CSE 190: Virtual Reality Technologies

LECTURE #9: LOW-END HMDS

Announcements

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

Instructor's office hour
- Moving from Thursday to Tuesday this week, 3:30-4:30pm

Jobs and internships at BrainCorp (Sorrento Valley)

New script to fix folder access problem when running Oculus driver:
- "OCULUS_APRIL_FIX" is on the desktop
- Run as admin then open OCULUS after the file has run
- If the file is not on the desktop running the command "gpupdate" will put it there

Low-End HMDs

Google Cardboard

Requires smart phone

Compatible with Android and iOS

Built-in magnet serves as button

Inexpensive: <$10

Merge VR

$30 at Walmart or Amazon

Indestructible

7 color options

Cutout for camera

Bracket for controller

Not big enough for Iphone 6+

$29.99 ✓prime

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Gear VR

Requires Galaxy Note 5/8 or S6-9
◦ Different versions of HMD available

100 degrees field of view

Built-in low latency IMU (Internal Measurement Unit) with accelerometer and gyroscope

Head proximity sensor

Touch pad on right side

Phone related:
◦ 60 Hz screen update rate
◦ Resolution: 2560x1440
◦ Low photon latency <20ms
  ◦ Oculus worked with Samsung to optimize graphics driver

3 DOF controller

Google Daydream

Requires Daydream-ready phone
(eg, Pixel 1+2, Samsung S8/Note8)

90 degrees field of view

Built-in IMU

Proximity sensor

Lightweight fabric material (261g)

Includes 3DOF controller

Dedicated space for controller in
front cover

	Google Daydream	Samsung Gear VR
Optical Lens	90-degree field of view	101-degree field of view
Display	Depends on device	2560 x 1440 pixel Super AMOLED
Refresh Rate	Depends on device	60 Hz
Required Hardware	Google Pixel, Pixel XL, Huawei Mate 9 Pro, ZTE Axon 7, Motorola Moto Z, Asus Zenfone 3 Deluxe	Galaxy Note 5, Note 7, Galaxy S6, S6 Edge, S6 Edge+, S7, S7 Edge, S8, S8+
Sensor	Accelerator, gyrometer, proximity	Accelerator, gyrometer, proximity
Focal Adjustment	N/A	Focus adjustment wheel
Interpupillary Distance Coverage	~64 mm	54~70 mm
Physical UI	Motion controller (included)	Touchpad, Back button, volume key, and Gear VR controller (included)
Connection	Wireless connection	USB Type-C and MicroUSB
Dimensions	166.8 x 4.18 x 3.88 mm	201.9 x 116.4 x 92.6 mm
Weight	220 grams	310 grams
Color variants	Slate, snow, and crimson	Blue black, orchard gray
Price	$60 (incl. controller)	$90 (incl. controller)

Oculus Go

Qualcomm Snapdragon 821

2,560 × 1,440 pixel LCD display

Binary compatible with Gear VR

Fresnel lenses

Built-in stereo speakers for spatial audio

3.5mm Headphone jack

3 DOF controller

32GB ($200) or 64GB ($250)

Released May 1st, 2018

Issues Today

High-End (PC-Based) VR:

◦ Too many cables: HMDs need to become wireless

◦ Drivers: most Windows only, few Mac OS, no Linux

◦ Camera calibration cumbersome

Low-End (Smart Phone) VR:

◦ Most apps only have orientation tracking

  ◦ Position tracking possible with Apple's ARKit and Google's ARCore, but not yet widely used

◦ Hand-held controllers not standardized and not supported by many apps

Both:

◦ More powerful GPUs needed for more realism

◦ HMDs don't allow view of environment and look weird: socially awkward

◦ AR coming, but not ready for widespread use