

CSE 190: Virtual Reality Technologies

LECTURE #5: HUMAN VISION

Announcements

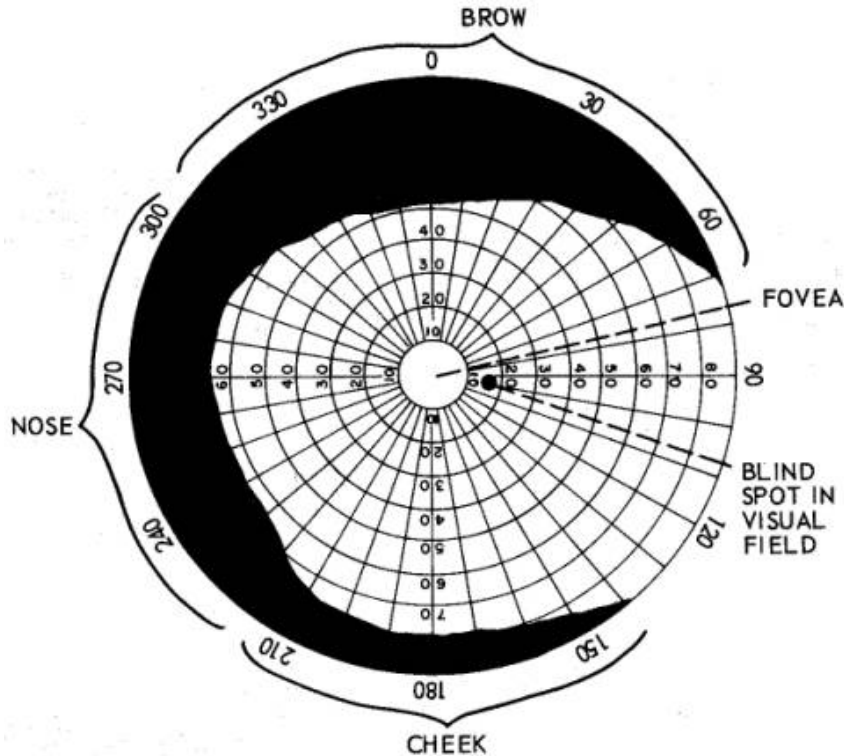
Homework project 1 is due this Friday at 2pm

- To be demonstrated in VR lab B210
- One member of each team:
Upload code to TritonEd by Friday 2pm

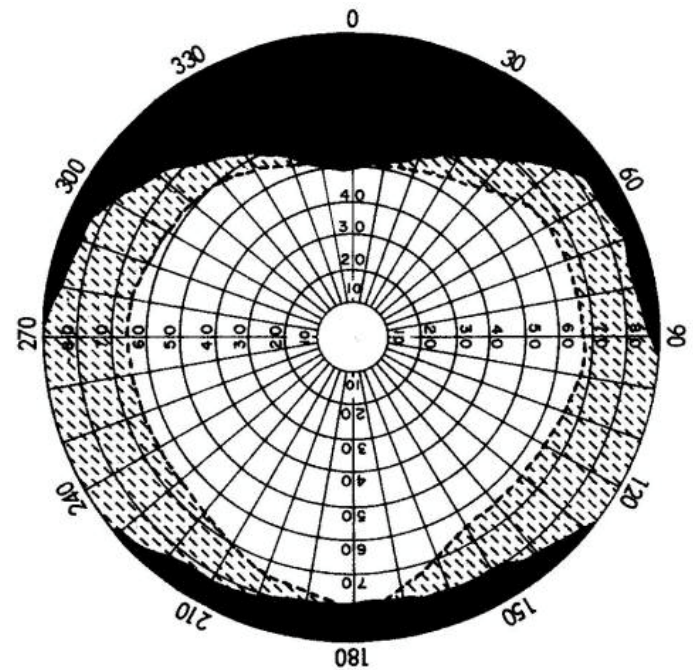
Human Vision

Field of View

Monocular visual field

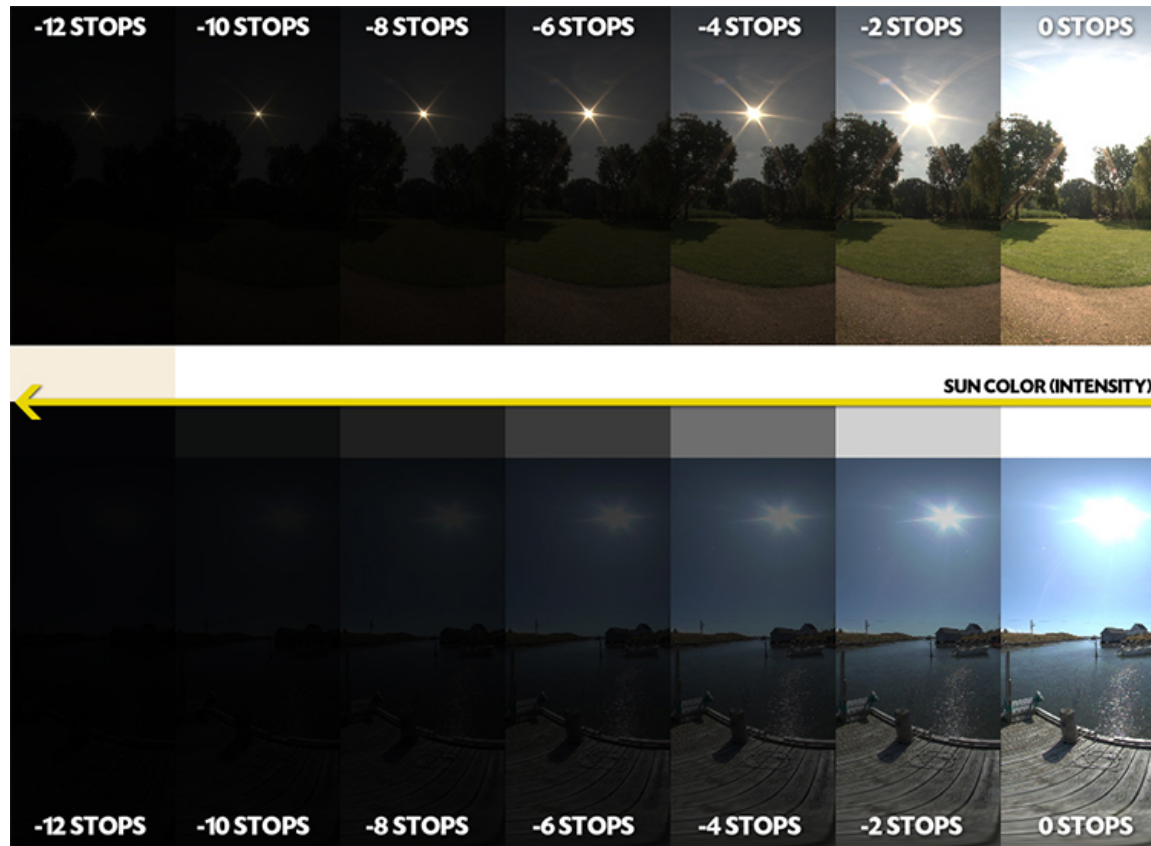


Binocular visual field



Horizontal field of view: $\sim 145^\circ$ per eye
Vertical field of view: $\sim 135^\circ$

Dynamic Range



100:1 (retina), 1 billion:1 (with iris)

Colors

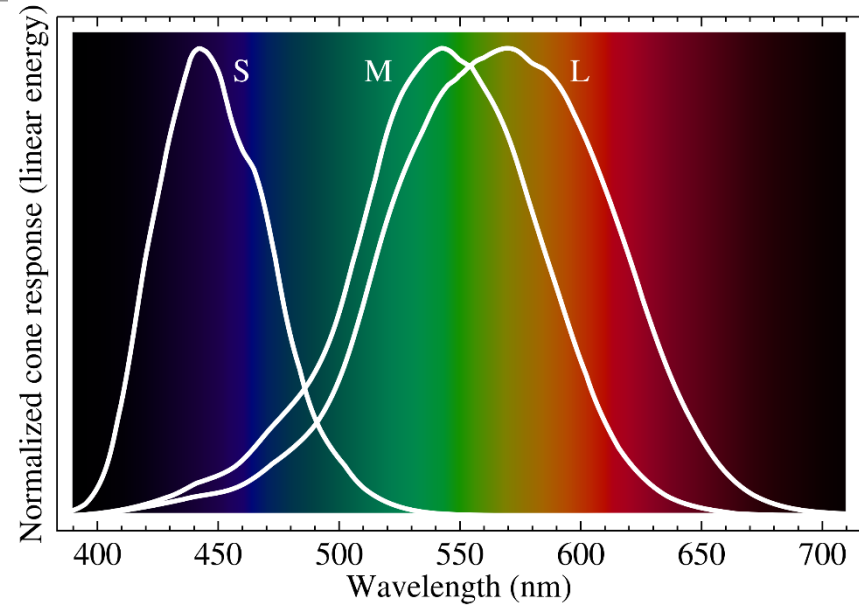
How many colors can the human eye distinguish?

About 10 million

But not evenly distributed in red, green and blue

32 bit can store 2 billion colors

→ 32 bit storage per color

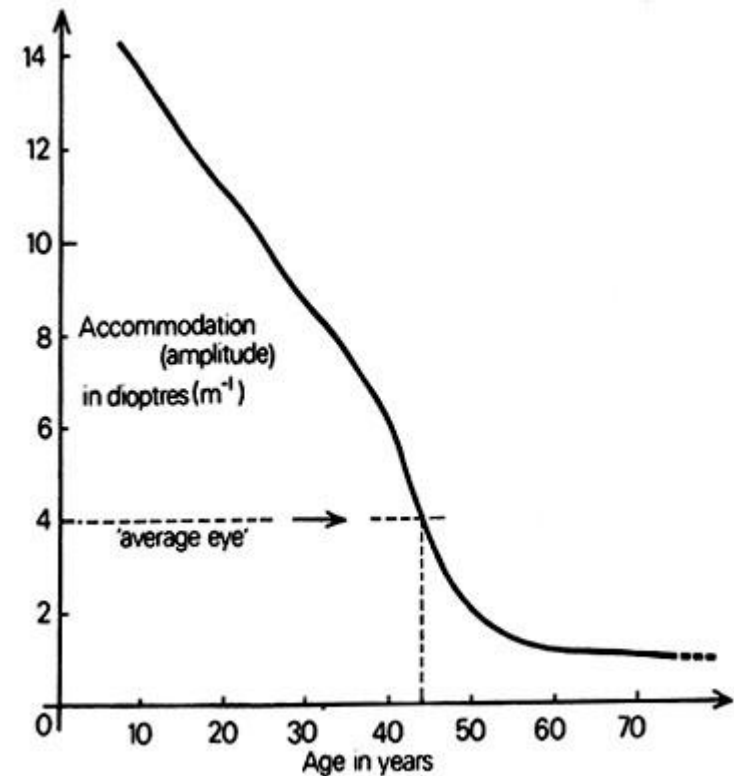


Accommodation Range

Age dependent

An 'average eye' likes to have things 25 cm away, or farther, for comfortable vision.

Young children can accommodate down to about 7 cm.



Summary

- Horizontal field of view: $\sim 145^\circ$ per eye
- Vertical field of view: $\sim 135^\circ$
- Pixel resolution: 150 pixels/degree
- Stereoscopic vision
- Temporal resolution: ~ 60 - 150 Hz (varies with brightness)
- Dynamic range: 100:1 (retina), 1 billion:1 (with iris)
- Colors: 32 bit color depth
- Accommodation range: ~ 7 cm to infinity

Retina VR Display

Resolution per eye:

145° x 135° with 150 pixels/degree resolution

→ 21,750 x 20,250 pixels = 440 Mpixels

Transmission of retina quality VR video in stereo: 528 Gbytes/sec

Full sphere: 1.7 Tbytes/sec = 13 Tbit/sec

With 300x compression: 45 Gbit/sec

Presents challenges to:

- Capture or render stereo panoramas
- Compress and transmit retina VR video over network
- Drive display pixels