

Depth Sensing & Photogrammetry

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Experimental Visualization Lab

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3D Depth Sensing



Microsoft Kinect: Licensed from PrimeSense (2010)

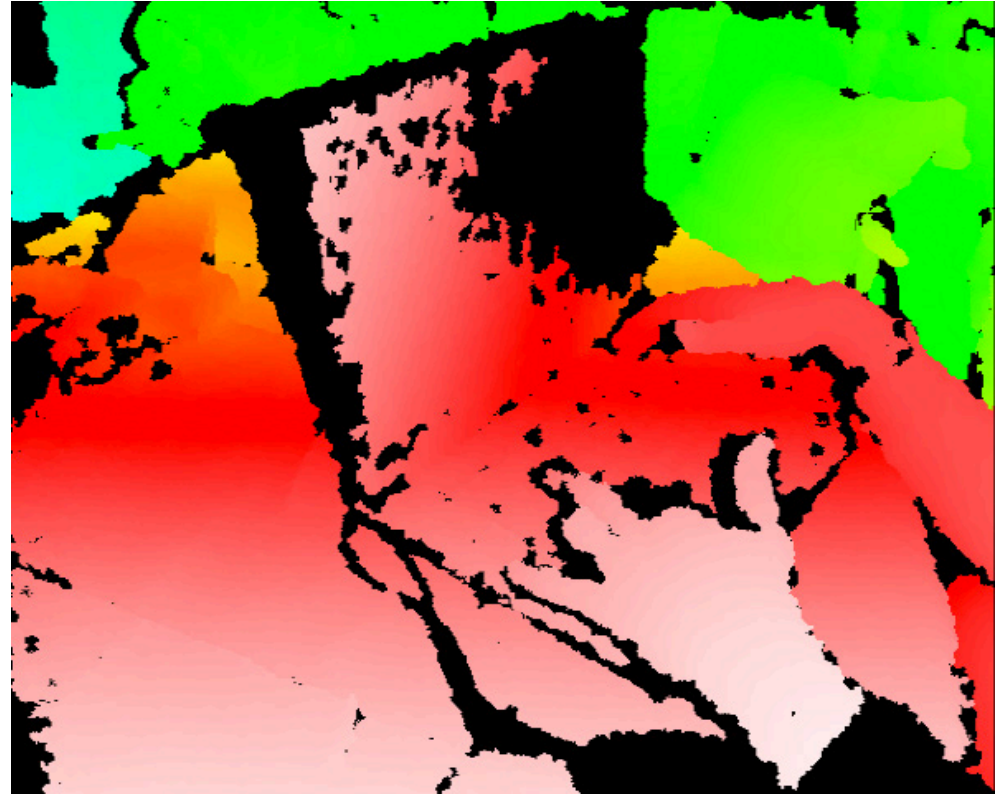
Motion sensing input device (infrared projection/detector)

Analyses projected pattern to measure depth (structured light)

Realtime gesture recognition, body skeletal detection (up to 4 people). Natural user interface

Apple acquired PrimeSense in 2013. Integrated features into iPhone

Depth Sensing



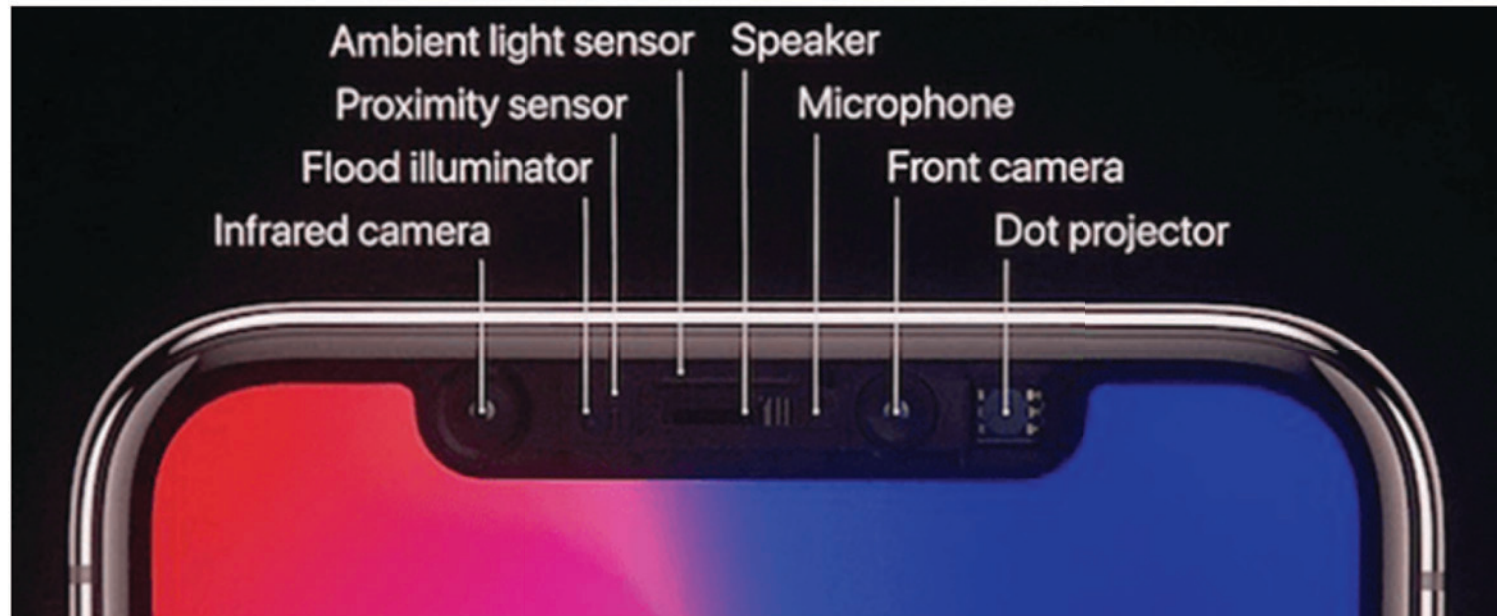
1st version: Near-infrared pattern projected across the space in front of the Kinect, while an infrared sensor captured the reflected light pattern

Next version “time-of-flight”: infrared projector on the Kinect sends out modulated infrared light which is then captured by the sensor. Infrared light reflecting off closer objects will have a shorter time of flight than those more distant.

Depth Sensing

What is the TrueDepth camera system?

The iPhone X launched a completely redesigned front camera system. Apple calls this system the TrueDepth camera. What does the TrueDepth camera do? Where is the TrueDepth camera?

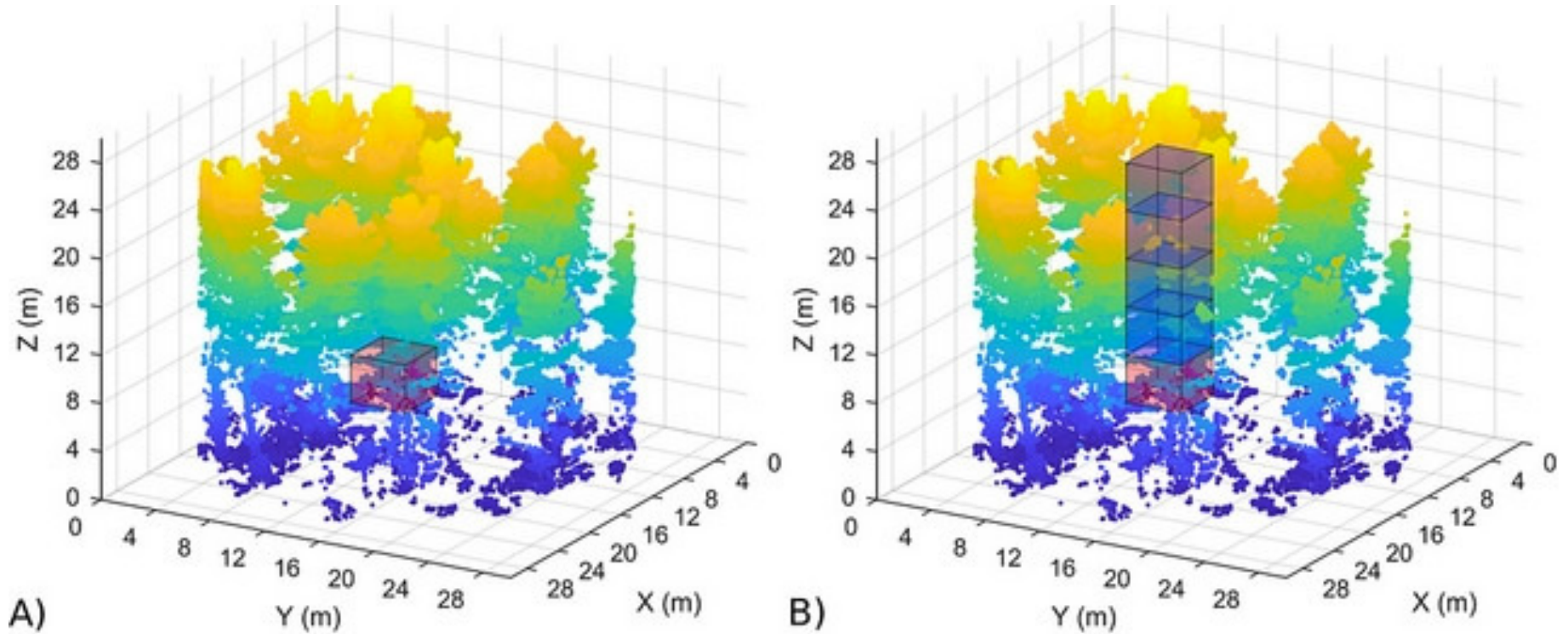


Apple's TrueDepth camera system replaces the front facing camera on the iPhone X and later. In addition to a 7 megapixel (MP) camera for photos, the system features several components dedicated to capturing 3D information for Face ID authentication and Animoji.

A dot projector throws over 30,000 dots onto the user's face, which are then captured by an infrared camera. To ensure the system operates properly in the dark, a flood illuminator adds more infrared light when needed.

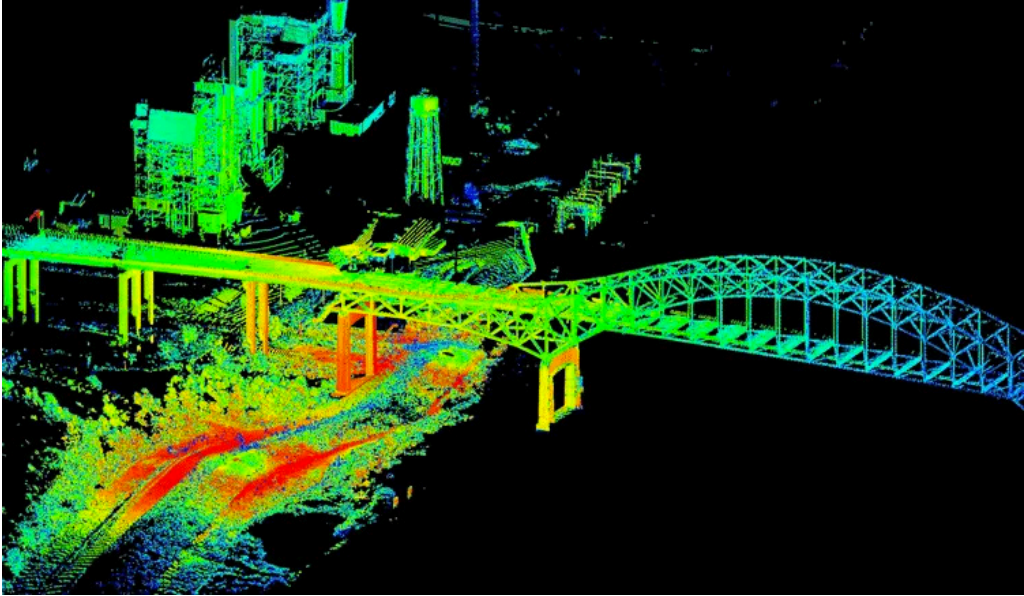
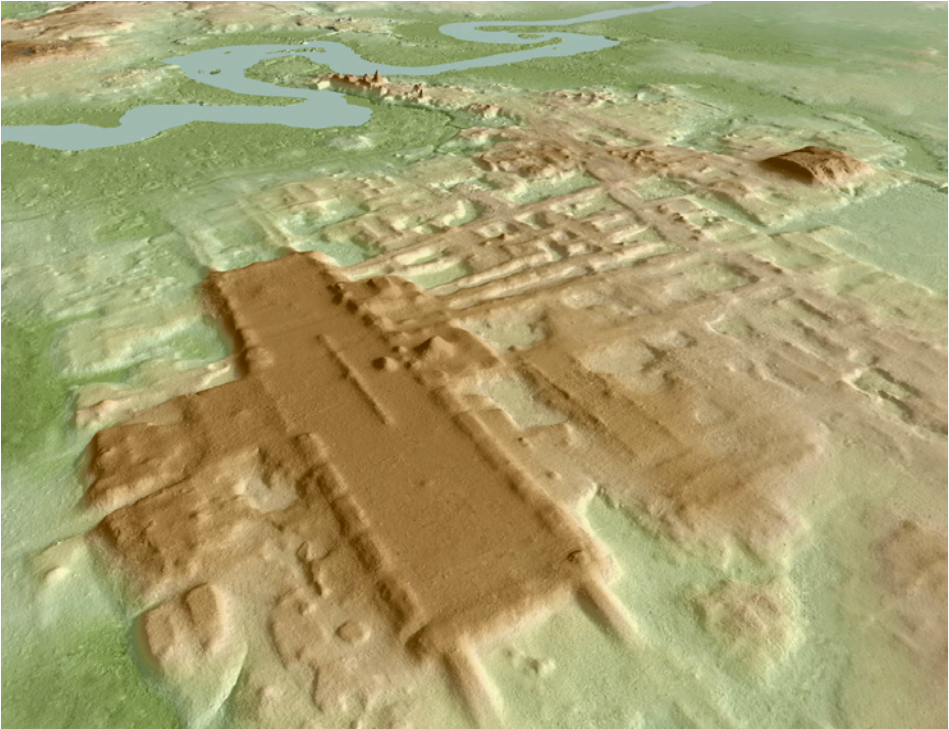
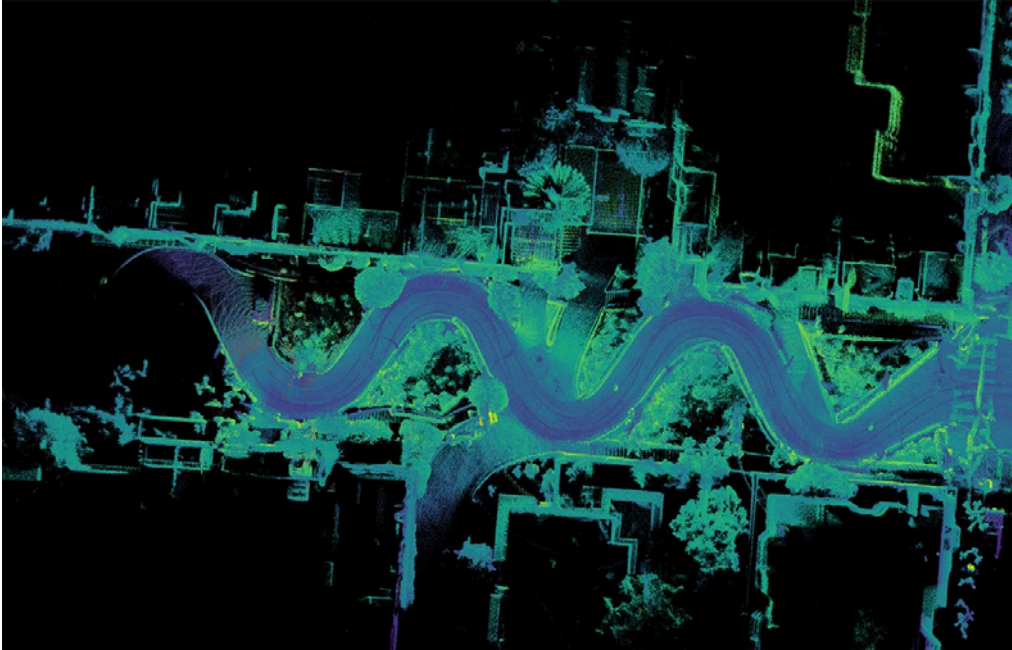
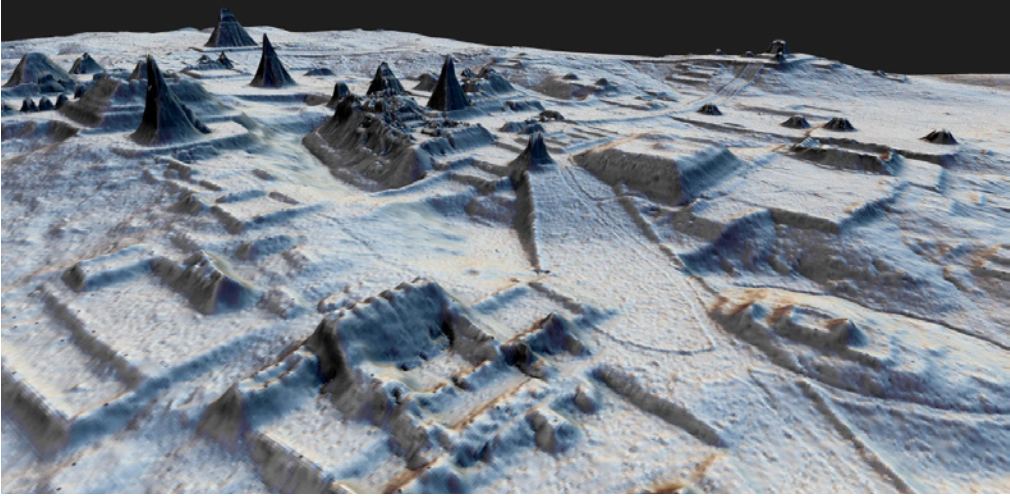
<https://www.iphonefaq.org/archives/976228>

Voxel: A 3D pixel



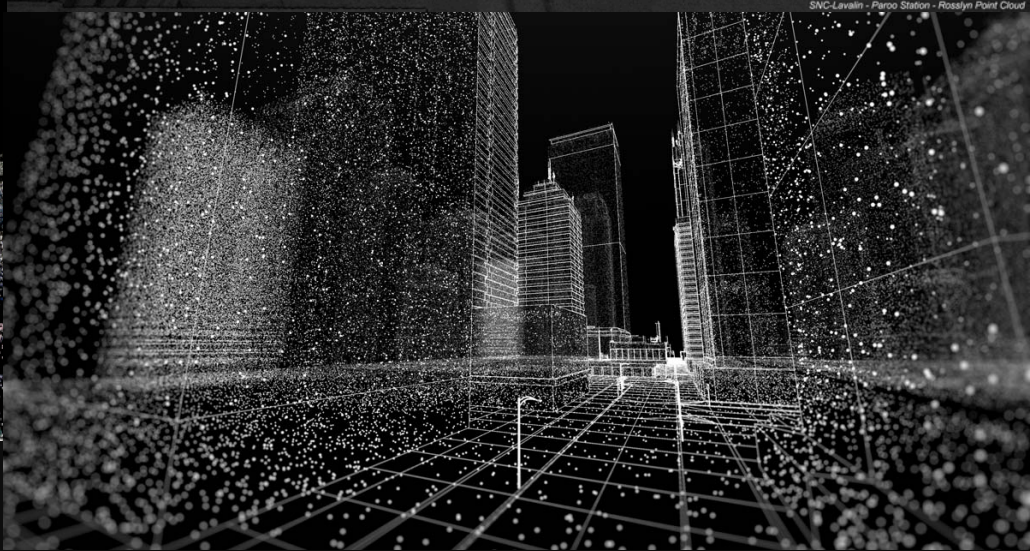
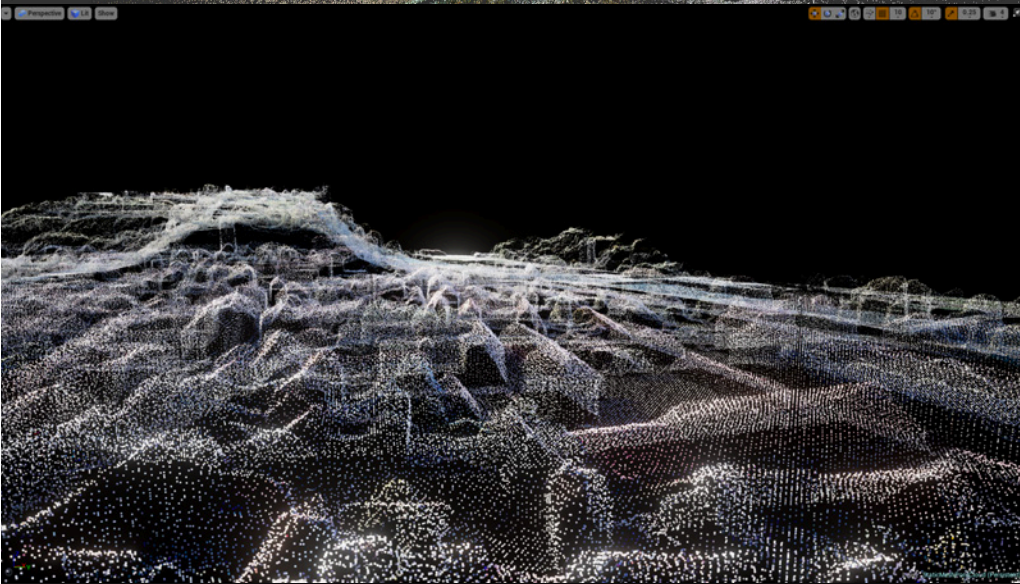
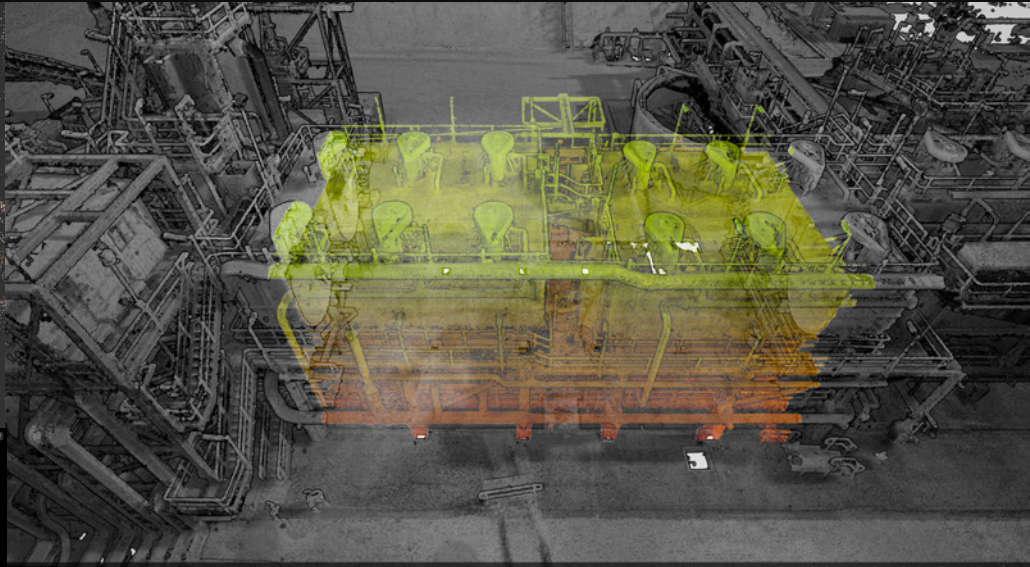
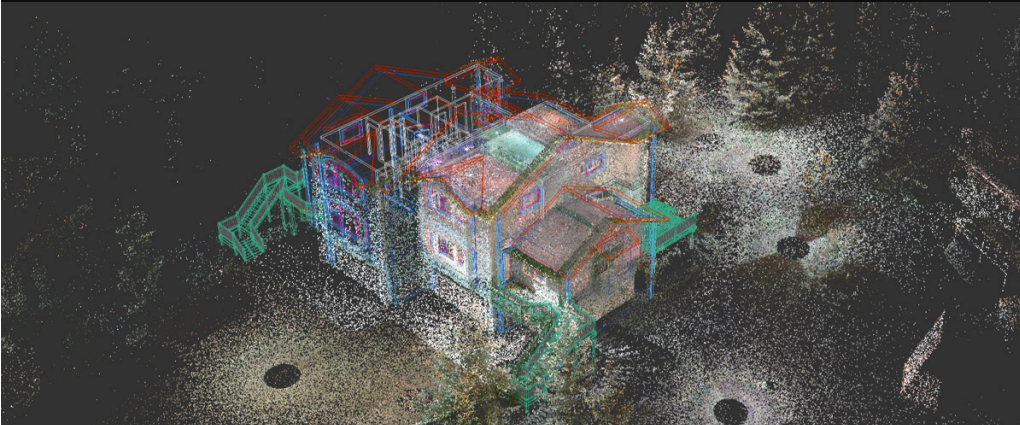
Voxels can be thought of as 3D pixels or cubes that are formed around a 3D point cloud.

Lidar: Light Detection And Ranging



<https://ouster.com/blog/lidar-mapping-with-ouster-3d-sensors/>

Point Cloud



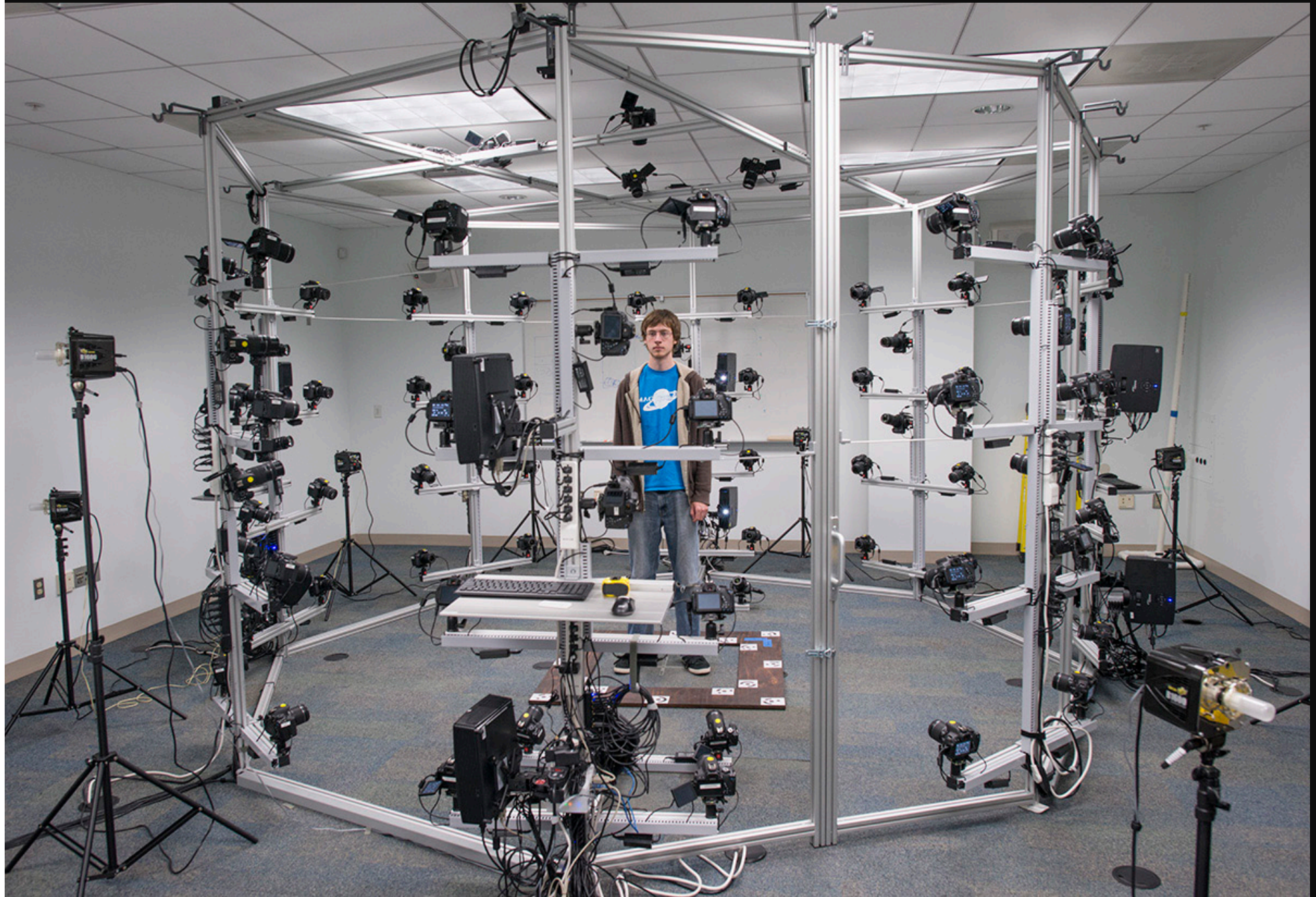
<https://answers.unrealengine.com/questions/572630/view.html>

Point Cloud Photogrammetry in Cultural Heritage



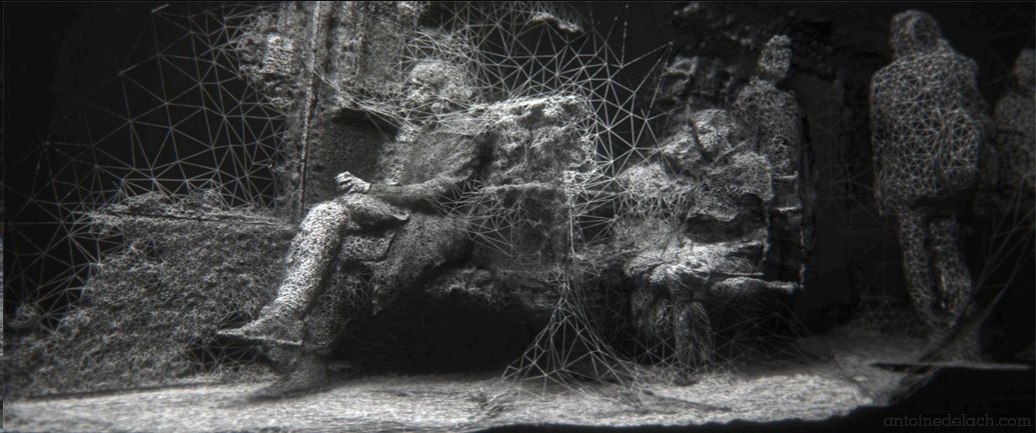
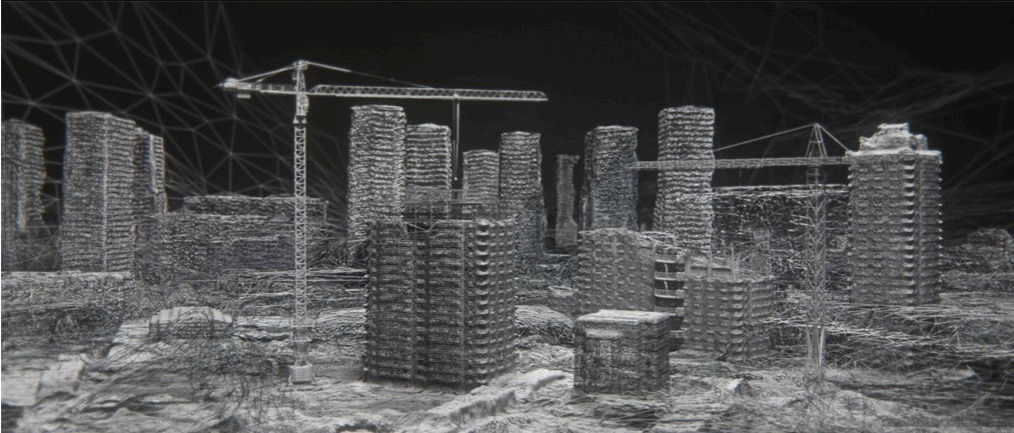
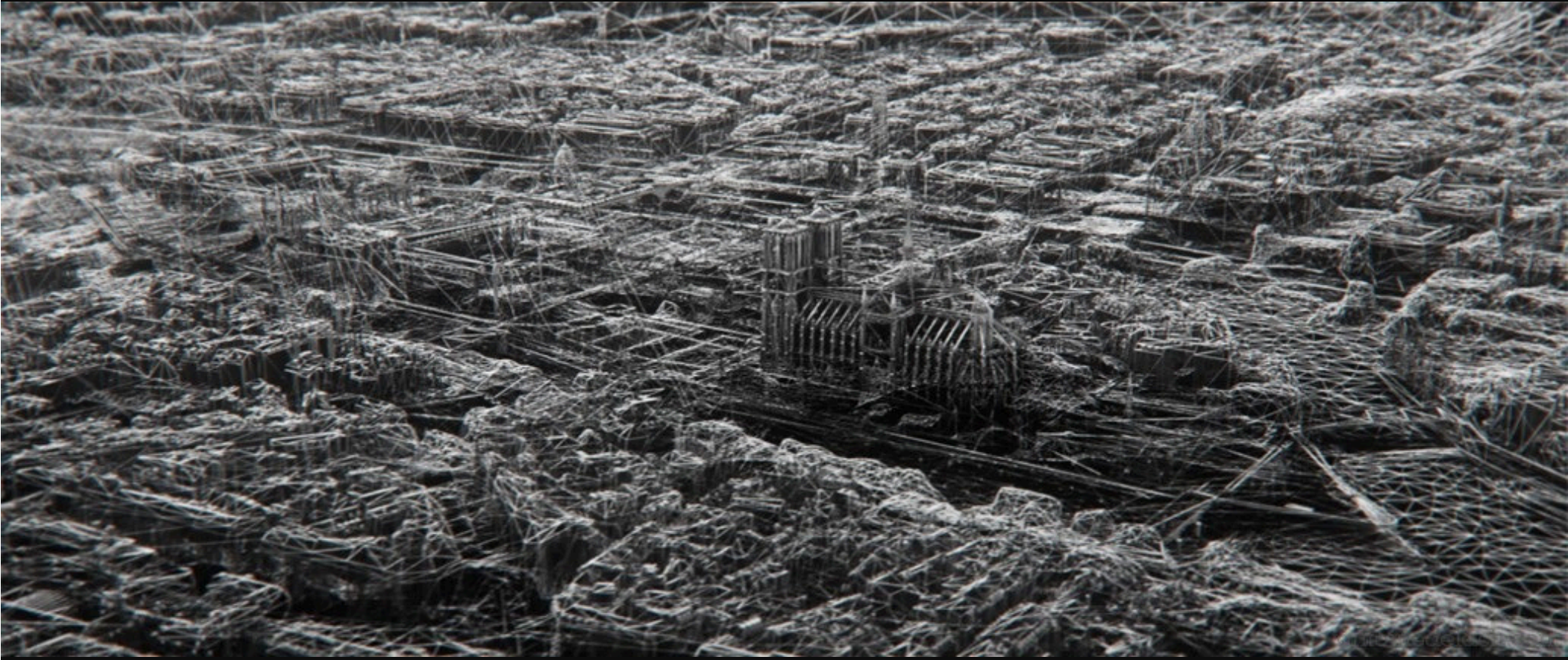
Photogrammetry is a 3D recording technique that employs 2D images to create a 3D model of an object or surface. It involves taking hundreds of overlapping photographs of an object from many different angles and processing them using specialised software such as RealityCapture (RC) or Agisoft PhotoScan. The digital 3D model can be used for study or outputted as a physical object via 3D printing or CNC milling.

3D Photogrammetry Scanning

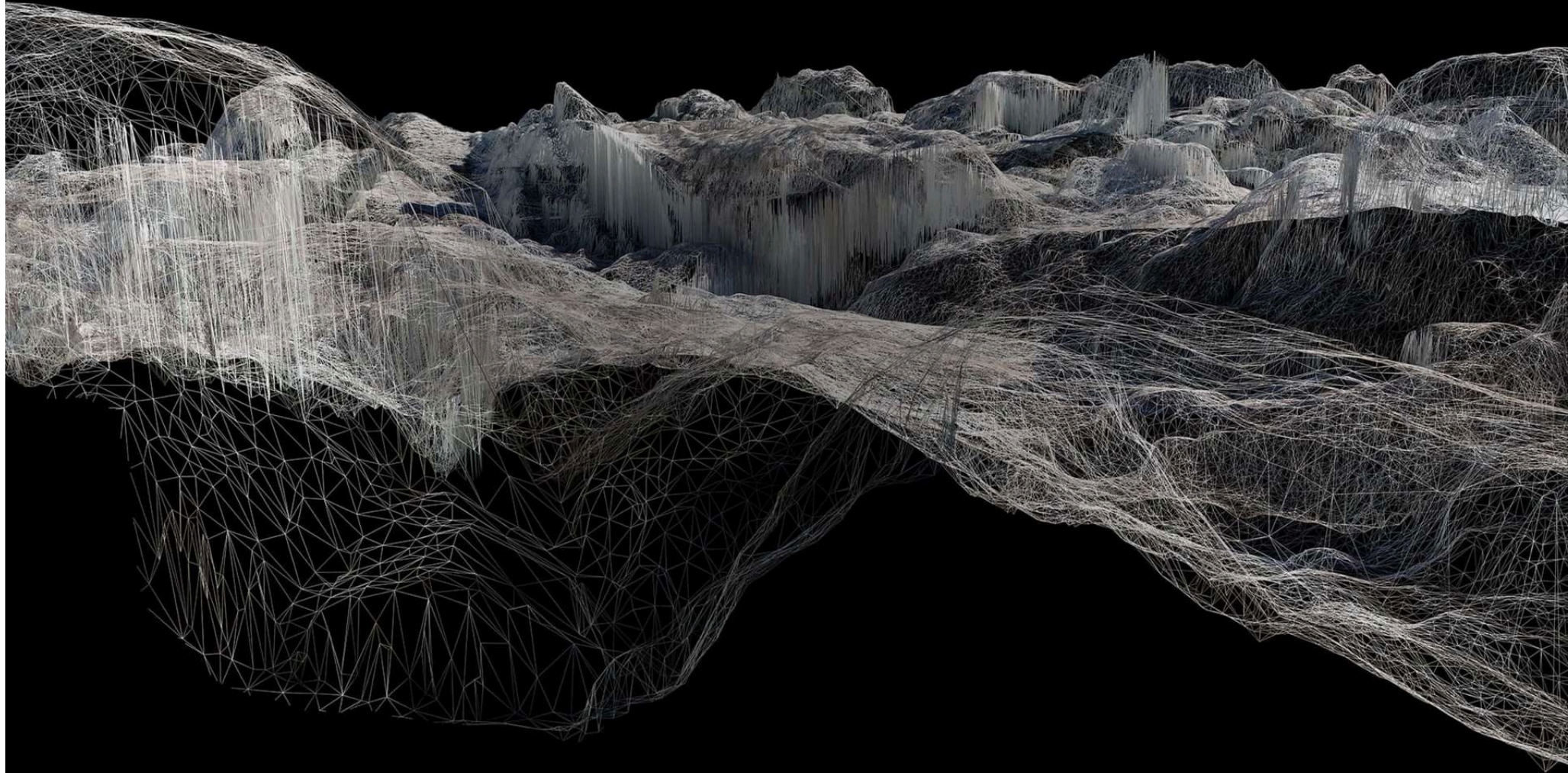


<http://photogrammetry.irc.umbc.edu/>

Ghost Cell

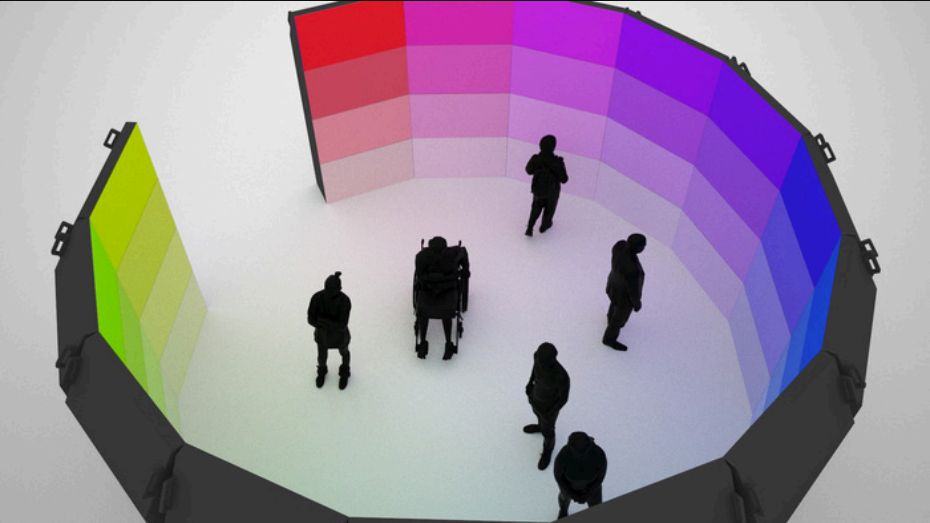


“Continuous Topography”, Dan Holdsworth (2016-2018)



<https://www.atlasofplaces.com/photography/continuous-topography/>

Parragirls Past, Present (2017)



<https://kuchelmeister.net/portfolio/parragirls-past-present/>

To be continued...