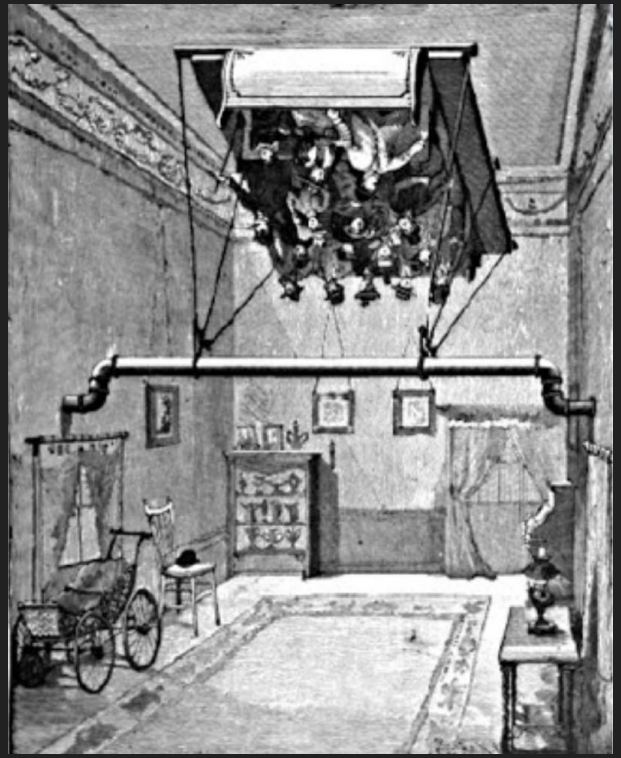
CS 498 VR

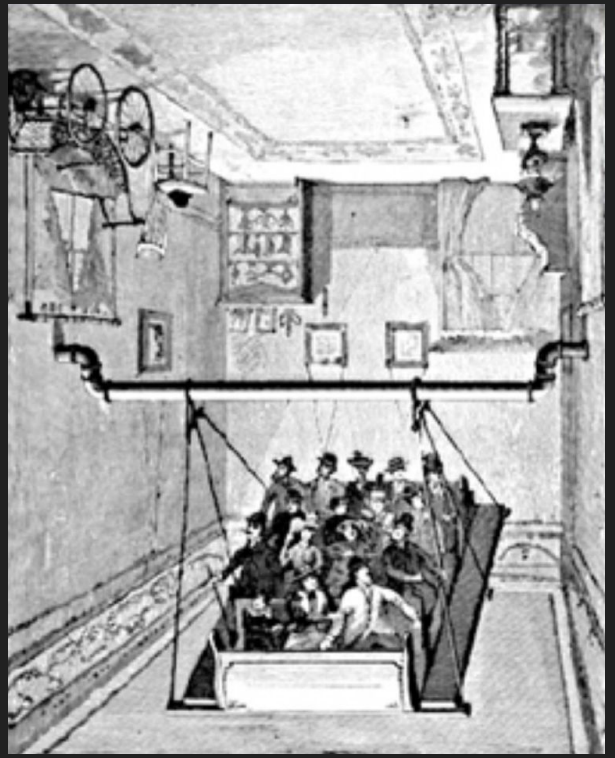
Lecture 16 - 3/26/18

go.illinois.edu/VRlect16

World Motions vs Self Motions

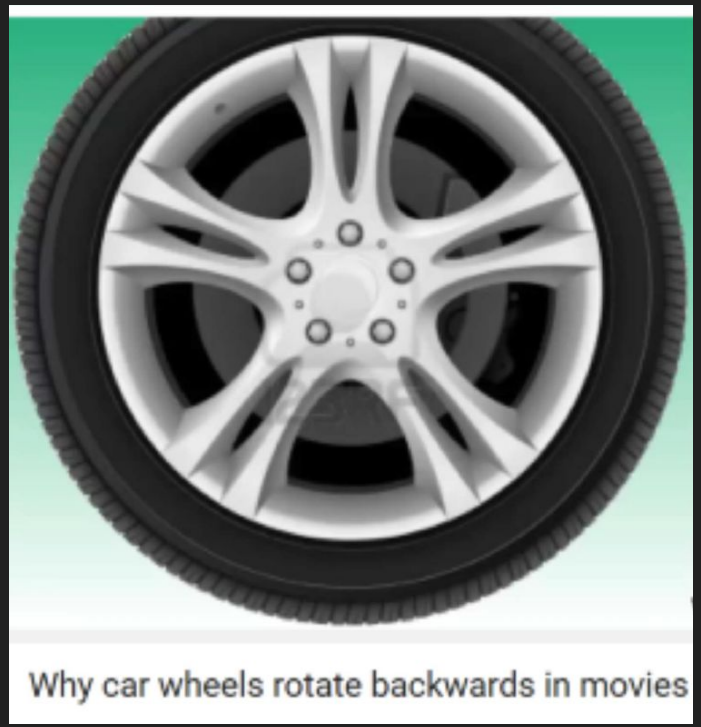
Big swing illusion.





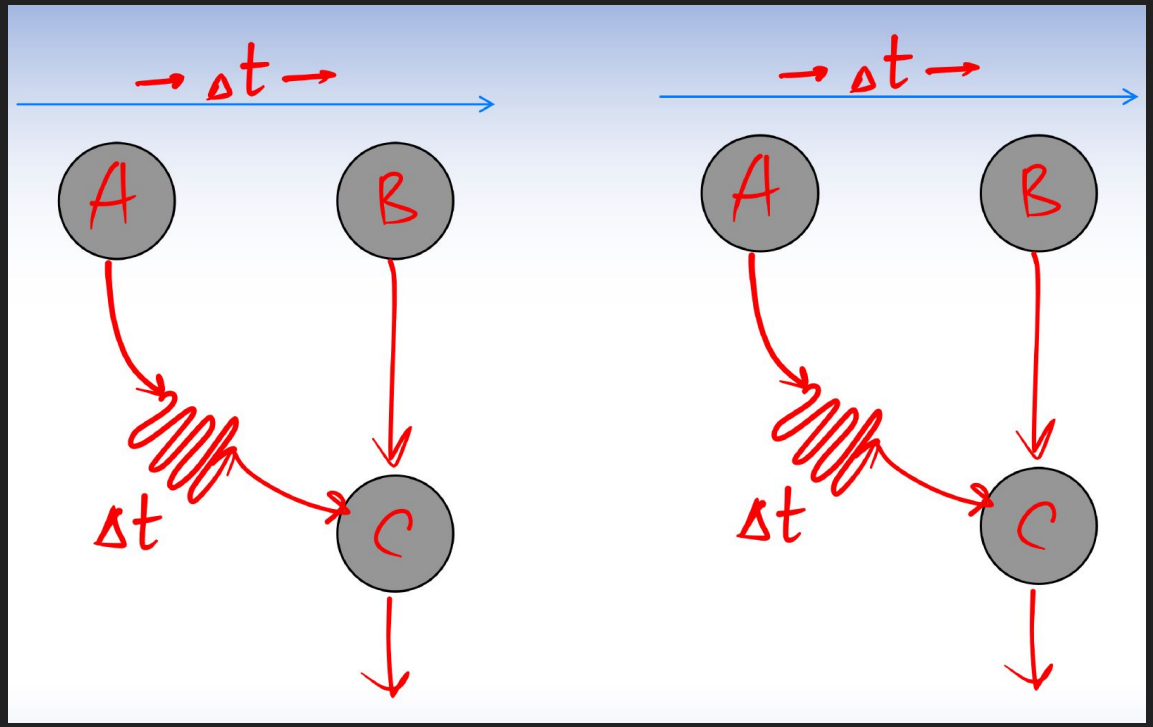
World Motions vs Self Motions

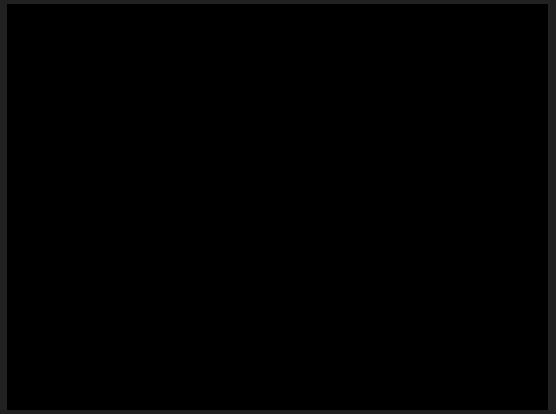
Motion Perception: Stroboscopic Effect



Wagon Wheel Effect

Neural Circuitry for Motion





Neural Circuitry for Motion

Fundamental Principles: Occlusions and Shutter

Pikler-Ternus Display

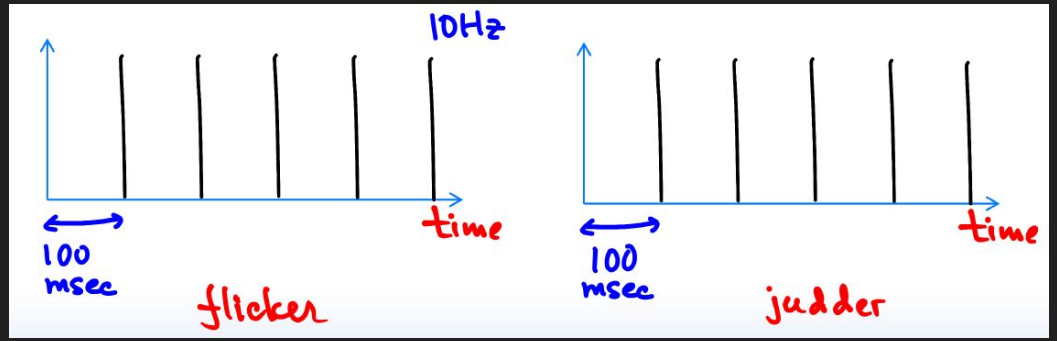
Breathing Square Illusion

Motion Binding

Stroboscopic Apparent Motion

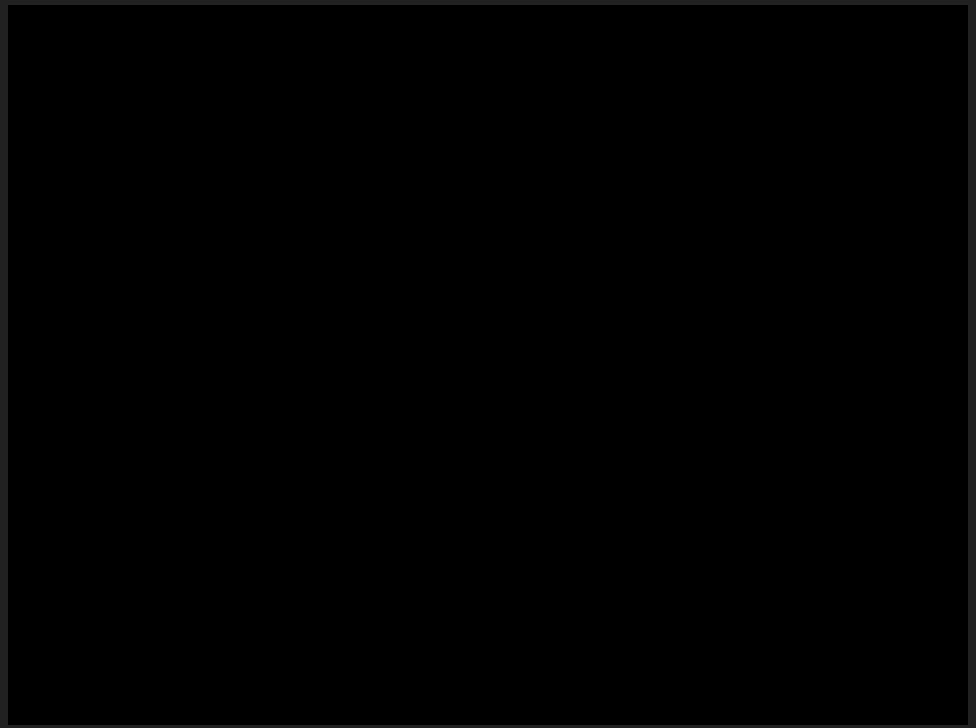
Stroboscopic Apparent Motion

(1) Inducing the illusion of motion by changing (still) frames
(2) FPS - number of frames per second. 10-12 is the minimum to perceive motion
(3) Pulsing vs “Always On”



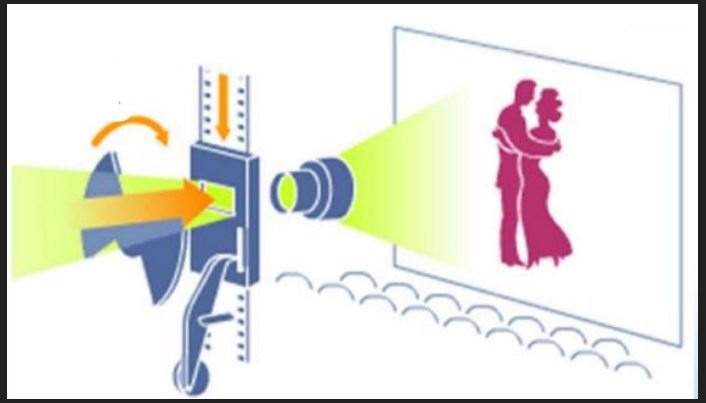
Example: draw images on pages and start flipping through them

Stroboscopic Apparent Motion - FPS



FPS in Movie and Display Industries

2 Hz	Beginning of perceived motion
10-12Hz	No longer perceive frames individually
16Hz	Early silent films, or old home movies in the 1960s
24Hz	The current movie industry standard
48/72Hz	Double/triple blade projector



FPS in Movie and Display Industries

We sit CLOSER to monitors than TVs!

Current standard for displays and phones is 60 Hz

CRT displays: 60, 72, 85

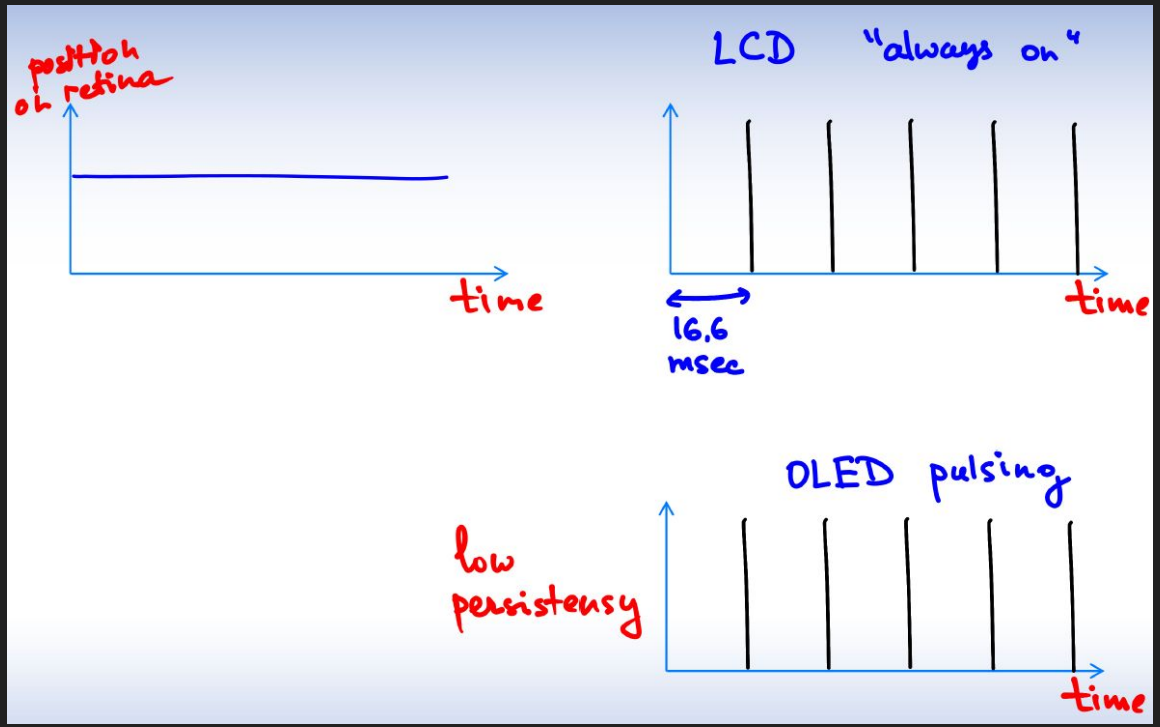
LCD displays: always on, 60 (DK1), pixel refresh rate is the limit!

OLED displays: FPS can be higher. 60, 75 (DK2)

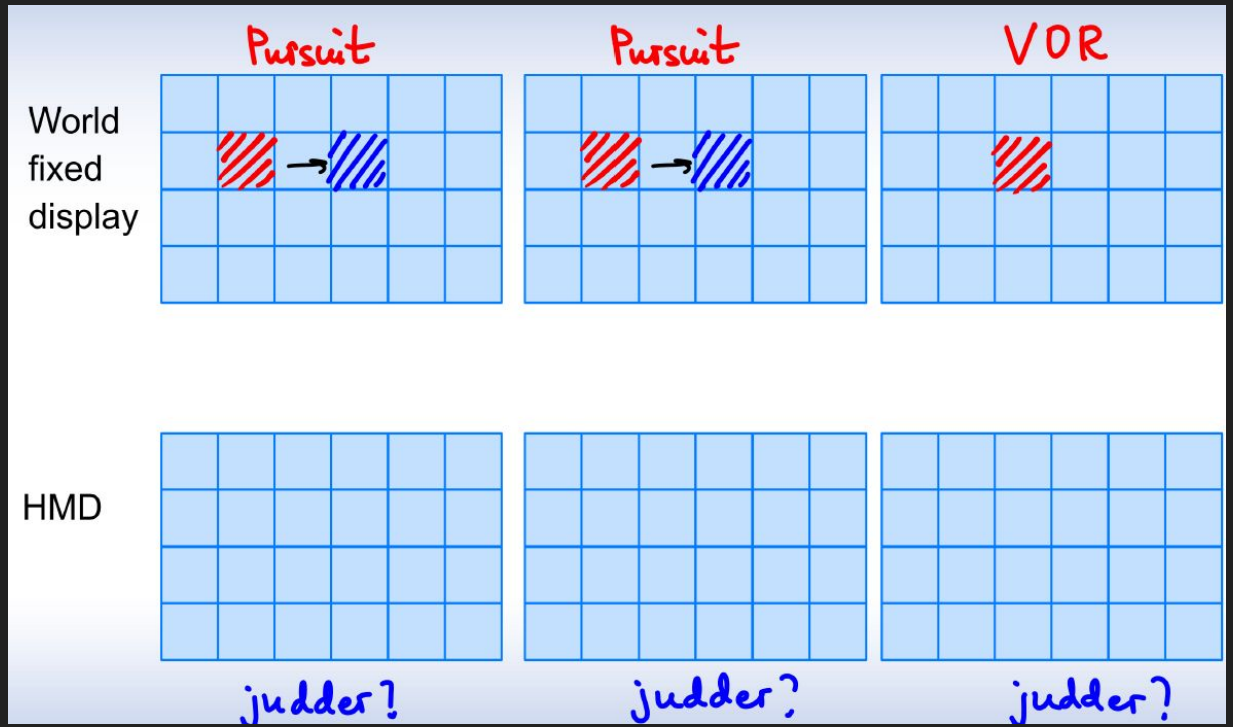
VR HMDs: OLEDS and 90

1000?

Perception of Stationarity in VR

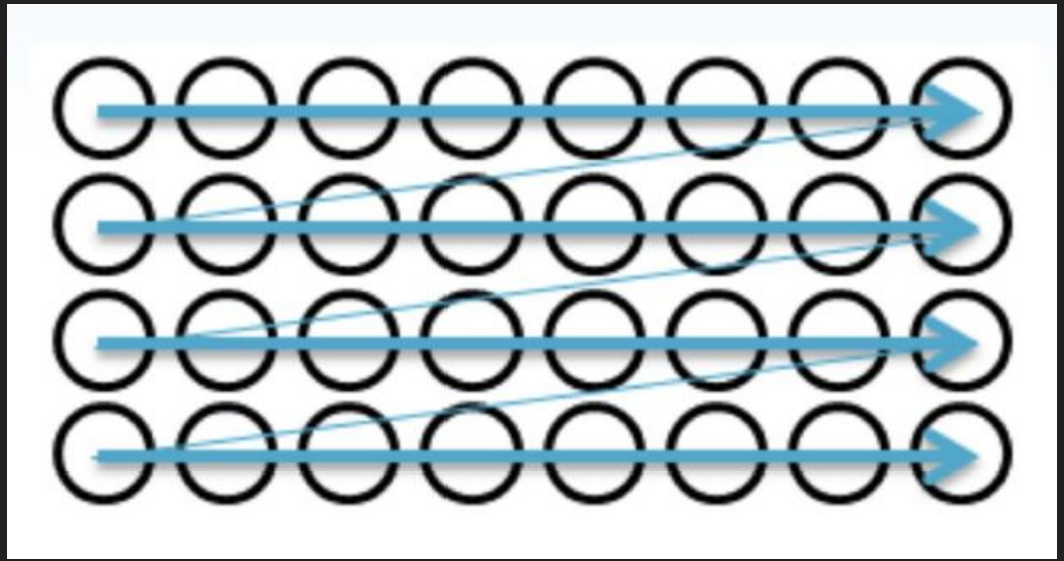


Perception of Stationarity and Smooth Motion in VR



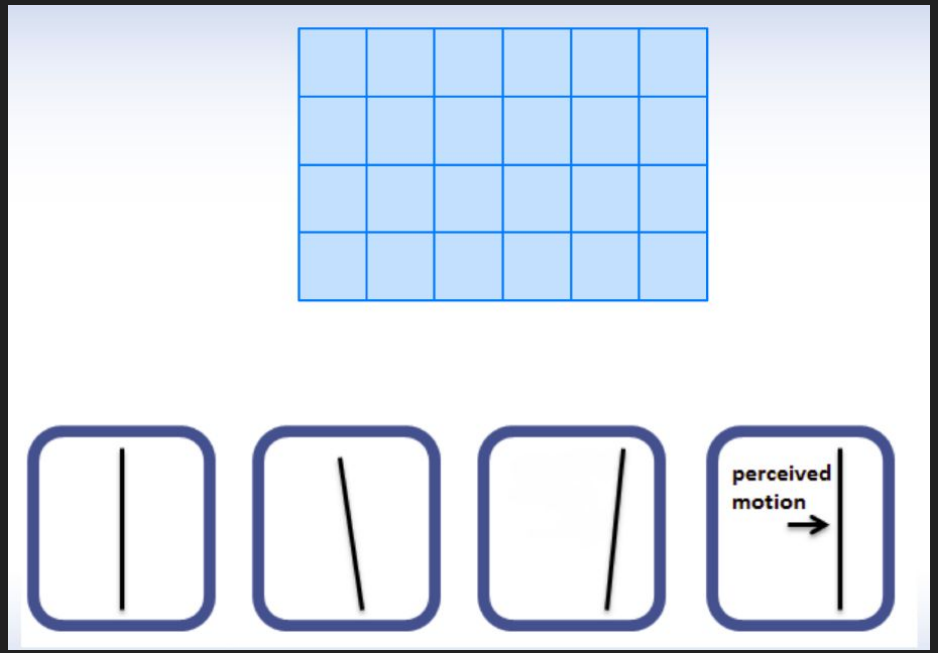
Perception of Stationarity and Smooth Motion in VR

Serious problems occur when eyes move independently from head, coupled with pixel update, scanout and FPS



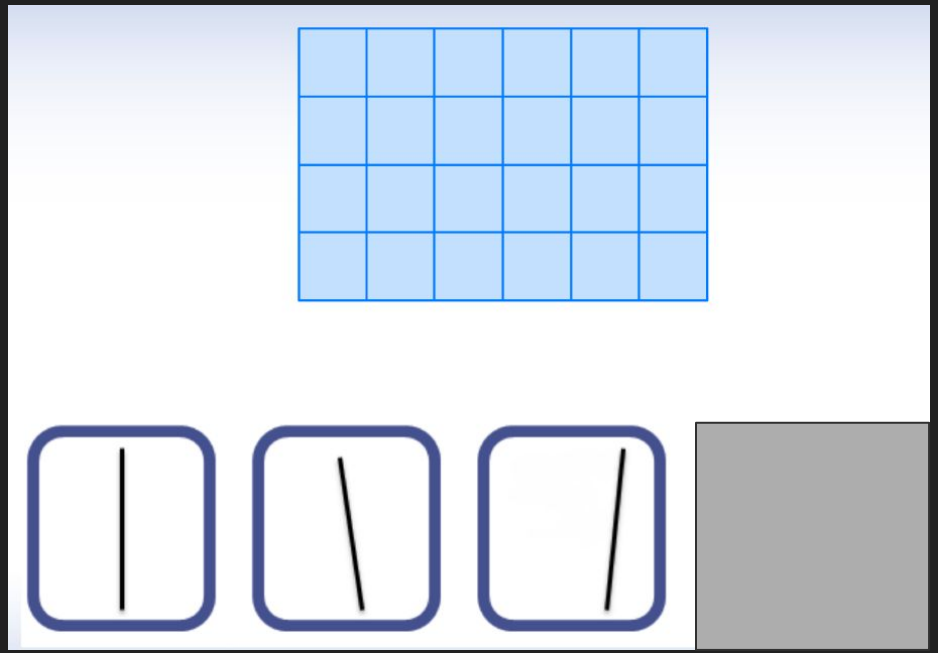
Scan Out Problems in VR

Scenario 1: Head is not moving; eyes are fixated on a vertical line; the vertical line is not moving on the display



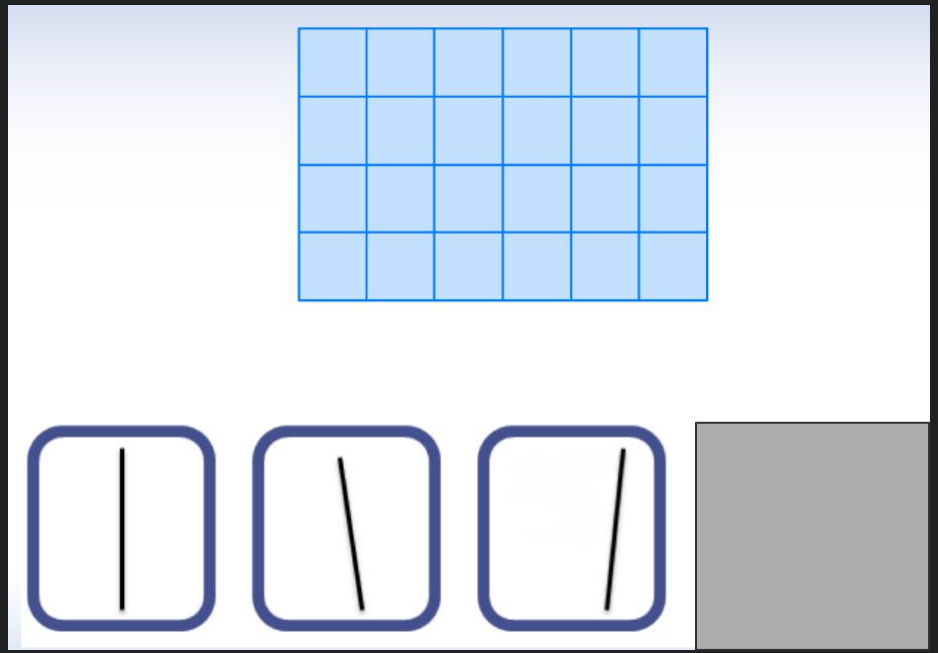
Scan Out Problems in VR

Scenario 2: Head is not moving; the vertical line is moving left to right; eyes are tracking the line.



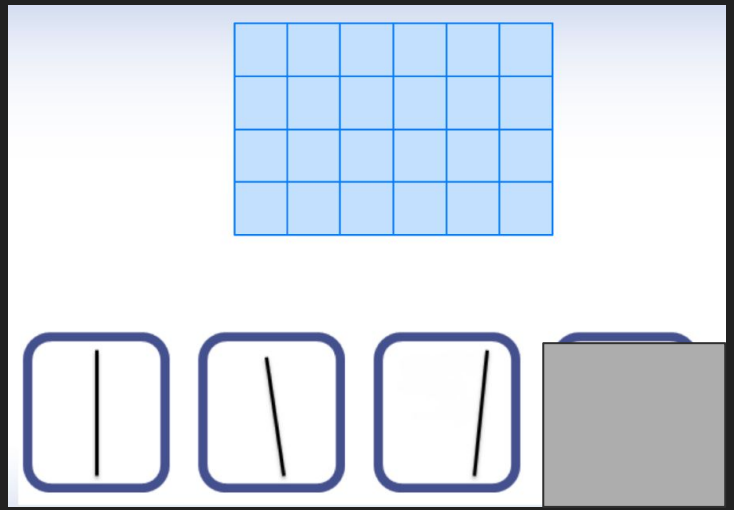
Scan Out Problems in VR

Scenario 3: Head is not moving; the vertical line is moving left to right; eyes are not tracking the line.



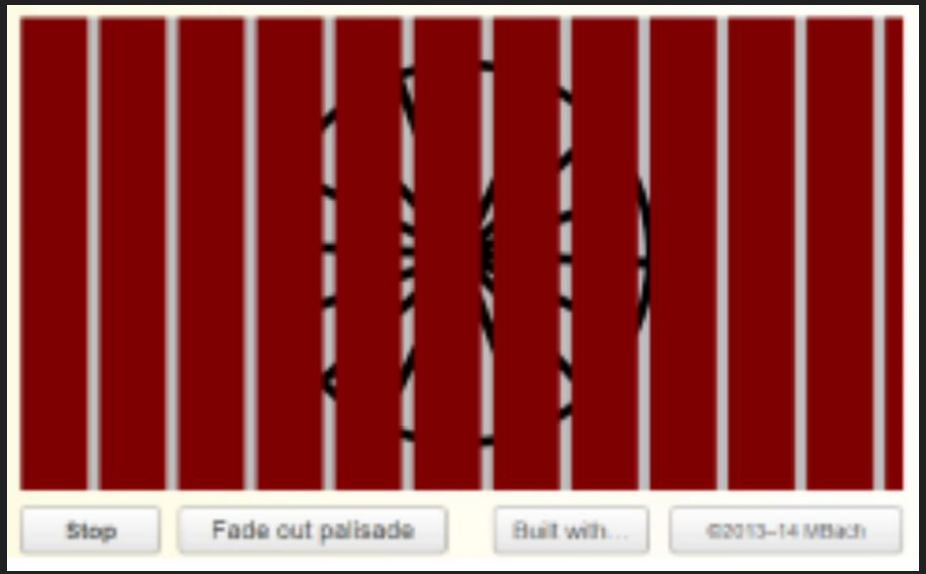
Scan Out Problems in VR

Scenario 4: Head is rotating left to right at 60 degrees/second; the vertical line in Figure 2 is moving right to left on the display at 60 degrees/second, compensating for the head motion so that to the eye the image appears to stay in the same place in the real world; eyes are counter-rotating, tracking the line.



Palisade Illusion

Roget's Palisade Illusion



Do width of bars change with eye motion?

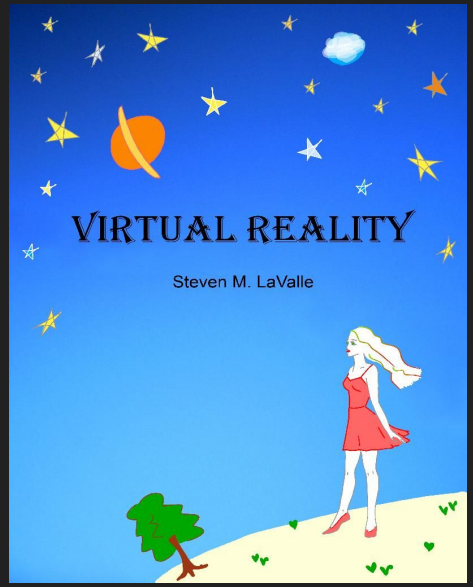
Review from today

1. What minimum frame rate is required to perceive motion?
2. What is Scanout problem?

Announcements

- MP4 was due today at 4 pm

- Continue progress on your final projects - they are a large part of your final grade :-)



Read LaValle, Chapter 5