CSE 190: Virtual Reality Technologies

Announcements

Homework project 3
- Due Friday, May 17th at 2pm
  - To be demonstrated in VR lab B210
  - Upload code to TritonEd by 2pm

Midterm exam on May 23rd

Late grading for project 2 this Friday at 2pm

Instructor's office hour
- This week: Tuesday and Thursday 3:30-4pm (room 2125)

Oculus Rift DK1

Funded through Kickstarter web site

Released March 2013

Single LCD display

1280 x 800 pixels

110 degrees field of view

60 Hz field of view

Fast, custom IMU

Head orientation tracking only (3 DOF)

No controllers

Oculus DK1 Kickstarter Page

Inertial Measurement Unit (IMU)

Measures
- gravitational force
- angular rate
- magnetic field (optional)

Consists of
- 3 accelerometers
- 3 gyroscopes
- magnetometer

Used in
- aircraft, spacecraft, satellites
- smart phones
- fitness trackers
- remote controls
- game controllers
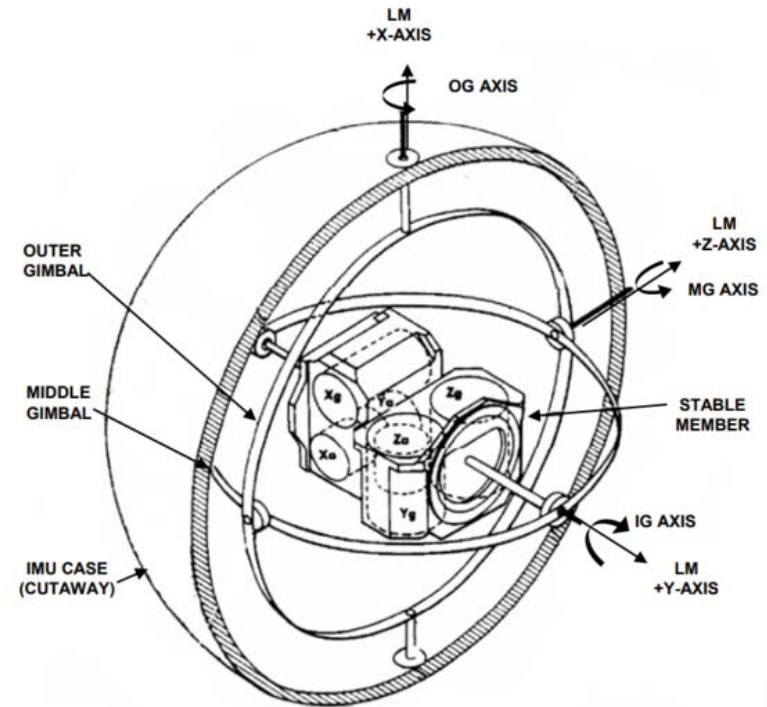
Oculus Rift DK2

Released July 2014

Single OLED display (same as Samsung Galaxy Note 3)

1920 x 1080 pixels

Field of view: 95 x 105 degrees

75 Hz refresh rate

Same IMU as DK1

6 DOF tracking with IMU and camera for head location tracking

No controllers

Sony Playstation VR

Released October 13, 2016

Sold for Play Station 4

Single OLED display

960 x 1080 pixels per eye

100 degrees field of view

90 or 120 Hz refresh rate

Fixed IPD

Headphone jack

Innovative head strap

External camera for tracking

6 DOF tracking with visible light in different colors

Uses Sony Move controllers

HTC Vive

Released April 5, 2016

2 OLED displays

1200 x 1080 pixels per eye

110 x 113 degrees field of view

90 Hz refresh rate

Adjustable eye distance (IPD)

Integrated camera

Headphone jack

Includes two controllers

6 DOF tracking with 2 Lighthouses

Oculus Rift CV1

Released March 28, 2016

2 OLED displays

1200 x 1080 pixels per eye

94 x 93 degrees field of view

90 Hz refresh rate

Adjustable eye distance (IPD)

Integrated headphones

Infrared LEDs on HMD and controllers

6 DOF tracking with infrared cameras ("sensors")

Initial Oculus Rift kit

Oculus Touch Controllers

Oculus Rift CV1 Teardown

Oculus Rift: Ear Phones

Face Foam

Infrared LEDs

Separate lens/display assemblies

CV1 Lens

Asymmetric

Hybrid Fresnel lens

Focus varies along vertical axis of lens

$\rightarrow$ Push lens higher or lower to focus

Lenses: DK2 vs. CV1

Circular vs. Asymmetric

Microsoft Mixed Reality

First devices released October 17, 2017

Virtual Reality HMDs
◦ No augmented reality, despite the name

Specifications by Microsoft

Dual 6 DOF controllers with infrared LEDs

Inside-out 6 DOF HMD tracking with two cameras

HMDs built by:
◦ Samsung, Dell, HP, Lenovo, Acer, Asus

HP Reverb

Released May 6, 2019

Windows Mixed Reality headset

2160 x 2160 pixels per eye

114 degrees field of view

90 Hz refresh rate

6 DOF inside out tracking

Same controllers as other Mixed Reality systems

HTC Vive Pro

Released April 5, 2018

Built-in stereo cameras for AR

1440 x 1600 pixels per eye

90Hz refresh rate

110 degrees FOV

Integrated headphones

New design with sizing dial

2 cameras

Tracking space up to 10 x 10 meters with new Lighthouses 2.0 (released April 23 2018)

HTV Vive Focus Plus

Released April 15, 2019

Standalone VR HMD

OLED display

1440 x 1600 pixels per eye

75 Hz refresh rate

110 degrees FOV

IPD adjustment

Qualcomm Snapdragon 835

Built-in headphones

Inside-out 6 DOF tracking

Includes 2 controllers

Oculus Quest

Release date: May 21, 2019

Standalone VR HMD

OLED display

1440 x 1600 pixels per eye

72 Hz refresh rate

100 degrees FOV

IPD adjustment

Qualcomm Snapdragon 835

Built-in headphones

Inside-out 6 DOF tracking

Includes 2 controllers

Oculus Rift S

Release date: May 21, 2019

LCD display

1280 x 1440 pixels per eye

80 Hz refresh rate

Internal speakers + headphone jack

Valve Index

Release date: July 1, 2019

1440 x 1600 pixels per eye

LCD display

120 Hz refresh rate (144 Hz experimental mode)

Integrated speakers

Lighthouse base stations 2.0

New Index ("Knuckle") controllers: sense finger positions, allow open hands