Announcements

- **MP4** is out. Due on Nov 6 @ 11:59pm.

Final project deadlines:

- **Nov 13**, a short video of your progress.
- **Dec 16**, final project presentation

Have some extra time?

Contact me if you want to contribute to the following project that will be showcased in one of the top museums in NYC next month.

https://courses.engr.illinois.edu/cs498sl/projects/vrmuseum.html

Stroboscopic Apparent Motion

https://www.youtube.com/watch?v=mjYjFEp9Yx0

http://cinematheque.fr/Chapter1-1/CHAPTER_01_PART_01.html#F1.7

Palisade Illusion

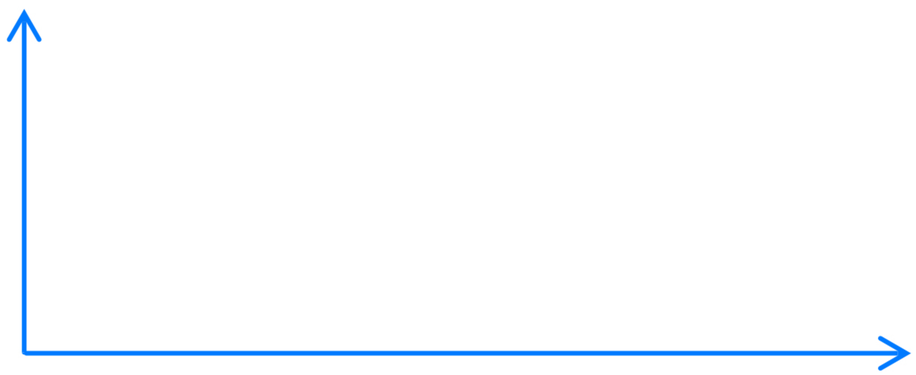
http://best-optical-illusions.weebly.com/rogets-lsquopalisadersquo-illusion.htm

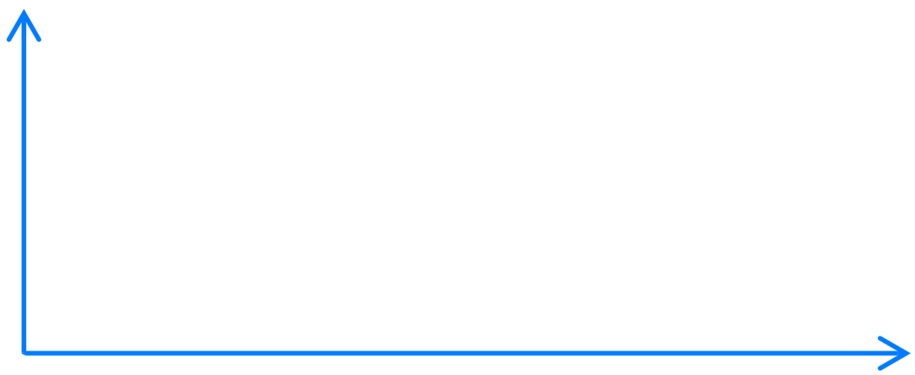
Stroboscopic Apparent Motion

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 https://www.youtube.com/watch?v=XRaDV8YADiQ

3) Pulsing vs "Always On"





Example: draw images on pages and start flipping through them.

FPS in Movie and Display Industries

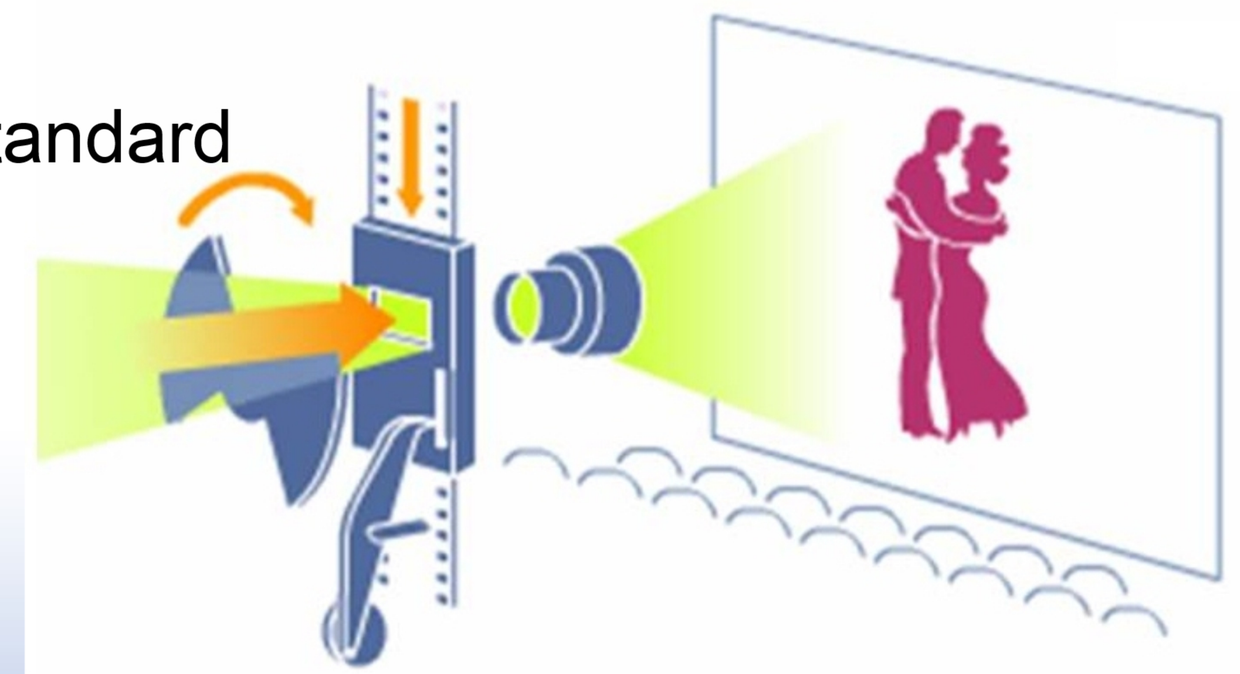
2 Beginning of perceived motion
https://www.youtube.com/watch?v=XRaDV8YADiQ

10 No longer perceive frames individually

16 Early silent films, or old home movies in the 1960s
https://www.youtube.com/watch?v=0O7YmNIpvYs

24 The current movie industry standard

48/72 Double/triple blade projector



FPS in Movie and Display Industries

We sit CLOSER to monitors than TVs!

60 Current standard for displays and phones.

CRT displays

60, 72, 85

LCD displays

60 (DK1), pixel refresh rate is the limit!

OLED displays FPS can be higher

60, 75 (DK2)

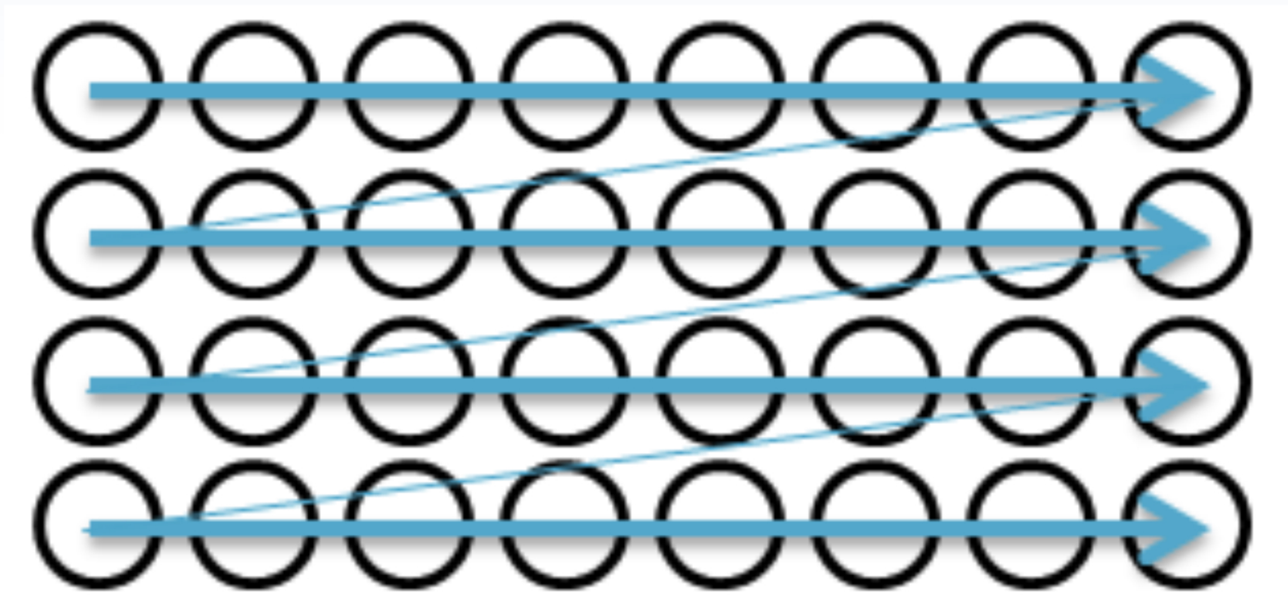
VR HMDs: OLEDs and

90

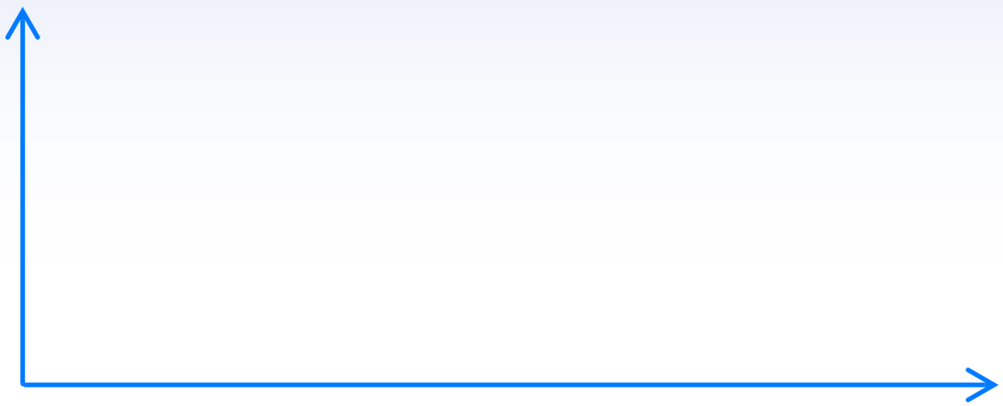
1000 ?

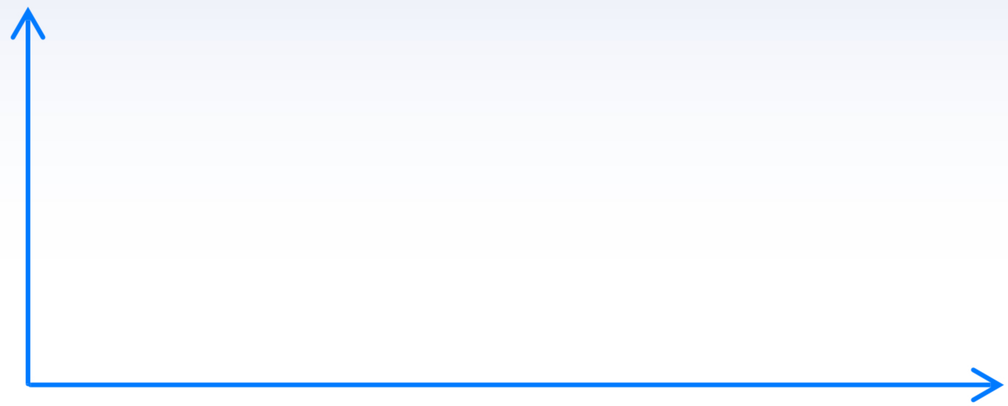
Perception of Stationarity and Smooth Motion in VR

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



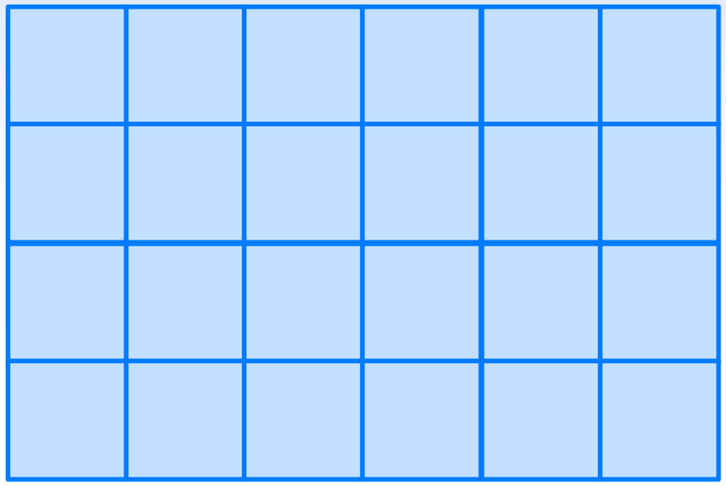
Perception of Stationarity in VR

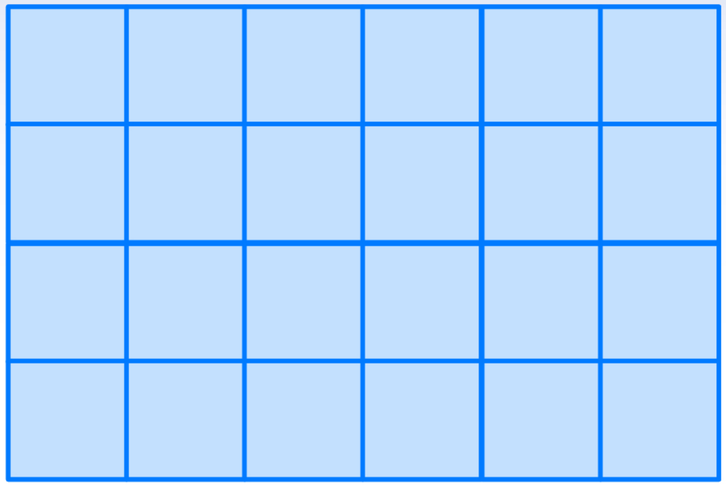




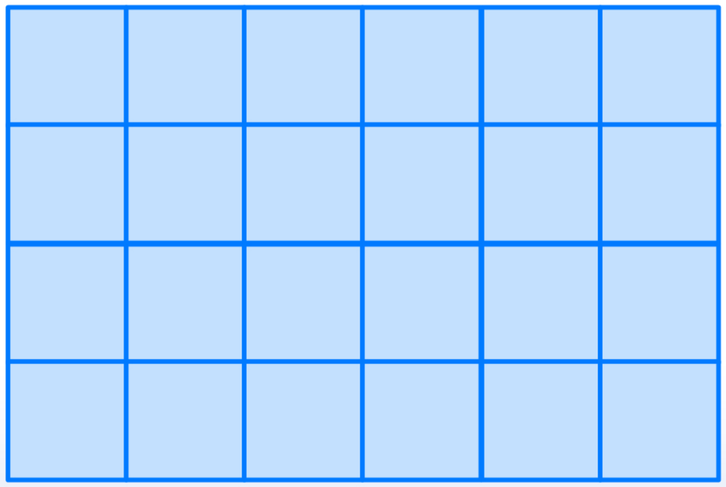
Perception of Stationarity and Smooth Motion in VR

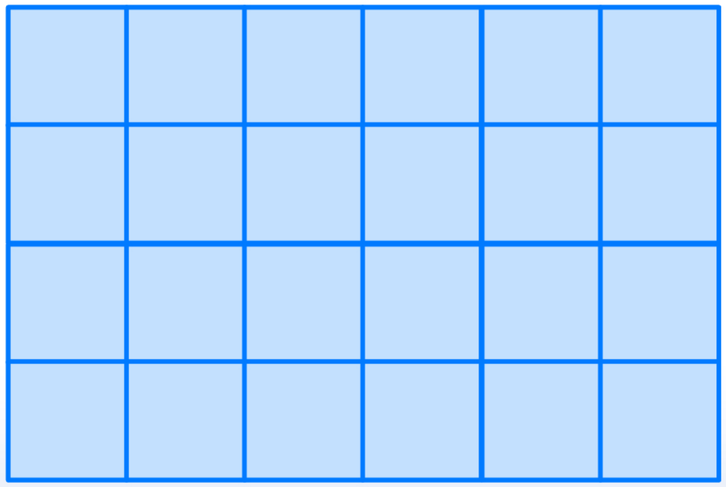
World fixed display





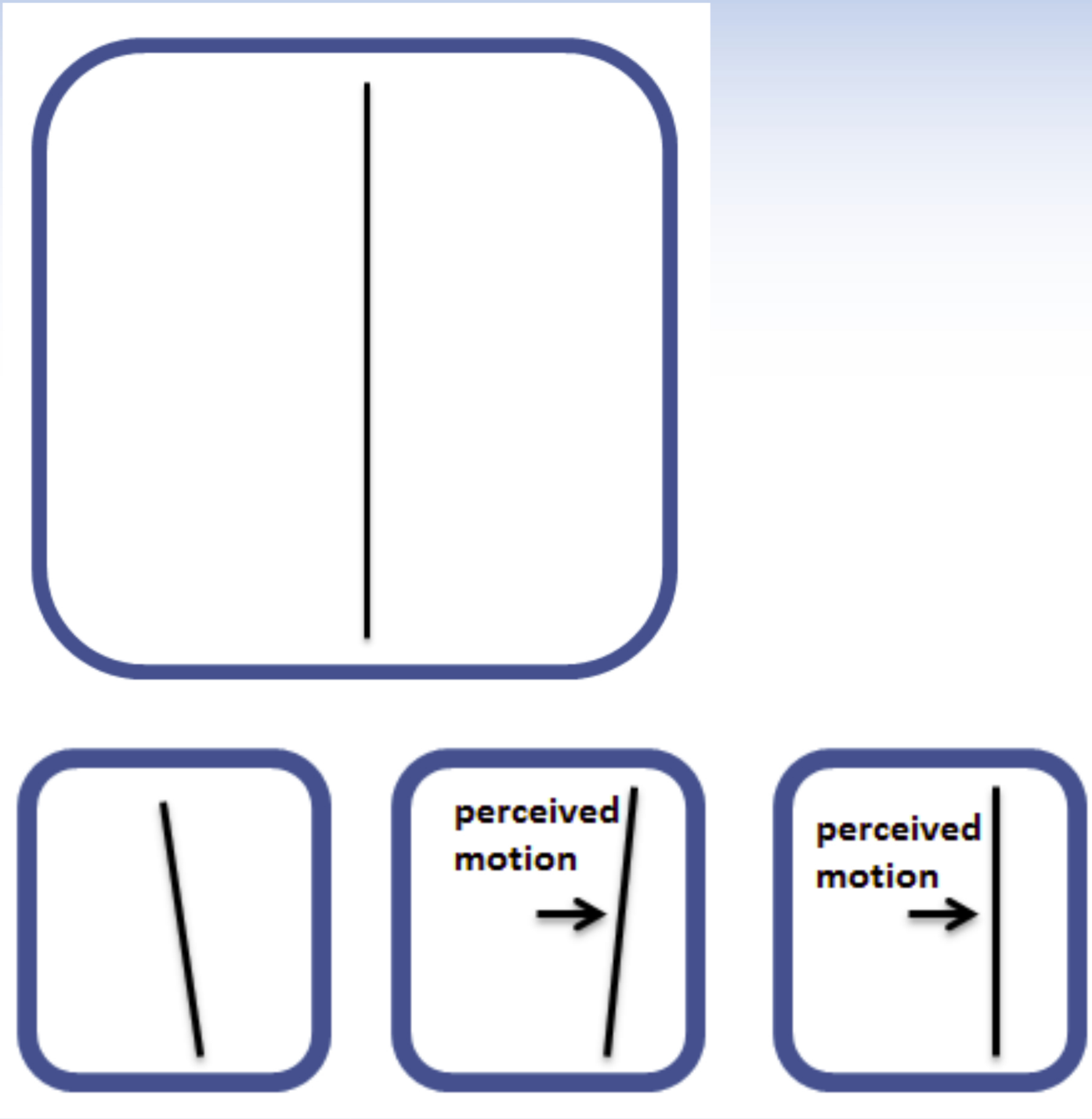
HMD





Scan Out Problems in VR

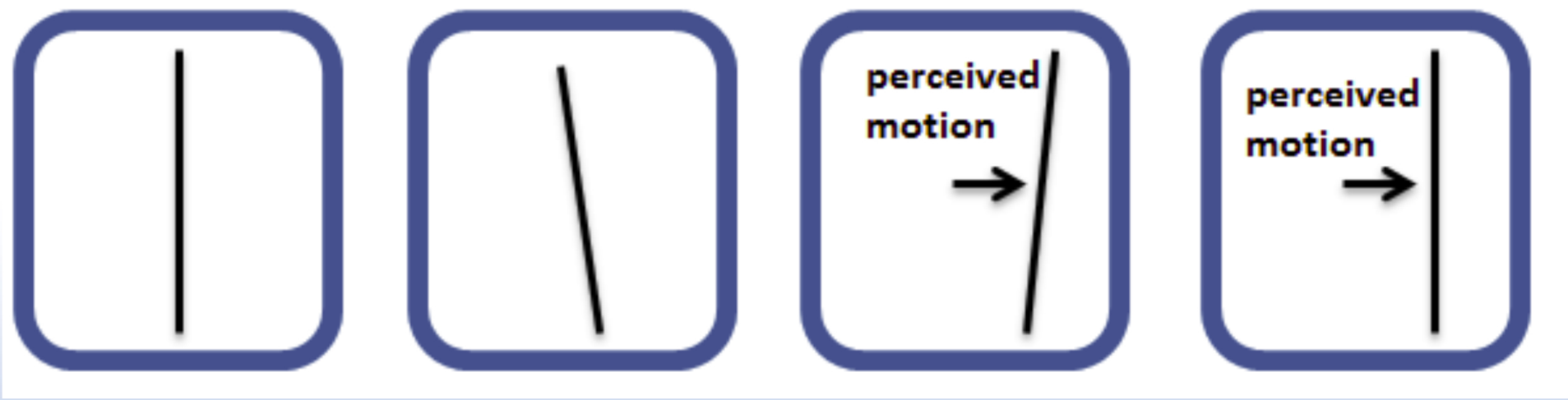
Scenario 1: Head is not moving; eyes are fixated on a vertical line; the vertical line is not moving on the display.



http://blogs.valvesoftware.com/abrash/raster-scan-displays-more-than-meets-the-eye/

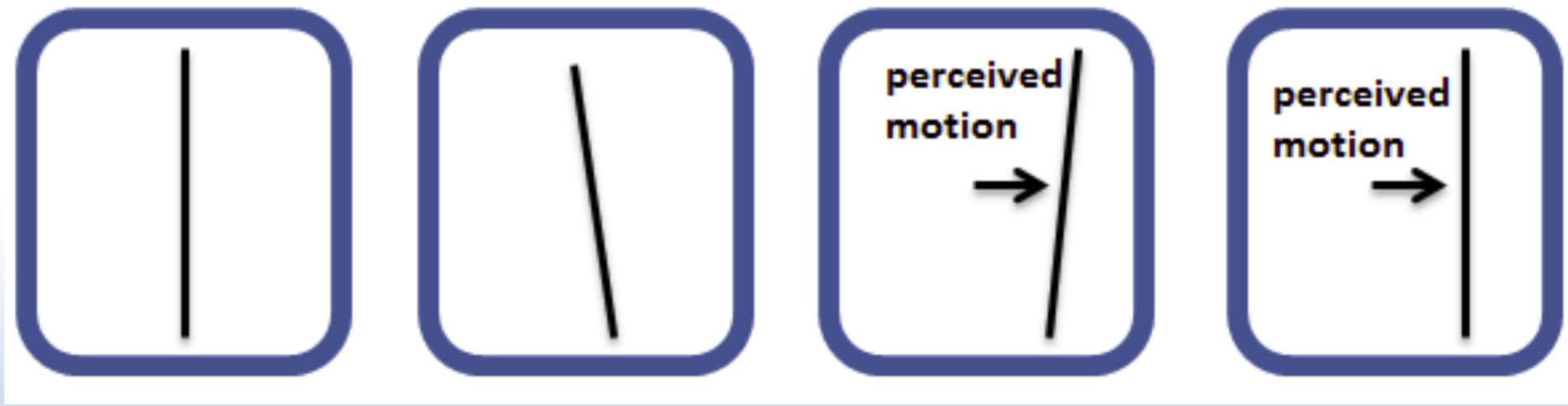
Scan Out Problems in VR

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



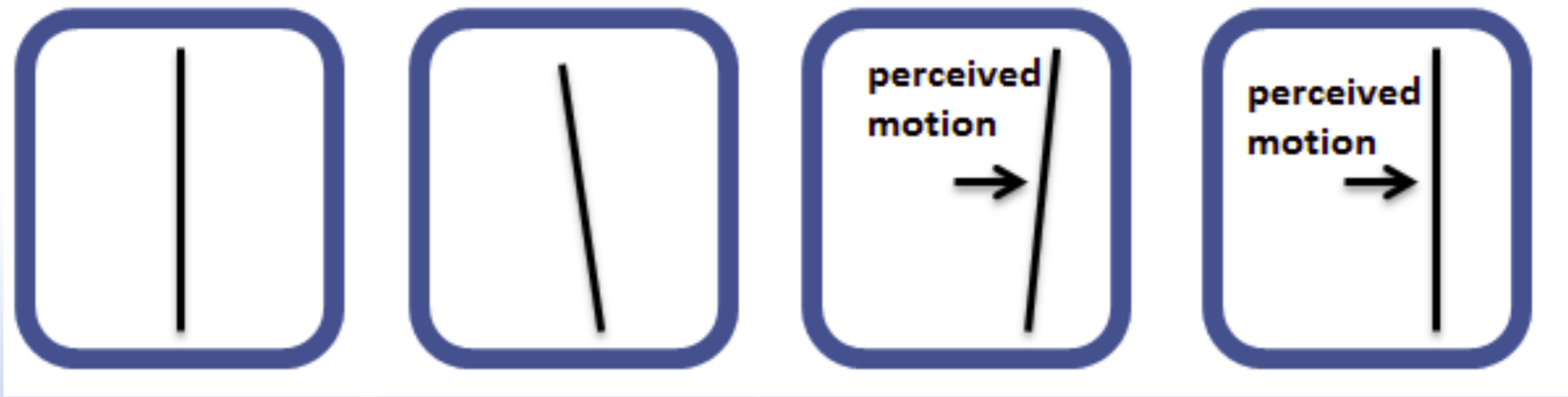
Scan Out Problems in VR

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



Tracking Systems in VR

What do we want to track?