Illuminate NEBRASKA
POWERING INNOVATION

REVERSE ENGINEERING

3D SCANNING

CONCEPT 3D Scanning is the process of collecting data of an environment or object and recreating it as a digital model using geometry, color, and captured images.

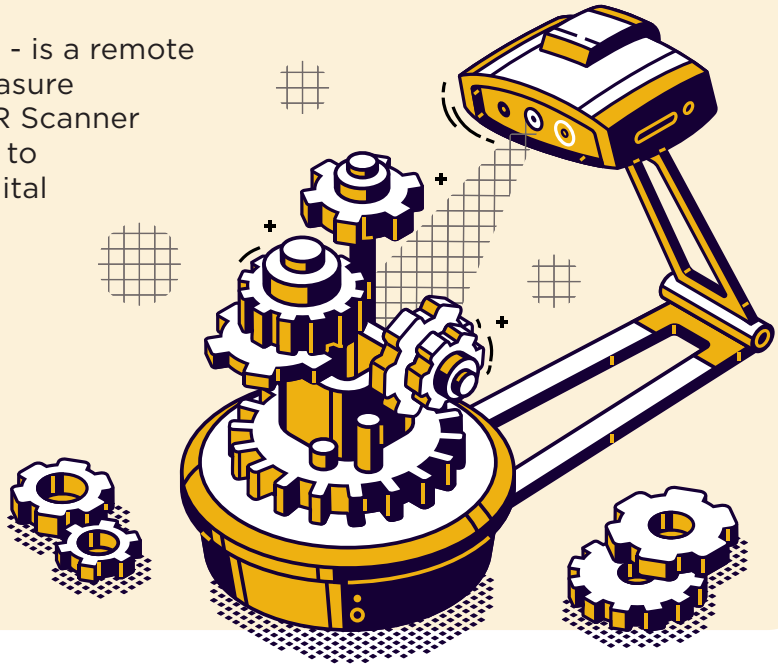
BACKGROUND

A 3D scanner is a device that identifies, analyzes, collects and draws/displays shapes or three-dimensional models of real-world environments or solid objects. A 3-D scanner enables the capture of geometric shapes and the recreation of the physical appearance of tangible objects, allowing them to be built and displayed on a computer. The earliest digital 3D scanners in the 1980s used contact probes that physically touched an object thousands of times until the device had enough data points to create a digital image or 3D model. A 3D model is a mathematical representation of something three-dimensional. They are used to depict visuals for art, simulation, drafting, etc. and are incorporated in virtual reality, 3D printing, art, video games, TV, and medical imaging.

As technology progressed, so did storage space to handle large amounts of data. With storage space increasing drastically, the 90's saw a huge burst in 3D scanning capabilities with the first 3D scanners hitting the commercial market and optical technology allowed for scanning fragile objects and for color scans. The relatively short timeline of digital 3D scanning means that we are pioneering new frontier. Scanners are more easily accessible, less cost prohibitive, and more user-friendly than ever before. Now, 3D scanning primarily utilizes two types of technology: LiDAR and Photogrammetry.

LiDAR- Light Detection and Ranging (LiDAR) - is a remote sensing method that uses pulsed lasers to measure distances. Using eye-safe laser means, a LiDAR Scanner sends hundreds or thousands of invisible dots to measure distances and record the data for digital reconstruction. This technique of 3D scanning is best for environments, such as rooms, and large objects such as cars, rocks, and buildings.

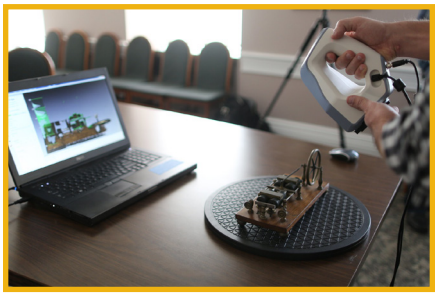
Photogrammetry - An approach to 3D scanning which uses photography to map an environment and measure distances between objects. This technique of 3D scanning is best for textures and capturing figures or small objects.



EXAMPLES

Make sure it measures up

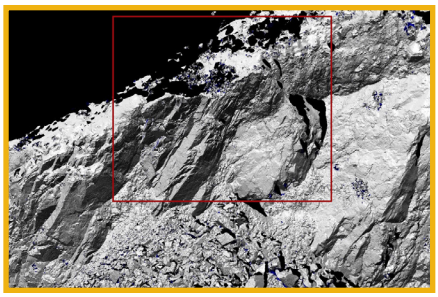
3D SCANNER



Smithsonian x 3D team makes 3D scans of National Museum of American History objects.

- by National Museum of American History

3D MODEL



Light Detection and Ranging (LiDAR) image of the US 2 Rockslide

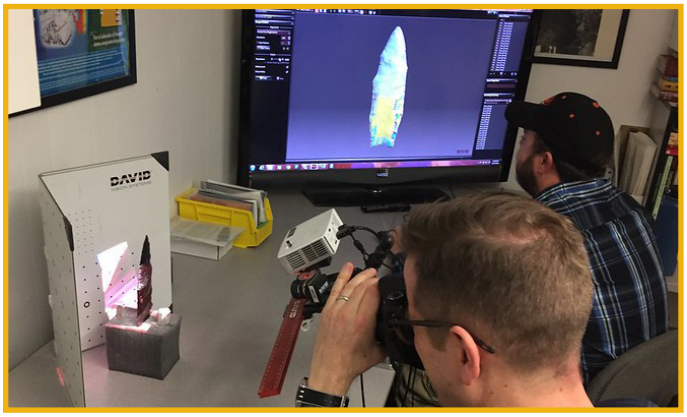
- by WSDOT

REAL WORLD CONNECTIONS

iPhone users can utilize a $10 app named Polycam for most of their 3D scanning needs. This app utilizes the iPhone 12 and 13 Pro's LiDAR Scanner for environments and the cameras for object captures. Within a few minutes, Polycam can process objects or an entire building's interior and allow the user to navigate it on their phone and export the file as OBJ, GLTF, DAE, FBX, USDZ, or STL format.

APPLICATION

3D scanning and printing are new tools being used increasingly by museums, curators, researchers, and archaeologists for cultural preservation. This technology allows professionals to study, restore damaged sculptures, and archive artifacts with more detail than pictures. The Smithsonian, Metropolitan Museum of Art, Harvard, Louvre, British Museum, and V&A are examples of institutions currently converting their entire collections into a digital 3D archive.



Printing the past: 3-D archaeology and the first Americans

-by BLM Oregon & Washington

FORMULA/DATA

In LiDAR scanning, as the sensor emits pulsed light waves in the surrounding environment, these pulses bounce off surrounding objects and return to the sensor. The sensor uses the time it took for each pulse to return to the sensor to calculate the distance it traveled. This process is repeated as many as 400,000 times times per second, collecting up to 1.5 million data points per second.

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