3D Scanning

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3D Scanning

This is just the learning part of a potential workshop brain dump, may be moved to a better place on the wiki, but here for now!

What is 3D Scanning?

3D scanning is the process of capturing real-world objects or environments and using that data for a variety of different means, from games production to physical fabrication.

What can 3D scanned objects and environments be used for?

Collected 3D data is used in a variety of ways, in the entertainment industry the data is used in the production of movies and video games, including virtual reality, as populating virtual worlds with the scanned data can achieve very realistic results. The 3d scanned objects can also be used for Augmented reality, placing scanned objects in you real world environment.

In a library environment 3D scanned items can be incredible useful for digitizing cultural artifacts and significant collection items. This data can be displayed on screens or re-produced in different scale with 3D printing etc.

Other use cases for the 3D data include motion capture, visual arts, gesture recognition, robotic mapping, industrial design, orthotics and prosthetics, reverse engineering and prototyping and quality control/inspection.

3D Scanning Technologies

Even with advancements in 3D scanning technologies, such as the ability to capture 3D Data in the palm of our hands (iPhone LiDAR), there are still limitations, advantages and costs. Getting to know the different methods and technologies available for scanning can help to choose the best possible method for your needs.

The purpose 3D scanning is usually to create a 3D representation, this model consists of a point cloud of geometric samples on the surface of the subject. These points can then be used to extrapolate the shape of the subject (a process called reconstruction). If colour information is collected at each point, then the colours on the surface of the subject can also be determined.

3D scanners share several traits with cameras, as like most cameras, they have a cone-like field of view, and they can only collect information about surfaces that are not obscured. While a camera collects colour information about surfaces within its field of view, a 3D scanner collects distance

information about surfaces within its field of view. The “picture” produced by a 3D scanner describes the distance to a surface at each point in the picture. This allows the three dimensional position of each point in the picture to be identified.

In most 3D scanning situations, a single scan won't produce a complete model of the subject as multiple scans, even hundreds, from many different directions are usually required to obtain information about all sides of the subject.

Laser based 3D scanning

Projected or Structured Light 3D scanning

Structured light scanning is a 3D scanning technology that uses a single light source that projects multiple lines on the object, all of which are tracked simultaneously by a camera or multiple cameras.

LiDAR - Light Detection and Ranging

Apple introduced a LIDAR scanner into their iPad 2020 and iPhone 12+ models.

Not all LiDAR systems are the same though, until fairly recently, the most common types of LiDAR scanners built 3D maps of their environments by physically sweeping around in a similar way to a radar dish. The mobile based LiDAR are solid state with no moving bits.

Many Android phones already use time-of-flight (ToF) sensors, which help sense scene depth and mimic the bokeh effects of larger cameras. But the LiDAR system used by Apple goes a step further, going with a LiDAR scanner, rather than the 'scannerless' systems seen on smartphones so far.

The scannerless system uses a single pulse of infra-red light to create 3D maps, but a scanning LiDAR system fires a train of laser pulses at different parts of a scene over a short period of time. This provides a couple of benefits, including an improved range of up to five meters and better object 'occlusion', which is the appearance of virtual objects disappearing behind real ones like trees. Another benefit is the speed of the process, which is possible with the latest mobile processors available.

Apple stated at the iPad Pro 2020 launch, the LiDAR scanner's data is crunched together with data from cameras and a motion sensor, then “enhanced by computer vision algorithms on the A12Z Bionic for a more detailed understanding of the scene”.

Photogrammetry

Photogrammetry is the science and technology of obtaining reliable information about physical objects and the environment through the process of recording, measuring and interpreting photographic images and patterns. Basically the process of taking overlapping photographs of an object, structure, or space and converting them into 2D or 3D digital model.

Contact-based 3D scanning

SLQ 3D Scanning Resources at The Edge

HP Sprout

Konica Minolta Vivid i9

Mobile Scanning Apps

We've tested a few of the available mobile apps and listed those below with some pros and cons!

Polycam - Lidar and Photogrammetry app for Apple and Android. You can use Polycam to generate 3D models from a set of photos. Alternatively, if your mobile device is equipped with lidar (Apple only for this app), you can quickly scan spaces in real time. Polycam allows you to export your scans in over a dozen file formats, including OBJ, GLB, FBX, DAE, and STL

3d Scanner App - Lidar app for Apple. You can export your scans in a variety of formats, including OBJ, USDZ, and STL, among many others.

Matterport Capture -

Record3D -

Scaniverse -

Further Resources

https://www.artec3d.com/learning-center/what-are-3d-scanners-used-for