CSE 190: Virtual Reality Technologies

LECTURE #18: VR CONTENT CREATION

Internship Opportunity by Prof. Pinar Yoldas

I am in the process of moving an offline project online and need VR wizards on our team.

The project is for the Venice Architecture Biennial, the top architecture event in the world.

https://docs.google.com/document/d/1P1pvhLFPoc-_AtxbCKmD0iNabUxGkil7eXFdKk8KBL8/edit

Contact:

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Announcements

Project 3 due this Sunday, May 31st at 11:59pm

- Late submissions accepted until June 7th at 11:59pm

Monday 1pm: Discussion with TA Andrew and instructor

- Topic: final exam

Tuesday: Guest speaker Sam Hessenauer from Nanome, Inc.

Today's VR app presentations:

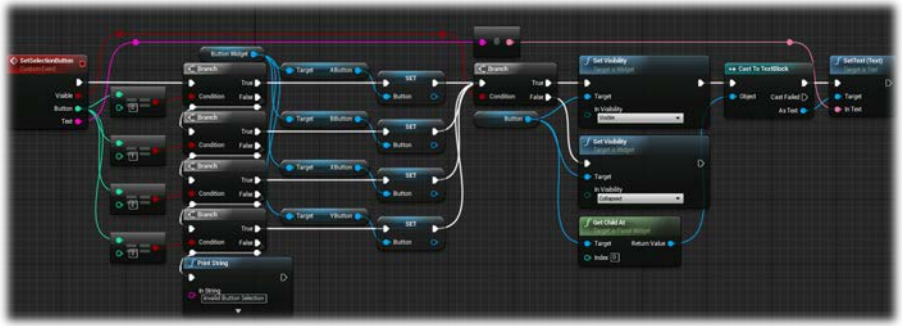
- Wei Zeng: BoxVR
- Wenlin Mao: InCell VR
- Andrew Chang: Boneworks

VR/AR Authoring Tools

Unity
- Scripting in C#

Unreal Engine by Epic Games
- Scripting in C++
- Blueprint visual scripting system

Amazon Lumberyard
- Based on CryEngine
- Scripting in C++ or Lua



3D Modeling Tools

Blender (open source, free)

Sketchup (free)

Maya

3ds Max

Rhino 3D

… and many more

3D Scanning

Example: Matter and Form 3D scanner
- Available in CSE VR lab (B210)

Scan accuracy
- Within ± 0.1mm

Maximum object size and weight
- Height: 9.8 in
- Diameter: 7.0 in
- Weight: 6.6 lbs

Photogrammetry

Photogrammetry is the 3D reconstruction from photos

- Photos often taken with drone
- Works best with >1000 photos

Agisoft Metashape

- https://www.youtube.com/watch?v=9Xa1dUaFCyc

Autodesk ReCap

- https://www.youtube.com/watch?v=jups9i9fKvQ

Summary

All of the above content creation methods are a lot of work

- Programming, 3D modeling, scanning, taking 1000s of pictures

Is there an easier way to create VR content?

Panoramic Photos and Video

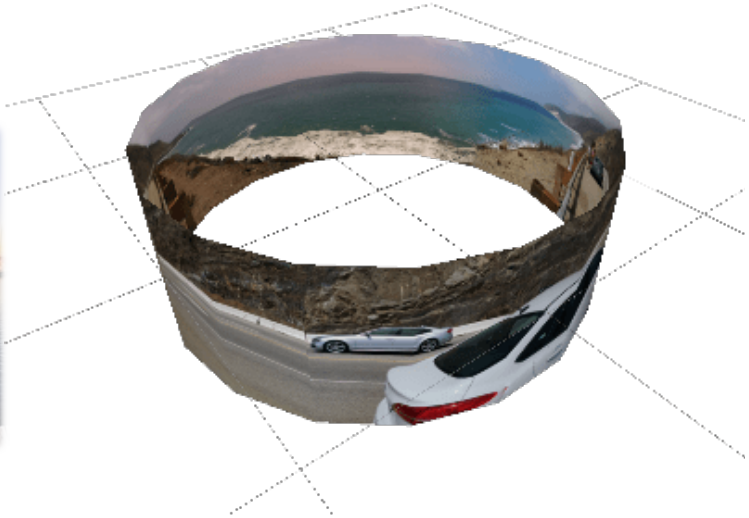
360˚ Photos

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

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

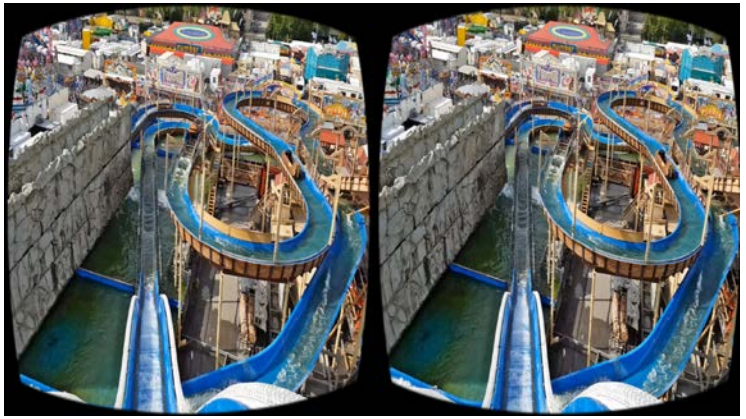
Popular example: Google Streetview

- https://www.google.com/streetview/



VR Videos

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_lAUW0&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

V1 (2016)

V2 (2017)

Vuze XR

Photos: 6000 x 3000 pixels

Video: 5.7K@30 fps

Storage: microSD

Lenses: 2x F/2.4 210^{o} 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 Tom DeFanti and Dan Sandin