CSE 190: Virtual Reality Technologies

LECTURE #7: STEREO

VR Content Presentations 4/25

Xinghang Li: Experience the Blue Angels in 360-degree video

- https://www.youtube.com/watch?v=H6SsB3JYqQg

Jiasheng Zhu: 360 Google Spotlight: Help

- https://www.youtube.com/watch?v=G-XZhKqQAHU&list=PLDn90-IQtk8ECc9ImldHoBlskWDzQ6Awf&index=4

Hoang Tran: Son Doong Cave

- http://www.nationalgeographic.com/news-features/son-doong-cave/2/
- https://www.youtube.com/watch?v=F60G7T4DF2I
- https://www.youtube.com/watch?v=h4EmrBPzfpE

Nikhilesh Sankaranarayanan: Dota2 VR

- Regular footage: https://youtu.be/uOAvtyFkln0?t=1m55s
- VR footage: https://youtu.be/l6US1o2nJL8?t=36s

VR Content Presentations 4/27

Carmen Tin: What Happens Inside Your Body
- https://www.youtube.com/watch?v=-FyN5_-njAU

Joshua Huang: Vraccoon
- https://play.google.com/store/apps/details?id=com.spxyz.vraccoon_card&hl=en
- https://www.youtube.com/watch?v=ZSWVVYfRb_o

Hanchao Liu: Inside the Tank
- https://www.youtube.com/watch?v=yV67vwiVaXc&list=PLU8wpH_LfhmsSVRA8bSknO4-2wXvYXS4C&index=15

Tianyang Li: Autism TMI Virtual Reality Experience
- https://docs.google.com/presentation/d/1pS-K3uyVDBYR8rV-69uuHEkaZNlmYAGazDtJq3IubE4/edit?usp=sharing
- https://www.youtube.com/watch?v=DgDR_gYk_a8

David Ruble: Large Hadron Collider
- https://youtu.be/d_OeQxoKocU

Announcements

Homework project 2

- On-line now
- Discussion moved to Thursday after class **in VR lab**
- Due next Friday May 5 at 2pm
  - To be demonstrated in VR lab B210

Stereo Imaging Techniques

Stereo Imaging: Concept

General concept: each eye sees a slightly different image

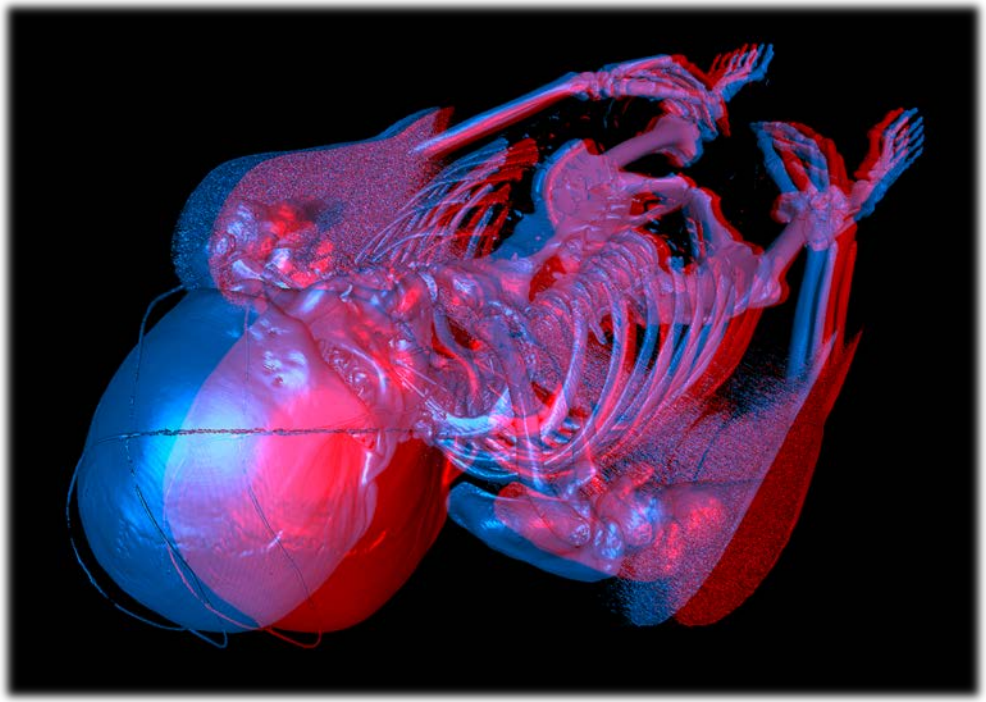
Example: Viewmaster:
left eye is shown one image on the disc, right eye sees a different image

Stereo Imaging: Anaglyphic

Requires red/blue, red/green glasses

Color is diminished (but not entirely lost)

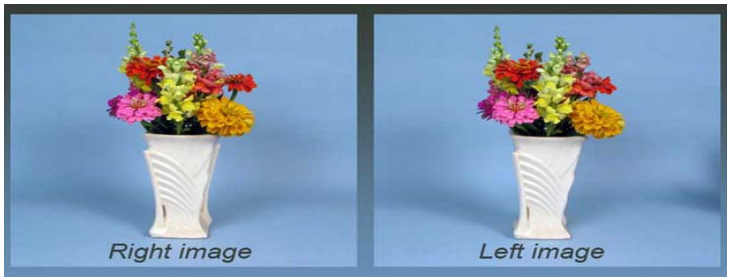
Example below: left eye: red, right eye: blue



Stereo Imaging: Side-by-Side

Stereo can be seen by fusing images: converge eyes in front or behind the actual image plane

Eyes converge behind image plane



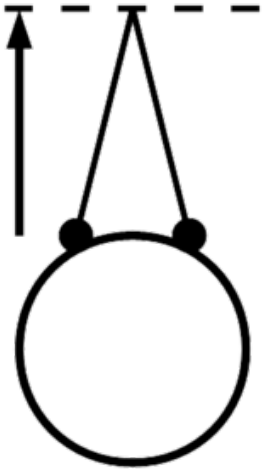
Eyes converge in front of image plane

Single Image Stereograms

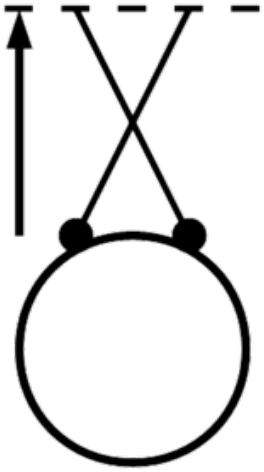
SIS: Single Image Stereogram

SIRDS: Single Image Random Dot Stereogram

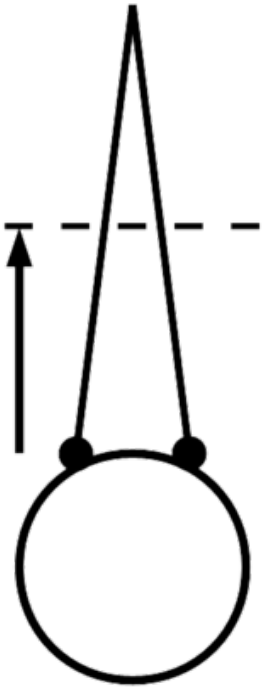
No glasses required



Aligned vergence and accommodation (normal viewing)

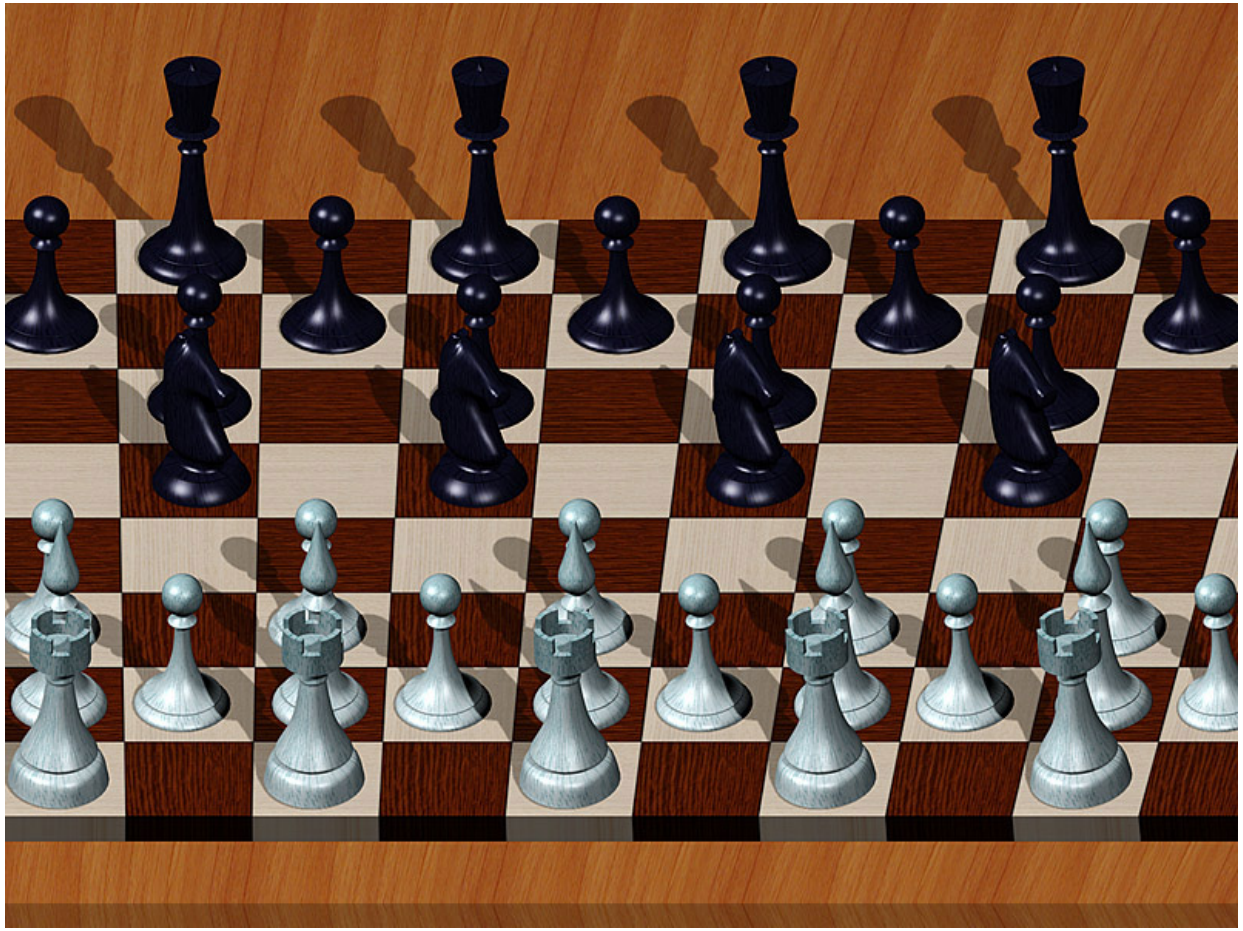


Cross-eyed vergence.
Arrow: accommodation

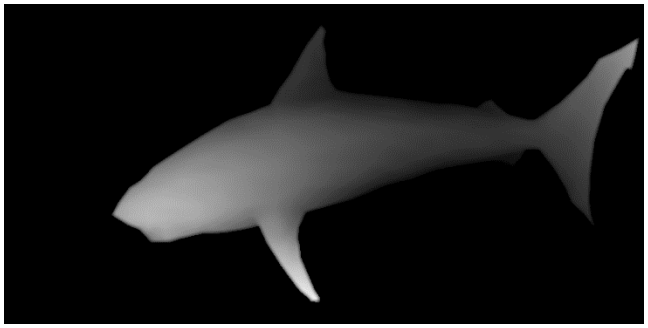


Wall-eyed convergence

SIS Example



SIRDS Example

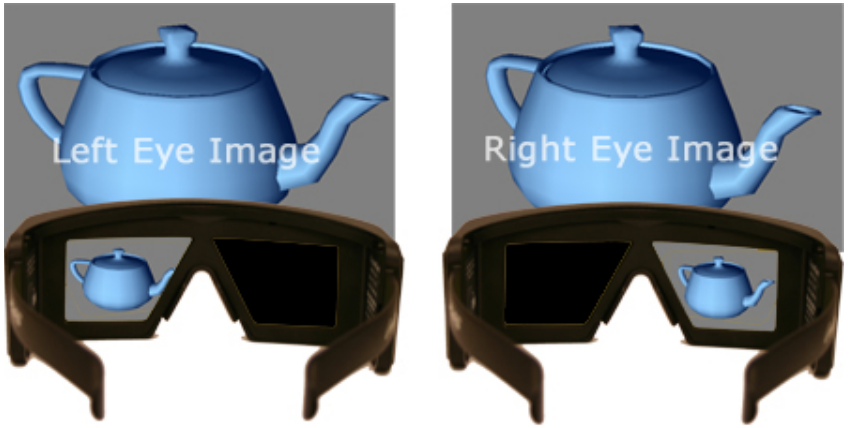


Stereo Imaging: Active Stereo

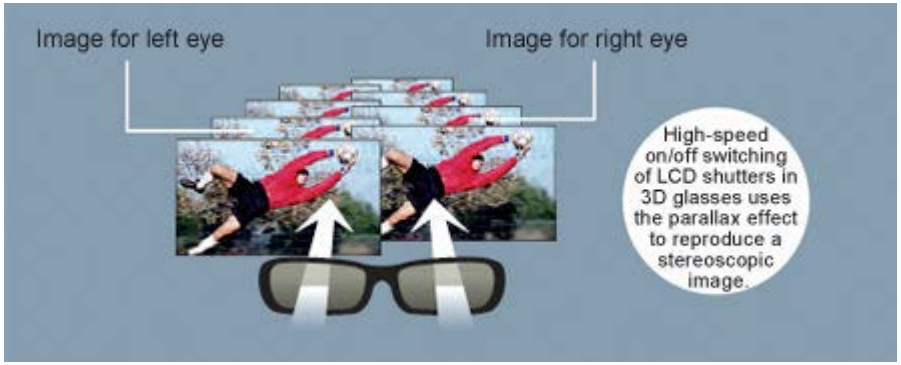
Display alternates between images for left and right eyes at 120+ Hz

Shutter glasses

- synchronized to display refresh rate
- more expensive than passive glasses (~$30+)
- require batteries



3D shutter glasses

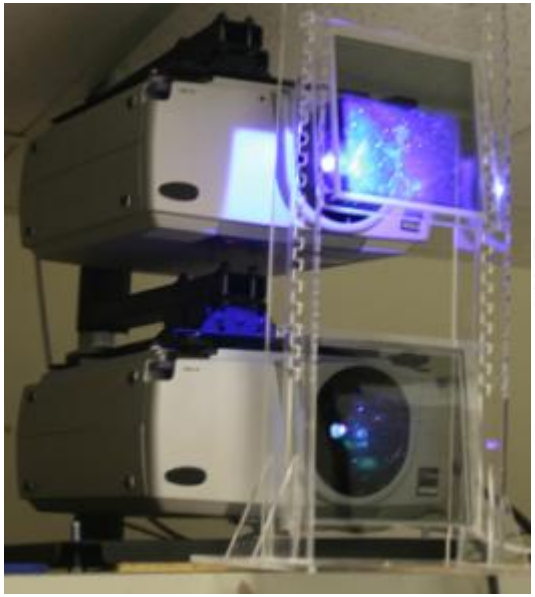


Stereo Imaging: Polarizing Filters

Linear polarization

Circular polarization: creates circularly polarized light by adding a quarter-wave plate after a linear polarizer

Polarizing glasses are inexpensive (~$2-10)



Stereo projectors

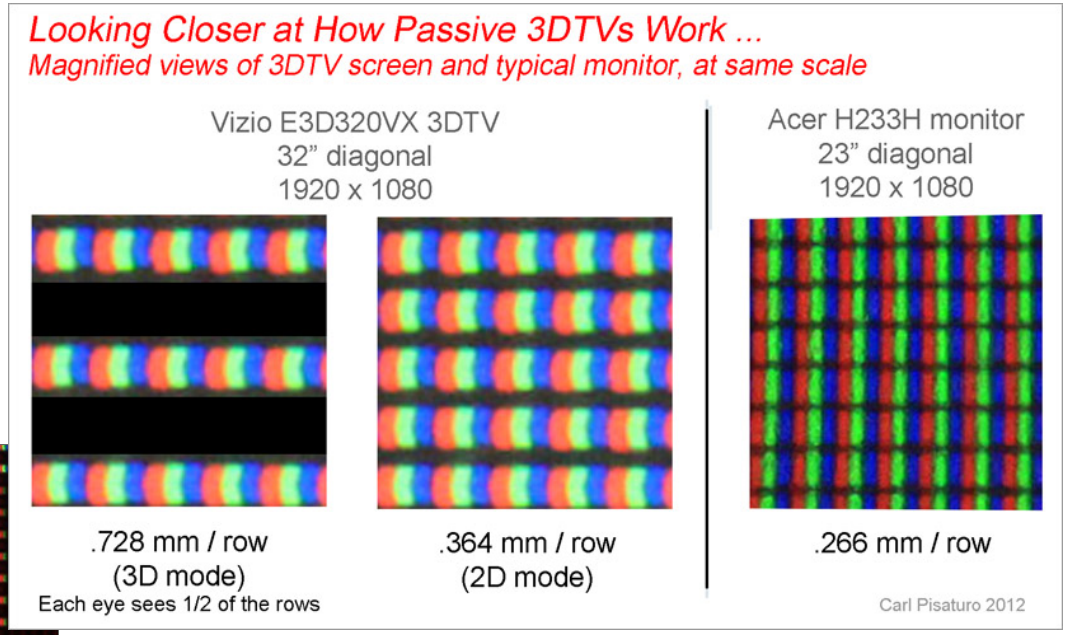
Polarizing glasses

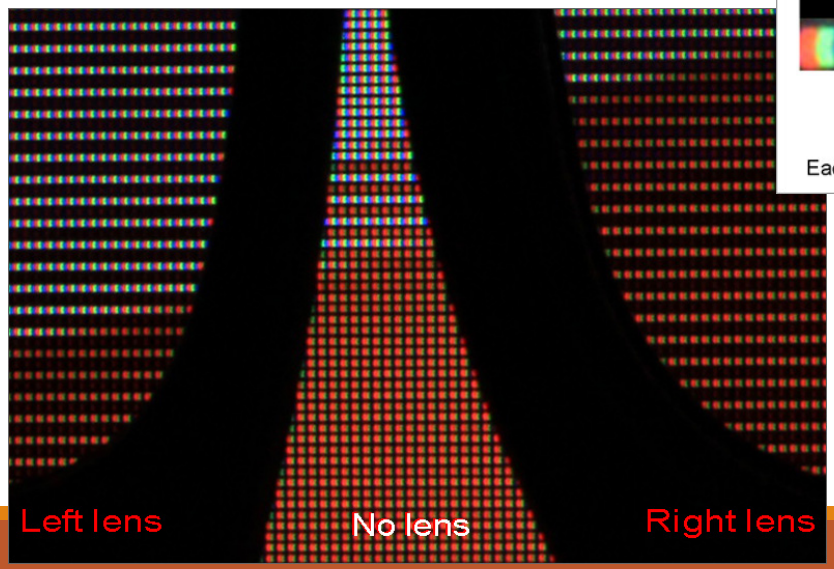
Passive Stereo Monitors

Filter on monitor polarizes alternating pixel rows clockwise/counter-clockwise

Best view point is on-axis

Off-axis viewers see ghosting





Stereo Imaging: Infitec

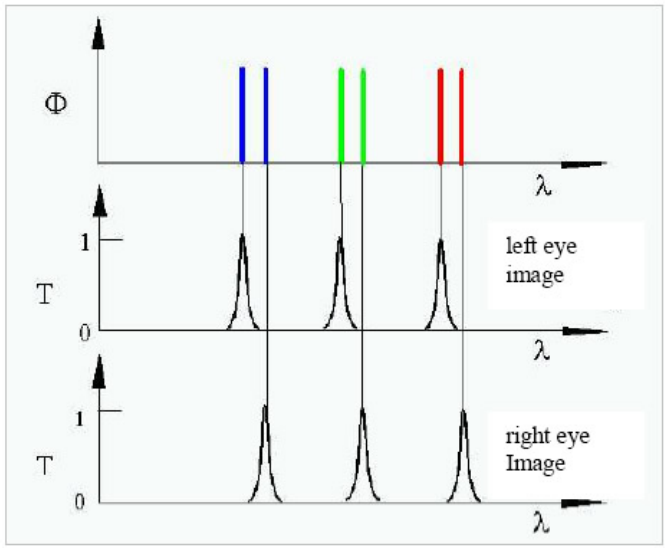
Clever technology, based on wavelength multiplexing

Two separate primary color triplets are filtered by glasses to generate two sets of primary colors

Infitec resulted from a research project at DaimlerChrysler

Projectors with Infitec filters

Infitec glasses



Primary color triplets

Autostereoscopic Displays

Light sent separately to each eye from a monitor

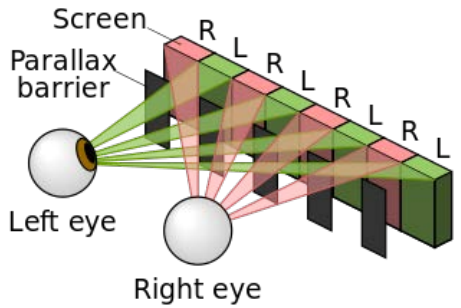
No headgear required

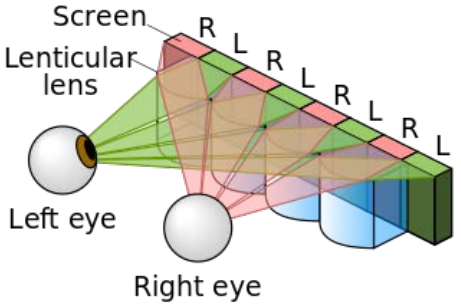
Tracked (dynamic) vs. non-tracked (static, sweet spot)

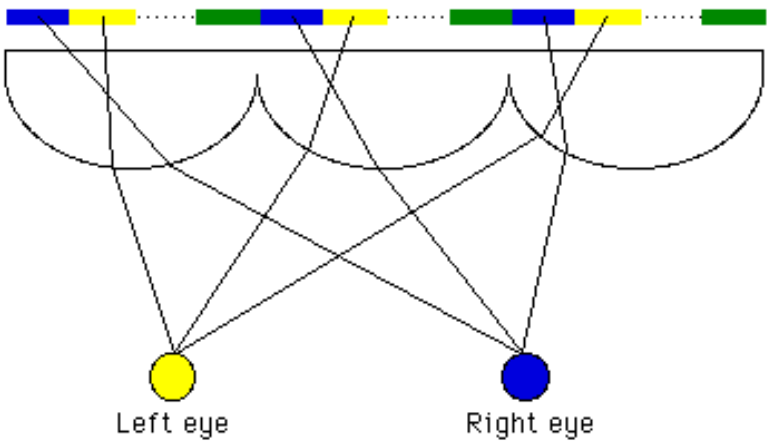
Approaches:

- lenticular screen
- barrier screen

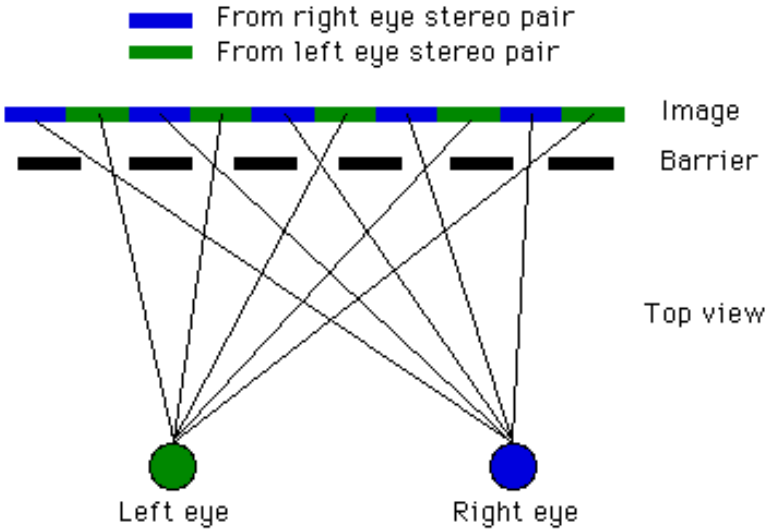
Autostereo







Lenticular screen



Barrier screen