Upcoming Deadlines

Sunday, June 6: Project 4 due

June 7+8: Final exam Monday 11:30am – Tuesday 11:30am
App Presentations

Baily Chen
  ◦ Minecraft VR

Juan Ramirez
  ◦ Super Hot VR
Final Exam

Exam window: Monday 11:30am – Tuesday 11:30am

Exam duration: 3 hours (continuous block)

Exam type: written exam (Canvas Quiz)

Open book, open internet

No consulting of other people (local or remote)

No posting or discussing exam questions or answers
Panoramic Photos and Video
360° Photos

A.k.a. panoramic photographs, surround images, image spheres

360° photos simulate being in the shoes of a photographer and looking around to the left, right, up and down as desired as well as sometimes zooming.

Popular example: Google Streetview
  - [https://www.google.com/streetview/](https://www.google.com/streetview/)
VR Video Formats

Fixed view 3D stereo videos are typically stored side-by-side:

360 degree 3D stereo videos are stored in over-under format:
360° Video on Youtube

Youtube VR videos can be viewed with almost any VR device:
- Google Cardboard, Daydream, Gear VR, Oculus, Playstation VR, HTC Vive

Youtube supports 360 degree videos
- uses Mercator projection
- 3D stereo in over-under format with up to 8192 x 8192 pixels resolution

Example: City tour of Rome (monoscopic 360 degree video)

https://www.youtube.com/watch?time_continue=93&v=1ziMH_IAUW0&feature=emb_logo
Panorama Capture Devices
Smartphone

Most smartphones have panorama photo capture modes/apps

Photos are 360 degrees but monoscopic
Samsung Gear 360

Two versions: released in 2016 ($350) and 2017 ($230)

360° Photos:
  ◦ Dual Lens: 25.9 MP (7200 x 3600) (2016) or 15MP (5472 x 2736) (2017)

360° Video:
  ◦ Dual Lens: up to 4096 x 2048 (24fps)

2017 version has better picture quality

Sensors:
  ◦ Gyroscope, Accelerometer

Storage: microSD

IP53 Dust and Splash-proof
Vuze XR

Photos: 6000 x 3000 pixels
Video: 5.7K@30 fps
Storage: microSD
Lenses: 2x F/2.4 210° fisheye lenses
Sensors: 2 x Sony 12MP
Price: $400
Google VR180

Limited to 180 degree FOV

Advantage: much easier to shoot
- Camera people don’t need to hide
- Camera and audio equipment can be used almost like in traditional video production

Lenovo Mirage Camera

YI Horizon VR180 Camera
Vuze+

Spherical Resolution: 4K (per eye)
Frame rate: 30fps for 3D or 60fps for 2D
Sensors: 8 Sony FHD image sensors
Lenses: 8x F/2.4 fisheye lenses
Media FOV: 360°x180° (Full Spherical)
Price: $700
Nokia Ozo

Released 2015
Discontinued 2017
Price: $45,000
8 lenses
3D 360 degree stitching
Samsung 360 Round

Price: $10,500

17 cameras with 2MP image sensor and F1.8 Lens
  ◦ 16 horizontal, 1 up camera

3D Video 3D: 4096 x 2048 at 30fps per eye

6 microphones for spatial audio

IP65 Splash and Dust Resistant

Weight: 4.3 lbs
3D Video: Google Jump Yi Halo

Price: $20,000

16 horizontal cameras + 1 up camera

Sensors: Sony IMX377, 1/2.3", 12 megapixels CMOS

Lenses: F2.8 aperture / 155° wide-angle

Omni-directional microphone

Battery: ATL 93Wh high density lithium polymer battery, battery life 100 minutes in video recording

Video and photo resolution:
  • 8192x8192 @30fps
CAVECam
For full 360° by 180° Panoramas
By UCSD’s Drs. Tom DeFanti and Dan Sandin