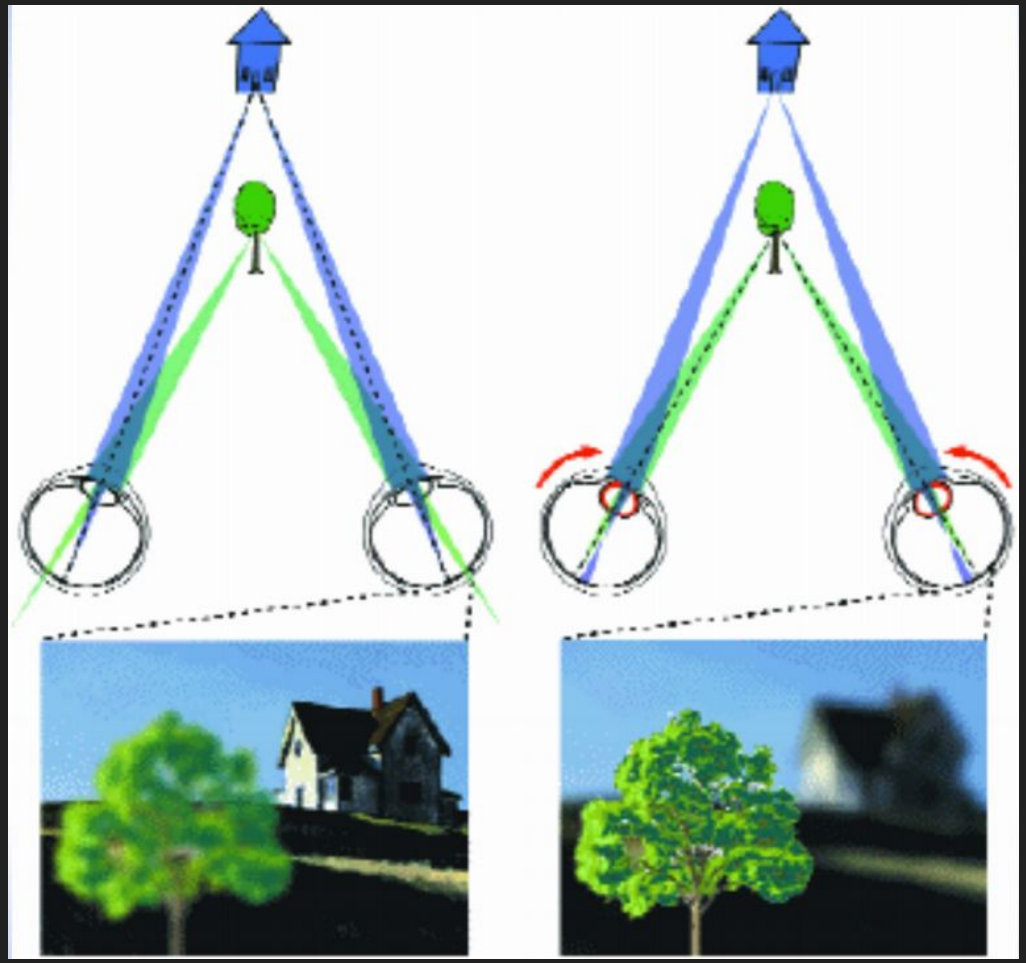




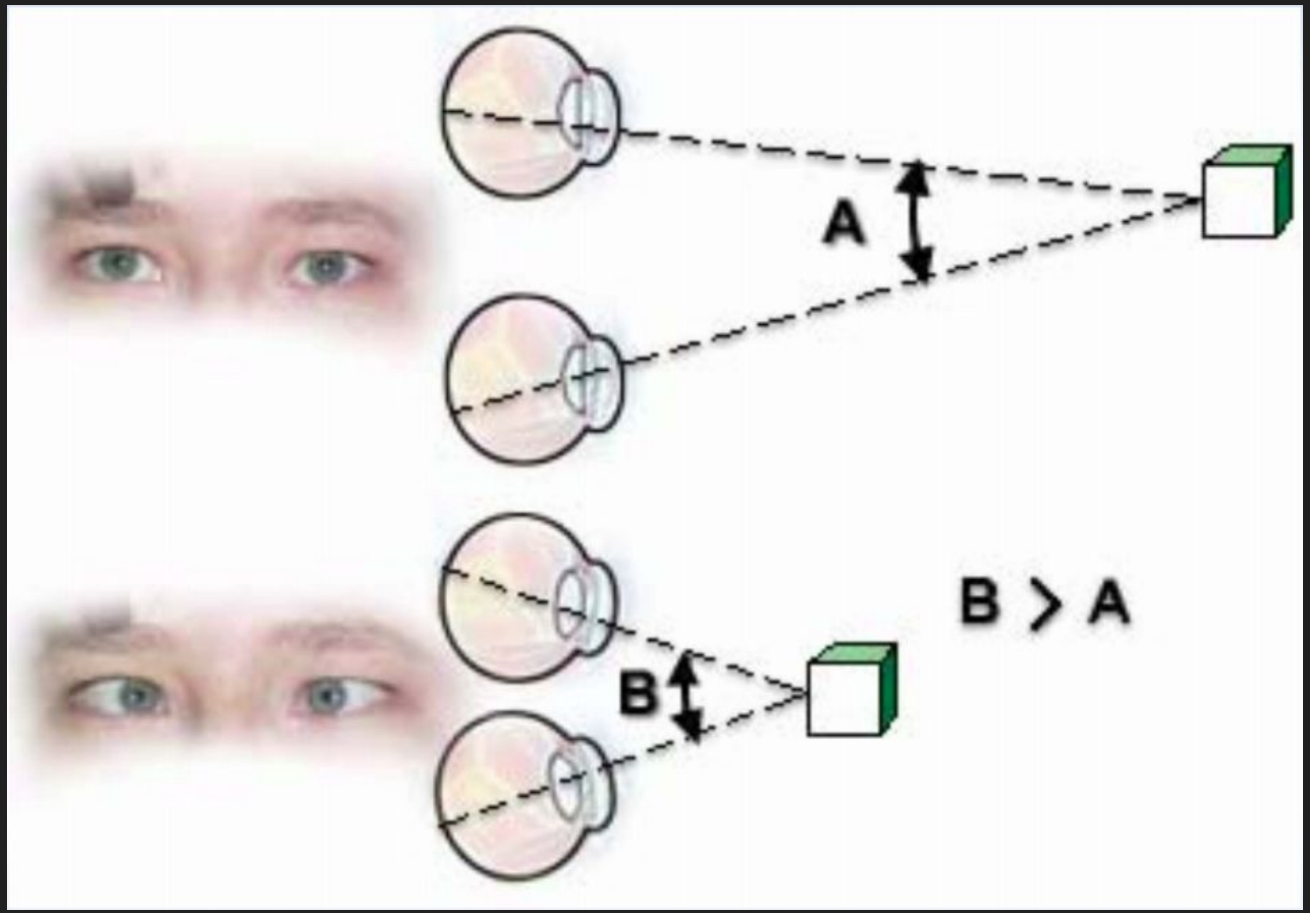
Depth Perception



Uncomfortable in VR?



Depth Perception



Depth Perception: Depth Cues

Monocular:

- Retinal Image Size
- Height in visual field
- Texture gradient
- Image blur
- Atmospheric perspective
- Accommodation
- Motion Parallax
- Shadows/shading
- Interposition

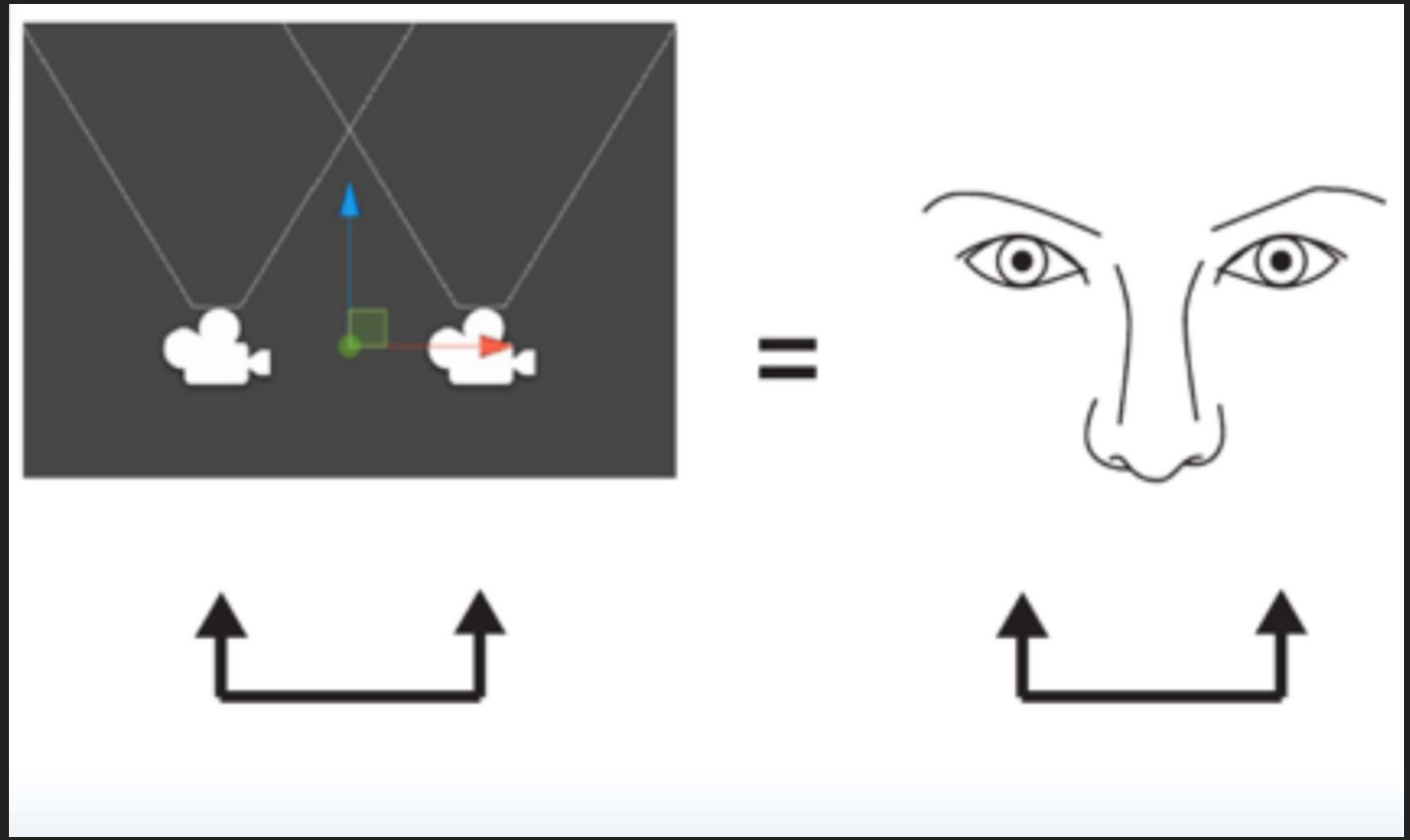
Binocular:

- Vergence angle
- Binocular disparity
- Diplopia

Combination of depth cues:

- Decision theory;machine learning
- Bayesian/probabilistic
  1, Priors/Bias
  2,Consistent or contradictory
  3, How discriminatory is each cue in the context

Depth/Scale Perception in VR:



Do you need to verge more for higher values of IPD? Is it comfortable?

Scale Perception (vs Depth Perception)

How large the object that I see is?

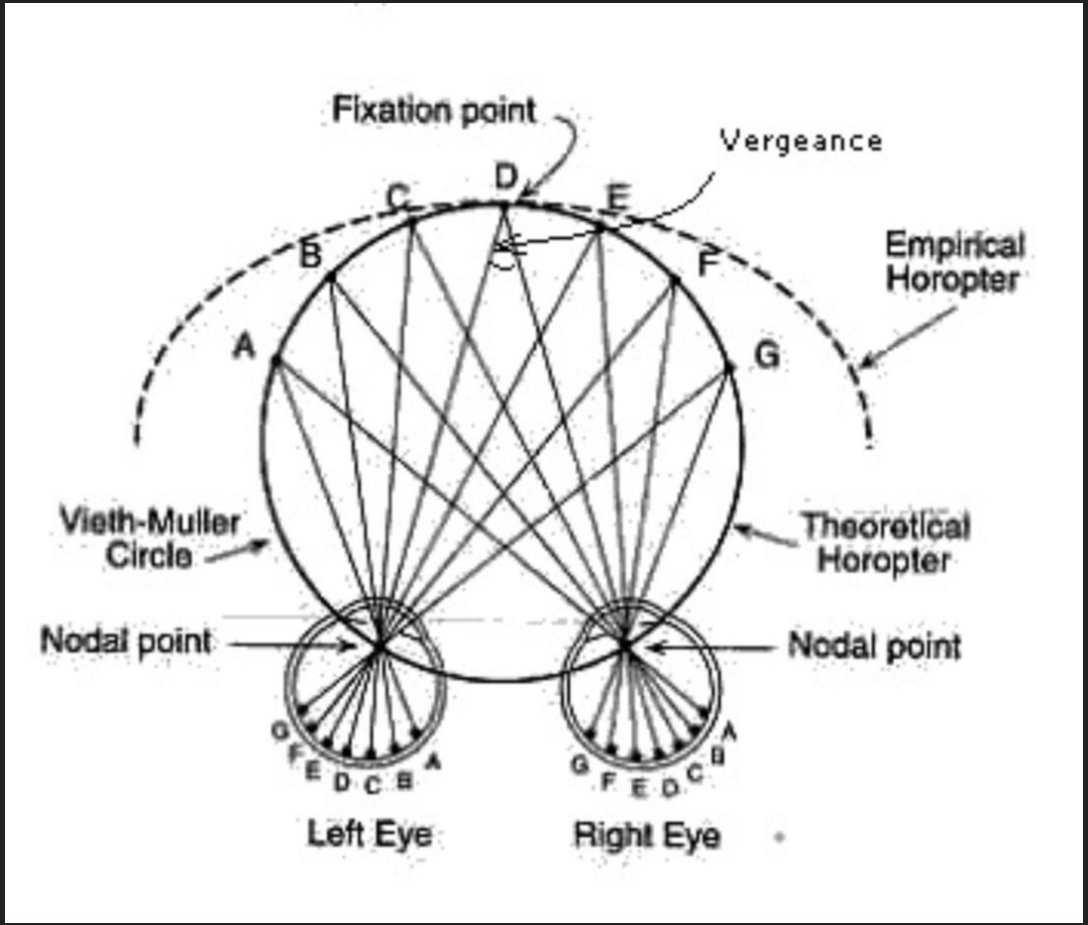
Your perception of scale and depth are affected by your IPD in the virtual word.

https://www.youtube.com/watch?v=HEBEQhwG-rU

Developer Advice

- Design your world in meters.
- Do not place the objects closer than 1 meter away.
- Match IPD in _____ and _____ to your physical IPD.

Horopter: Optimal Focal Curve



Horopter: Optimal Focal Curve

Motion Perception: Purposes

Purposes:

1) Segmentation/Segregation via quick eye fixation on moving objects.

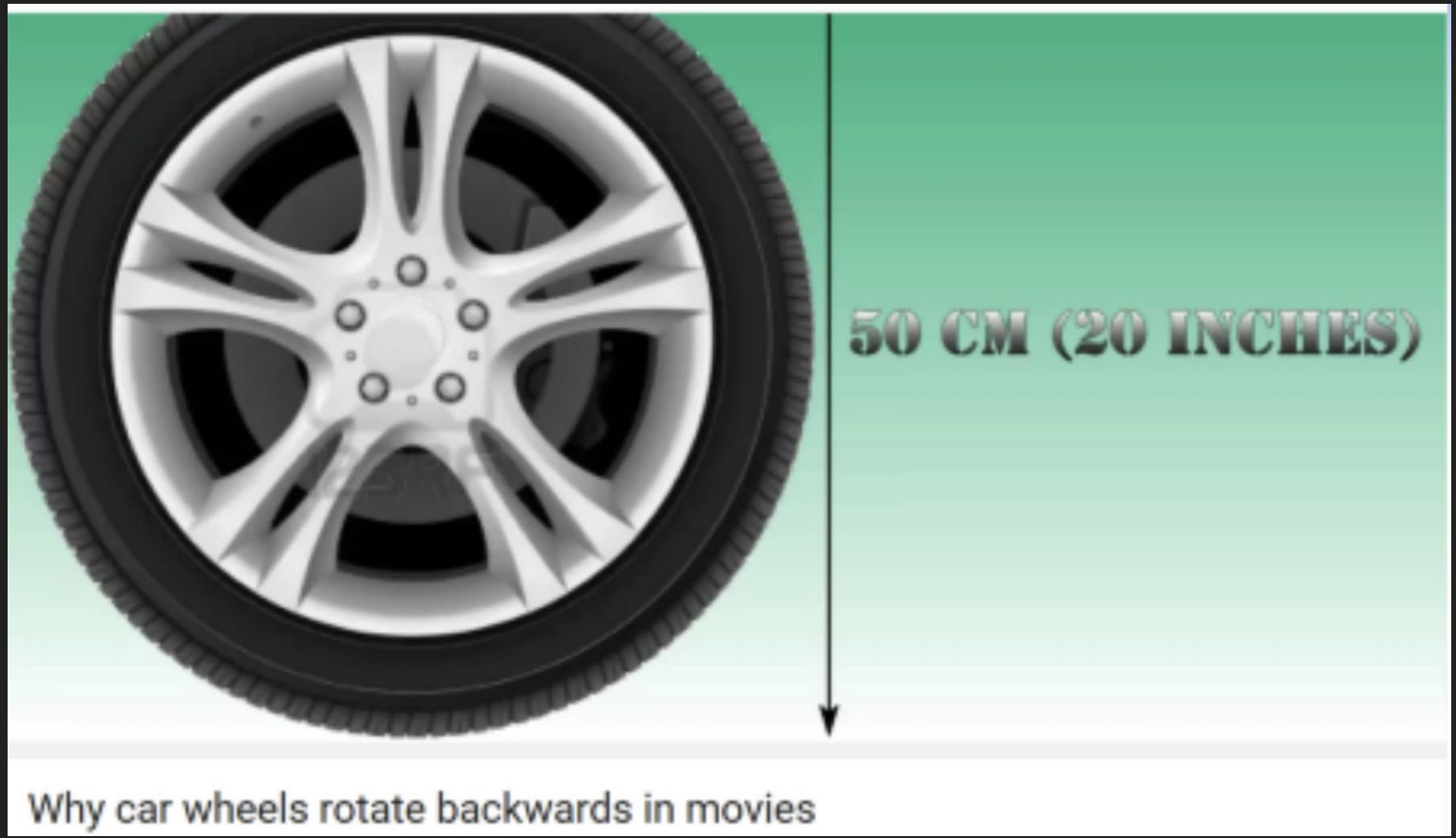
2) Extract 3D structure of an object (spin chair around)

3) Visual guidance for action:

- Manipulation - grab a cup
- Hand-eye coordination
- Self motion information

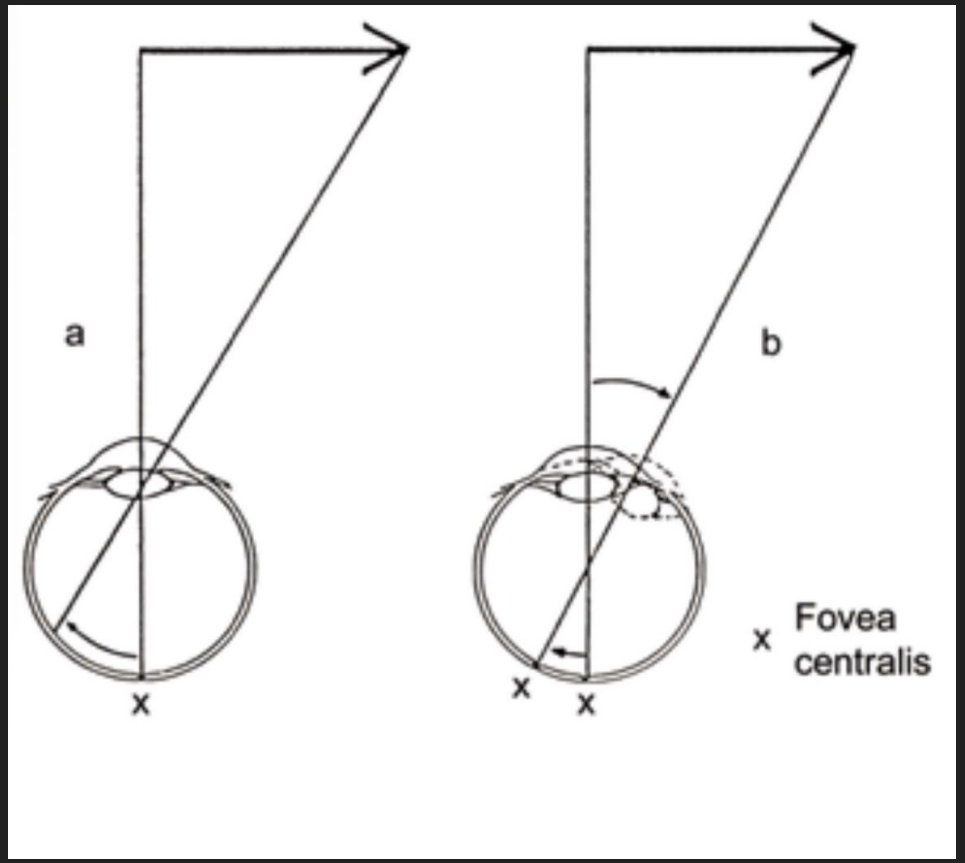
https://www.youtube.com/watch?v=PhWUf9D52RQ

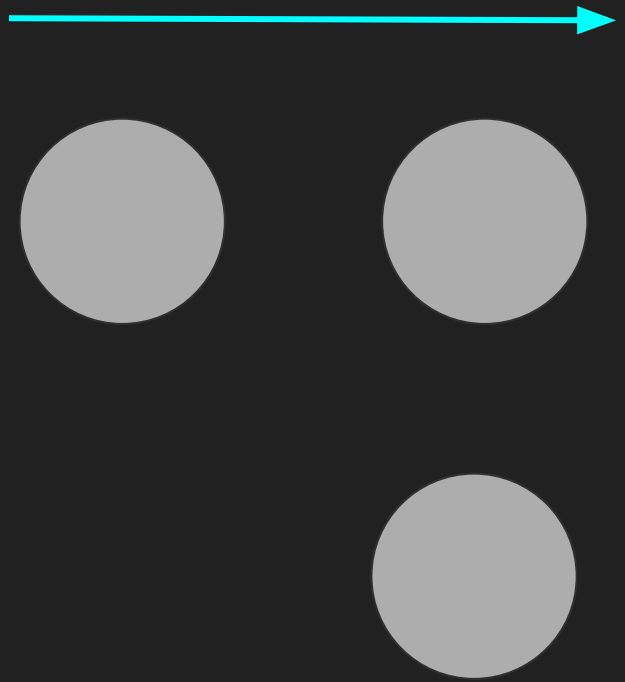
Motion Perception



https://en.wikipedia.org/wiki/Wagon-wheel_effect

Neural Circuitry for Motion





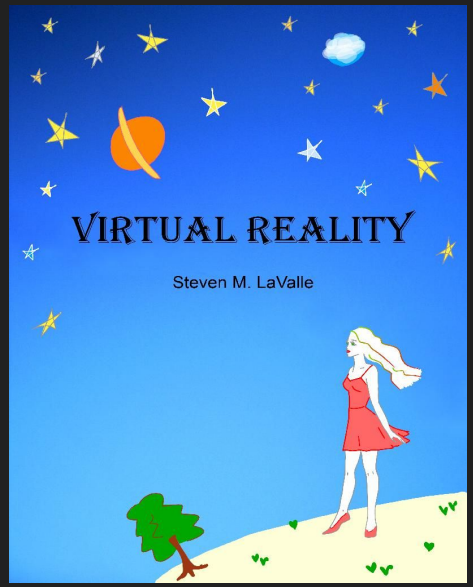
Review

1. Name four types of monocular cues for depth perception.

2. What’s the purpose of motion perception?

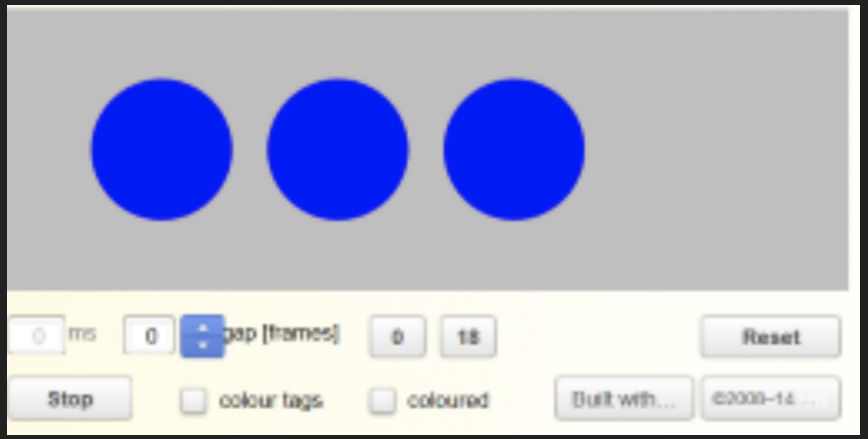
Announcements

- MP 4 due March 26th (right after spring break)
- Continue progress on your final projects - they are a large part of your final grade :-)



Read LaValle, Chapter 4, 5

Fundamental Principles: Occlusions, Rigidity, and Shutter



http://www.michaelbach.de/ot/mot-motionBinding/index.html
http://michaelbach.de/ot/mot-Ternus/
http://www.michaelbach.de/ot/mot-breathingSquare/index.html