Alaska Office of History and Archaeology and State Historic Preservation Office
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Practical 3D Modeling for Archaeology and Cultural Heritage Projects

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Why 3D modeling?

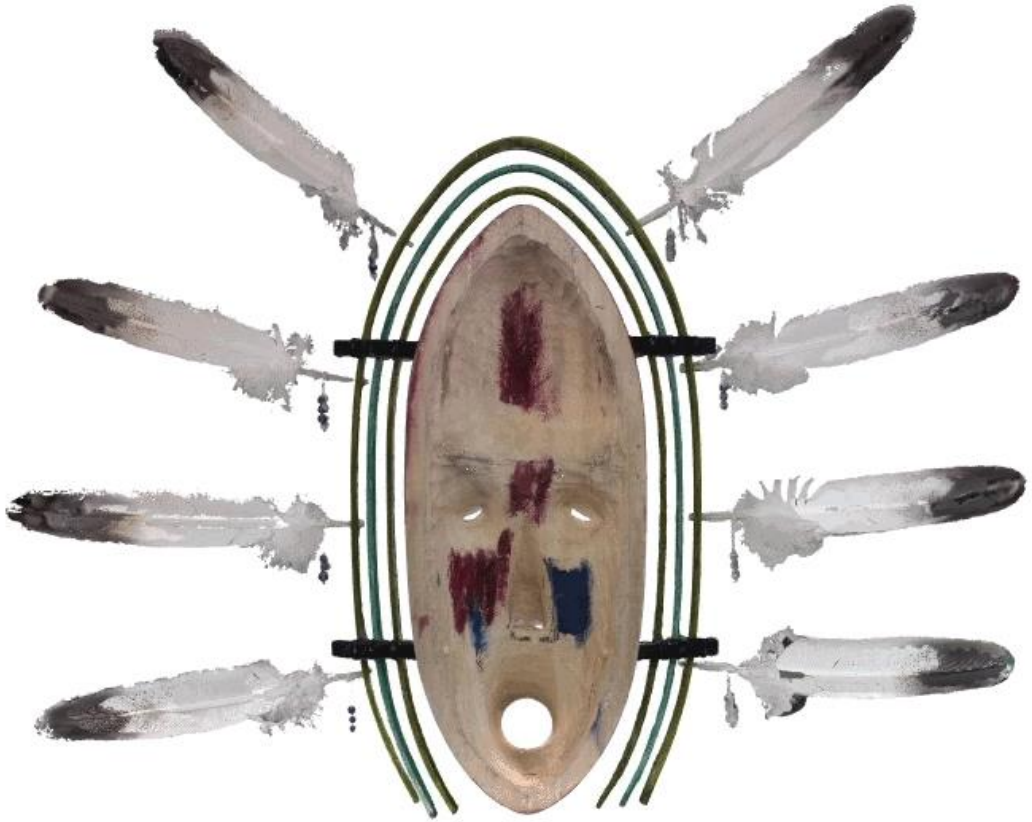
Provides a record for posterity

Quantifiable measurements and qualitative data can be derived later as future questions arise

Models can be analyzed in studies like morphometrics, lithics analysis, comparatives, 3D printing

The importance of 3D representation

Objects and landscapes are meant to be dynamic and interactive

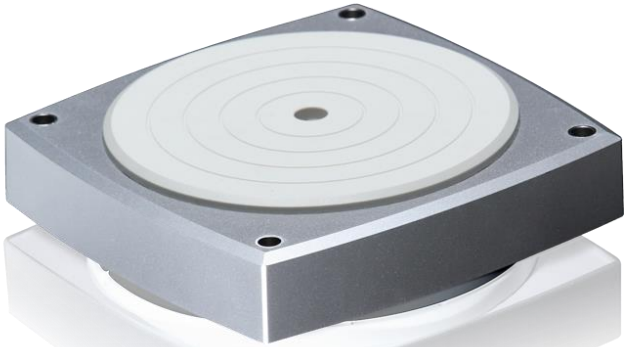


UAA purchased this mask created following the Deg Hit’an tradition by Alaska Native artist Brian Walker II

Technology

3D SCANNER HD
NEXTENGINE

Canon
EOS
REBEL
T3i
CANON ZOOM LENS EF-S 18-55mm 1:3.5-5.6 IS II
φ58mm



XBOX 360
KINECT

Context or Setting

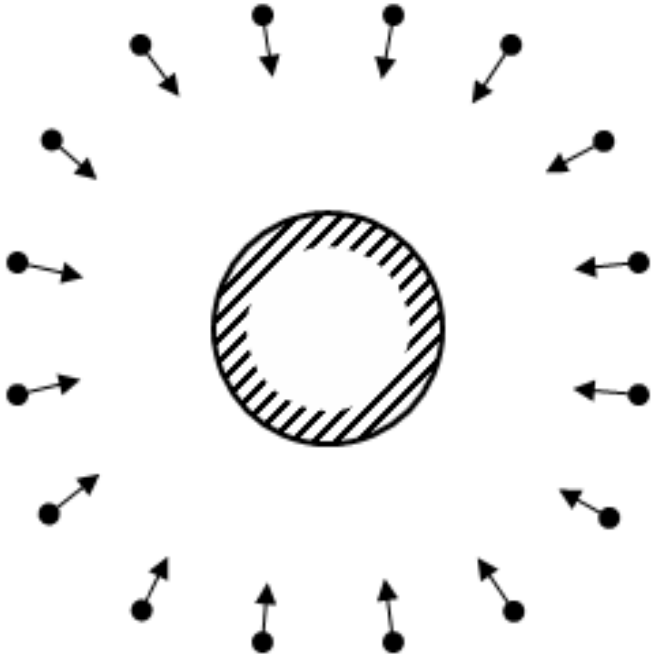
3D modeling objects and landscapes in the field has some unique considerations

3D modeling in the laboratory or at a museum/repository also can present challenges

3D Modeling in the Field

Housepit excavation, UAA field project on Adak Island led by Diane Hanson 2011

Photo Modeling



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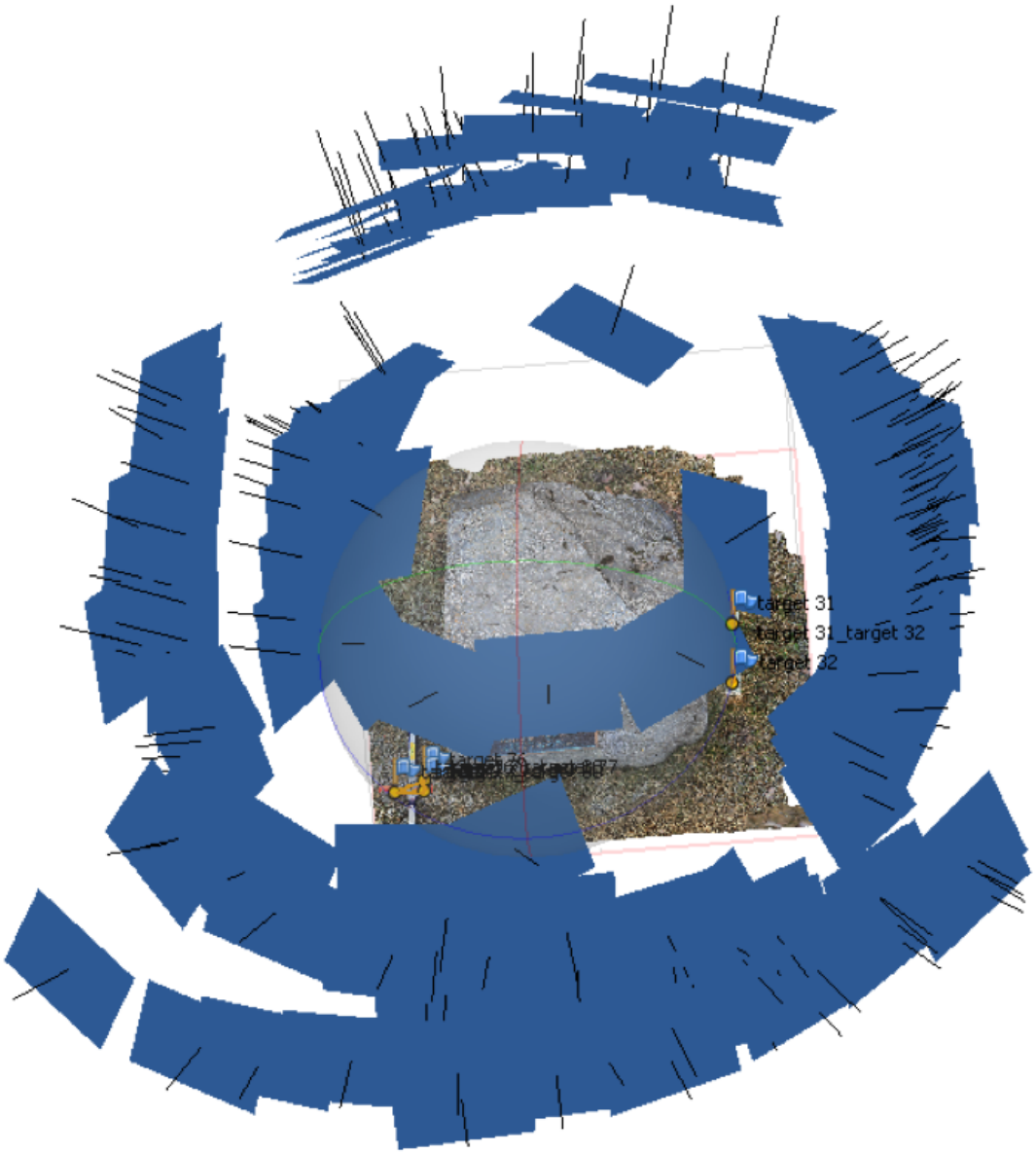
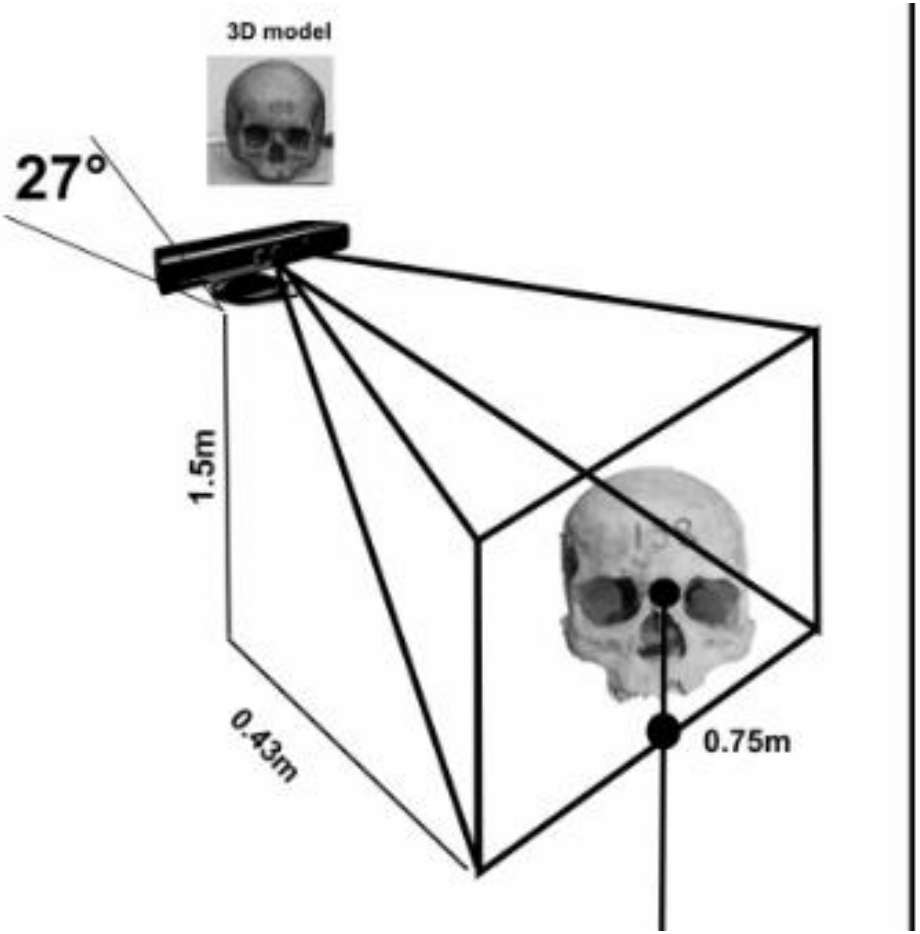


Housepit excavation, UAF field school at Swan Point led by Gerad Smith 2017

Kinect Scanning



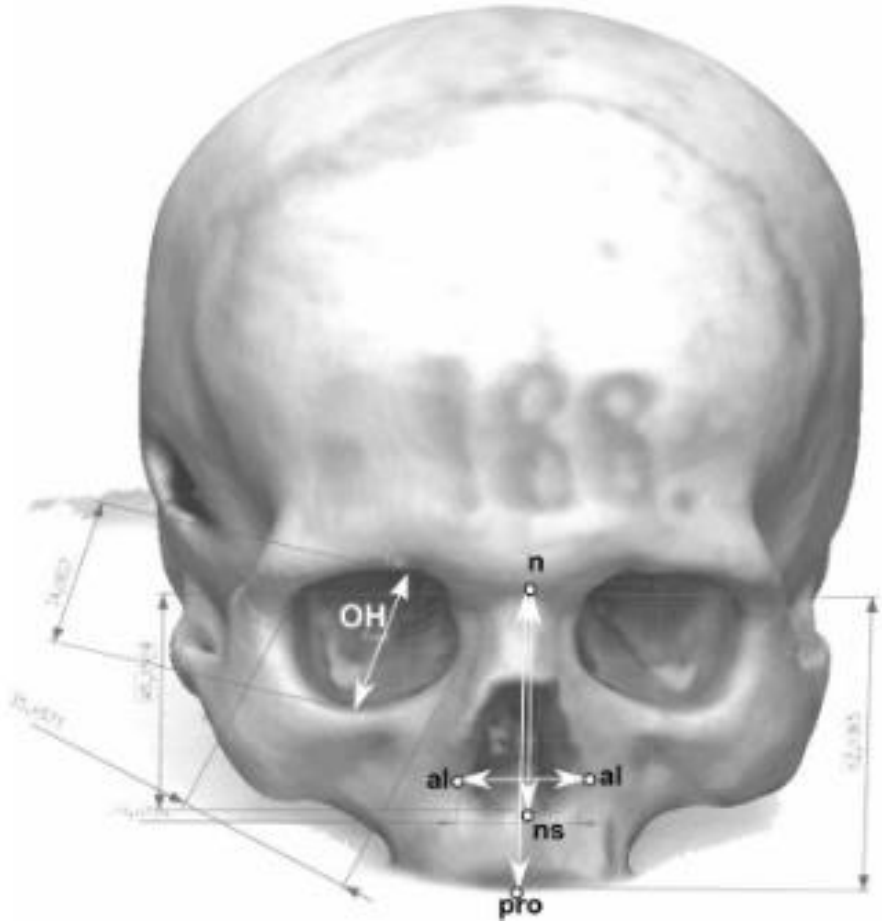
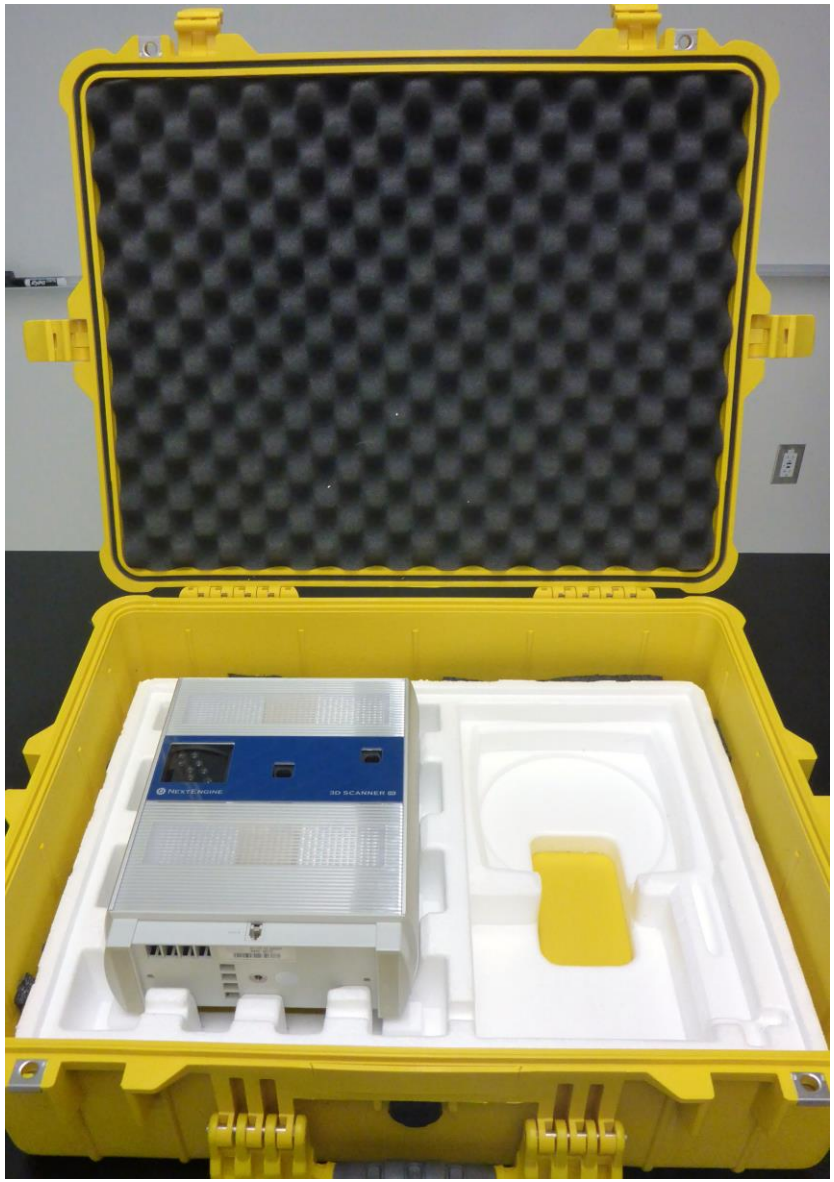
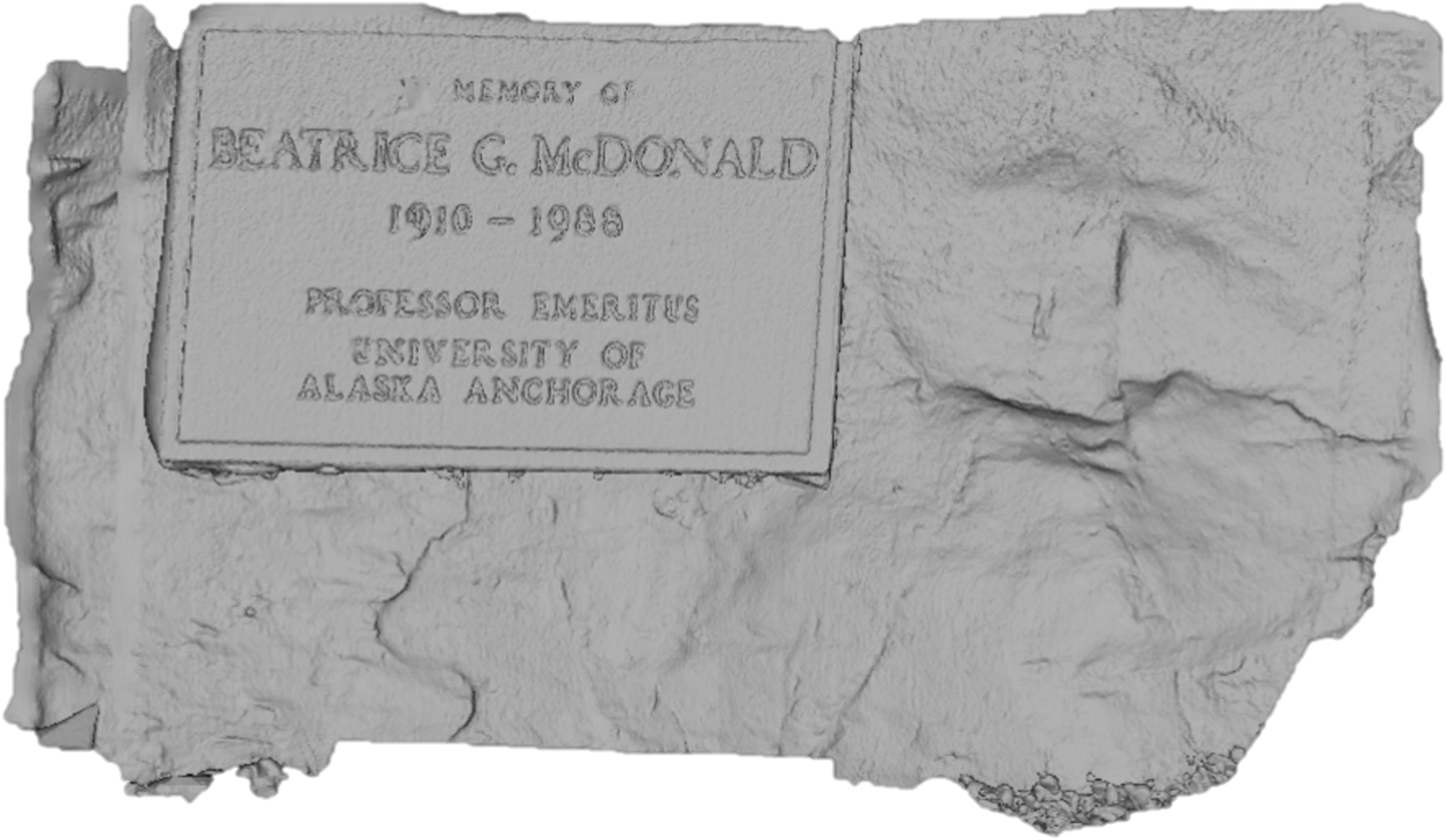


Figure 1 (Viggiano et al. 2015:345)

XBOX 360

NextEngine Scanning

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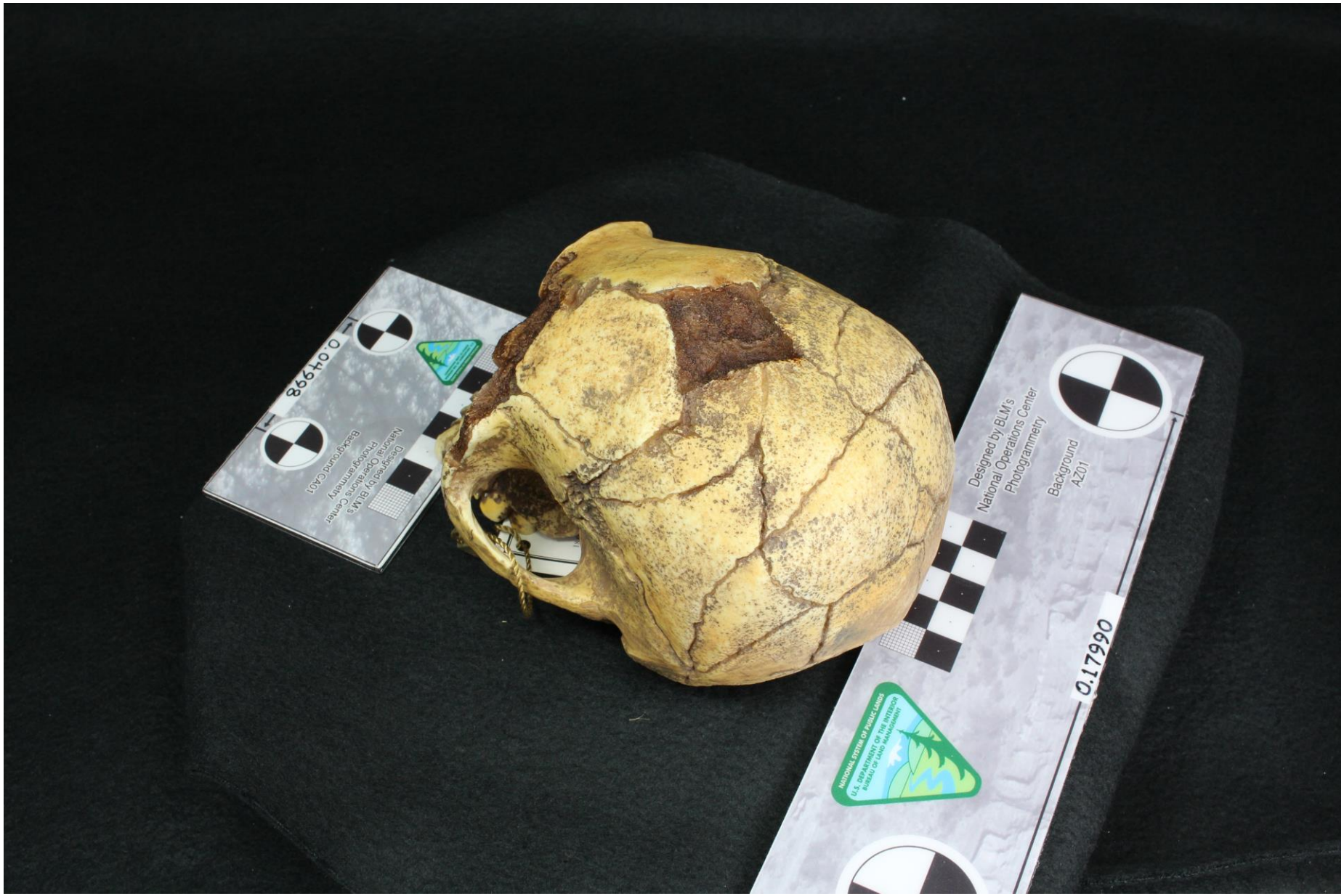
3D Modeling in the Lab



Homo floresiensis replica by Bone Clones

ALCES

LABORATORIES

ALCES Lab

Archaeology Dry Lab

Archaeology Wet Lab

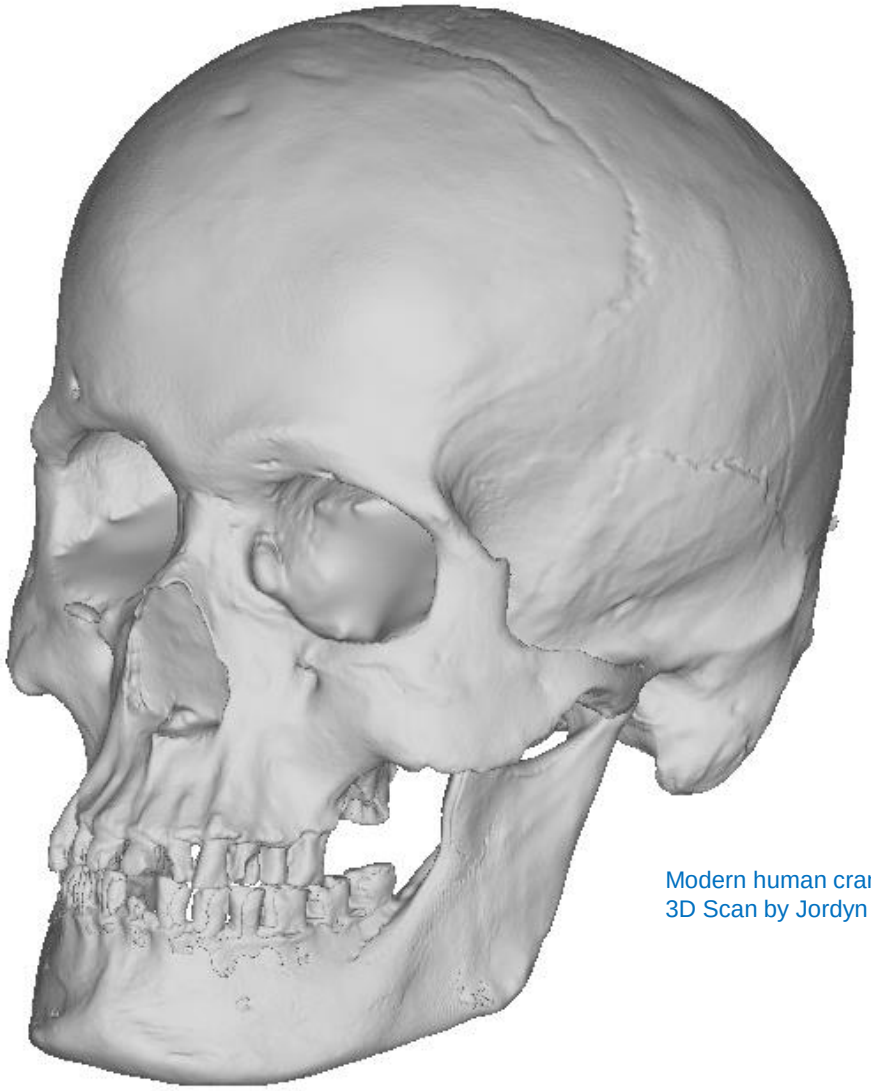
Biological Anthropology Lab

Cultural Resource Management Lab

GIS/Cultural Research Lab

The ALCES or Anthropology Laboratory for Cultural and Environmental Scanning includes computers equipped with 3D-scanning and photogrammetry technology used by students and faculty to model and analyze a variety of human, faunal, and cultural materials.

NextEngine



Modern human cranium replica by France Casting
3D Scan by Jordyn Jones

Photo Modeling

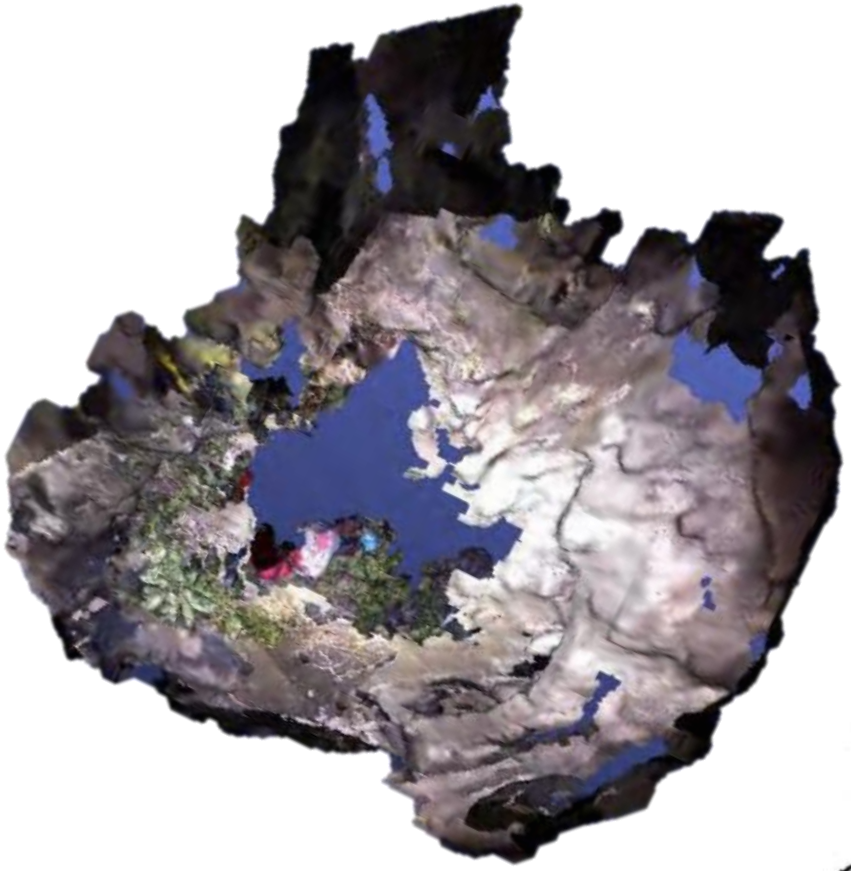
Comparing the Technologies

Kinect V1

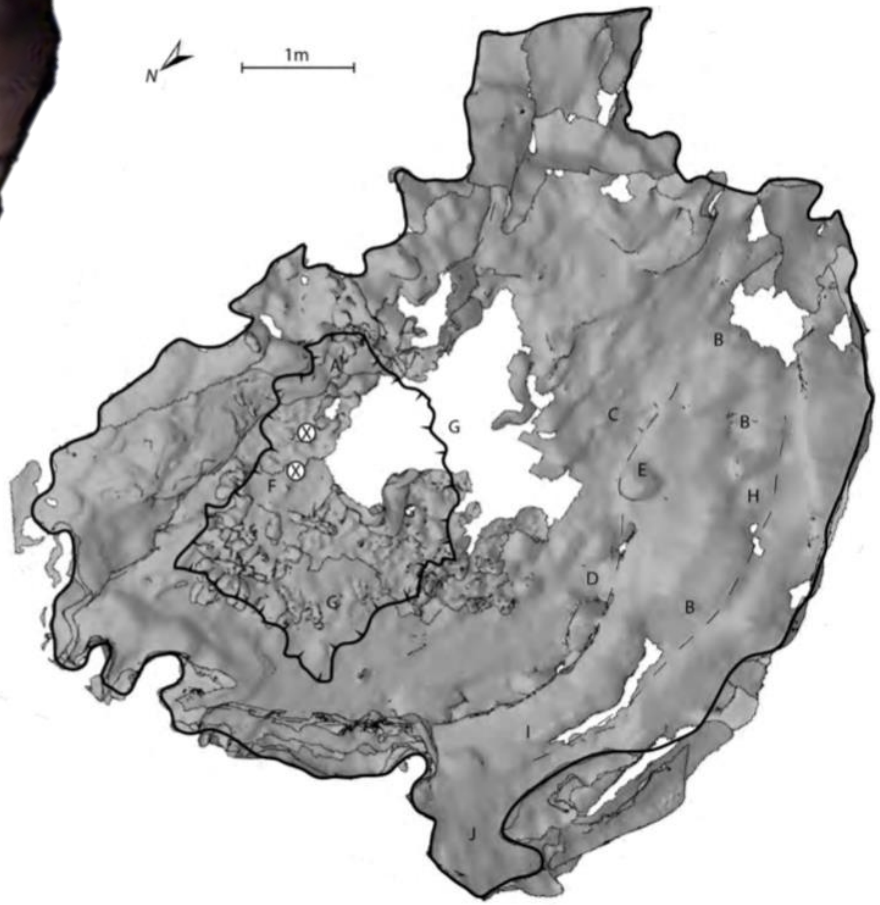
A hands-free video game controller that can be repurposed as a scanner

Positive: creates accurate models without light and offers a time-efficient way to create a model with Skanect software ($139)

Negative: camera creates low resolution models



XBOX 360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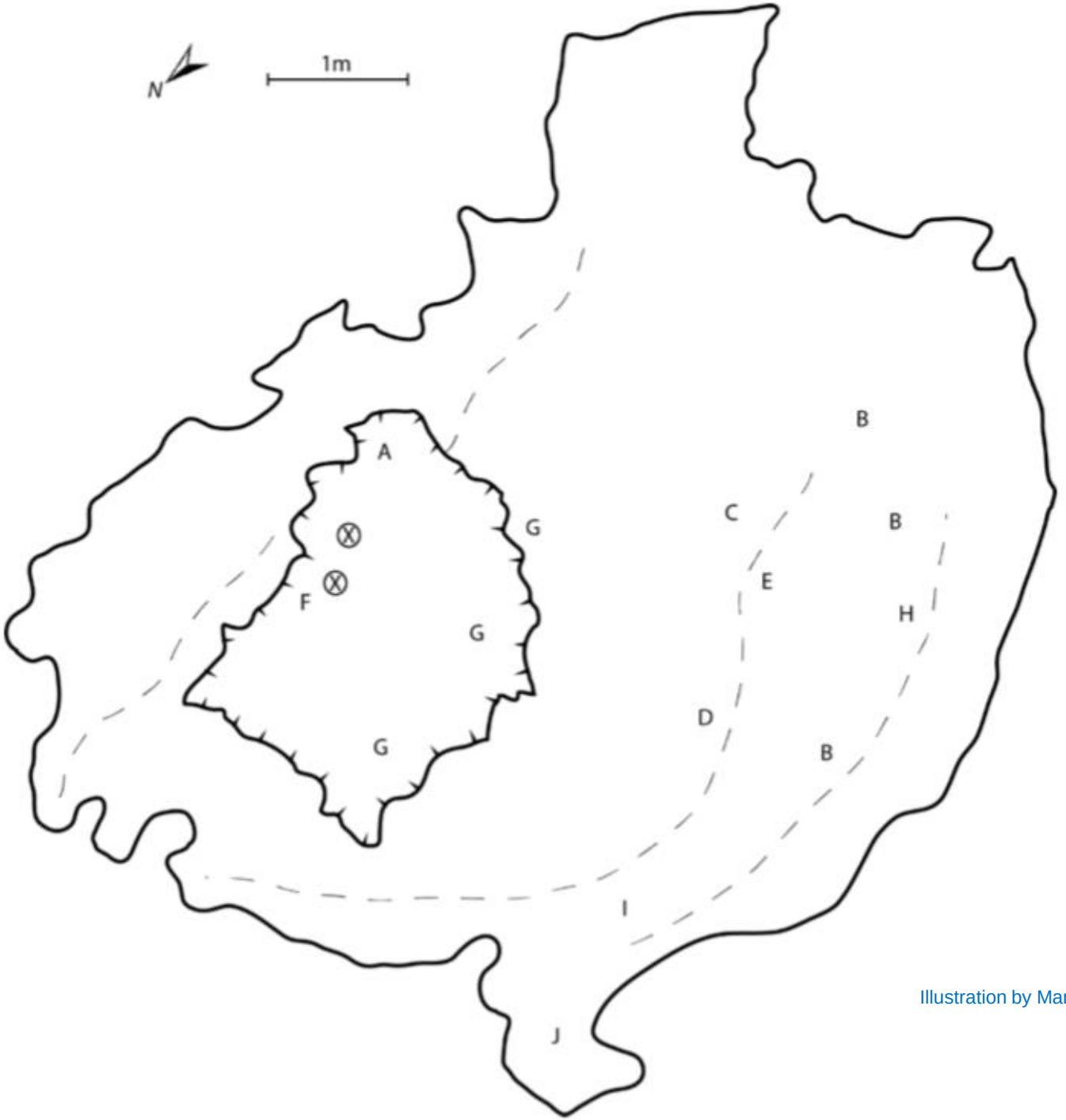
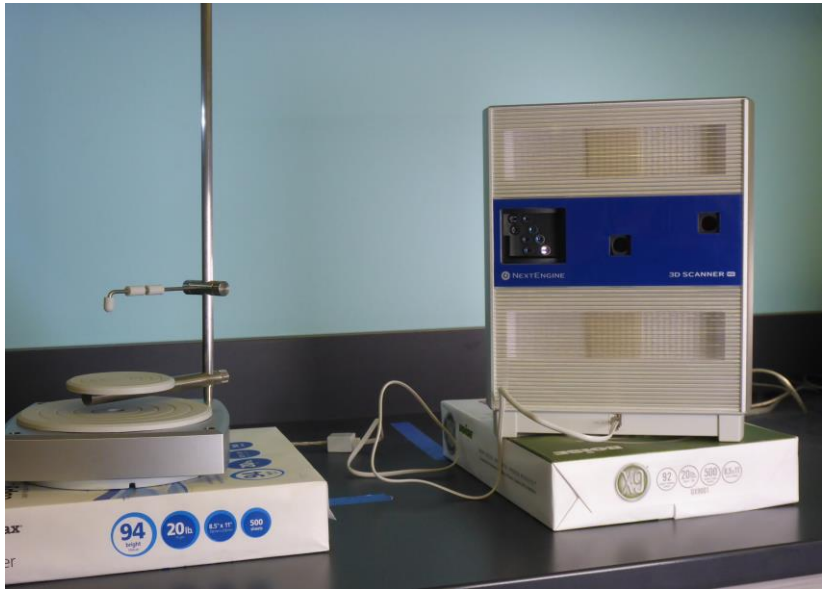


Illustration by Margan Grover

NextEngine

A tabletop laser scanner that was designed to be relatively affordable ($2995 + $1000 for the HD pro software)



Positive: creates a model with good surface detail and it is an automated way to create a model with a self-powered turntable

Negative: time consuming and photo realism is low

Where is the Electrical Power?

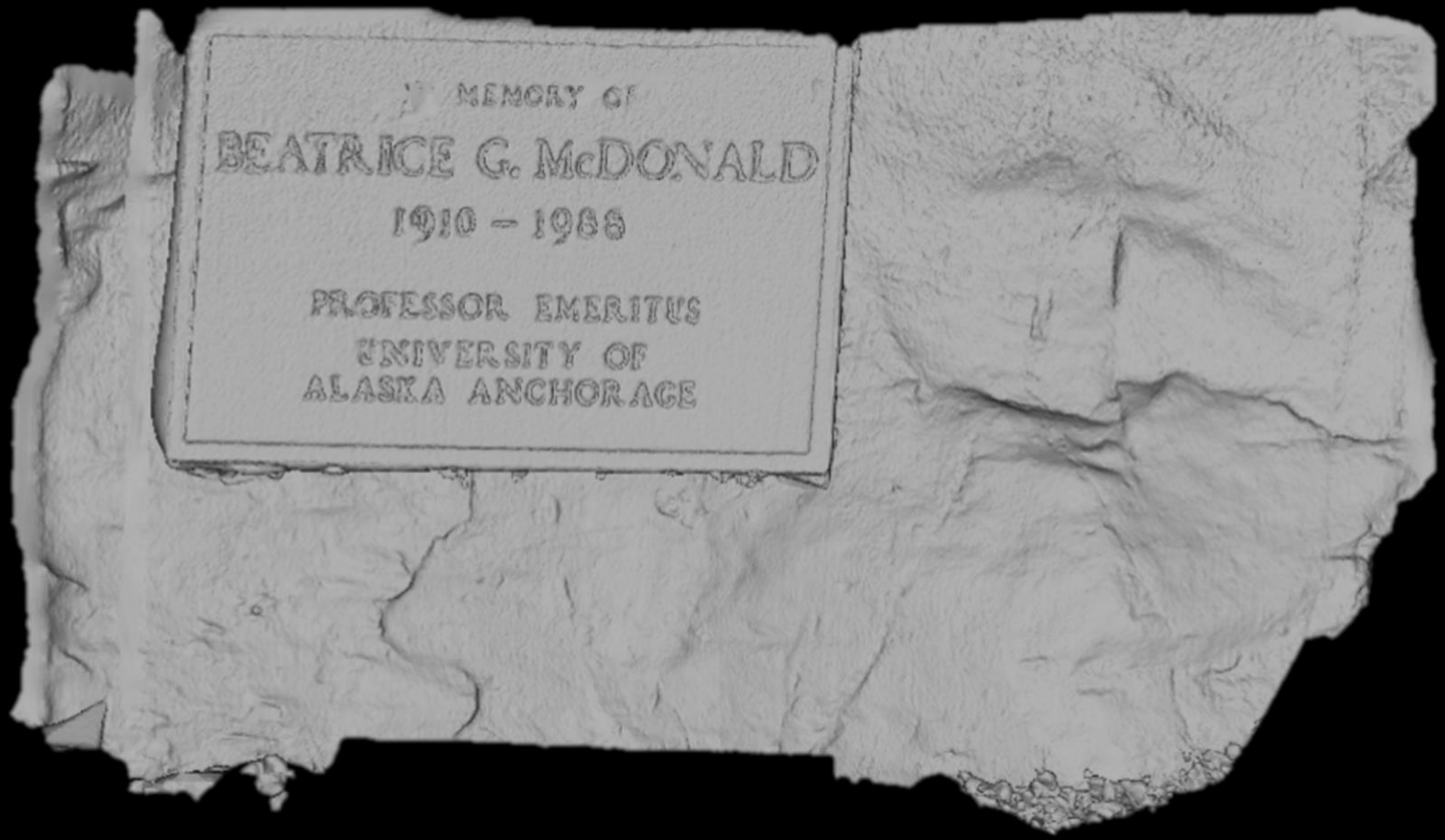

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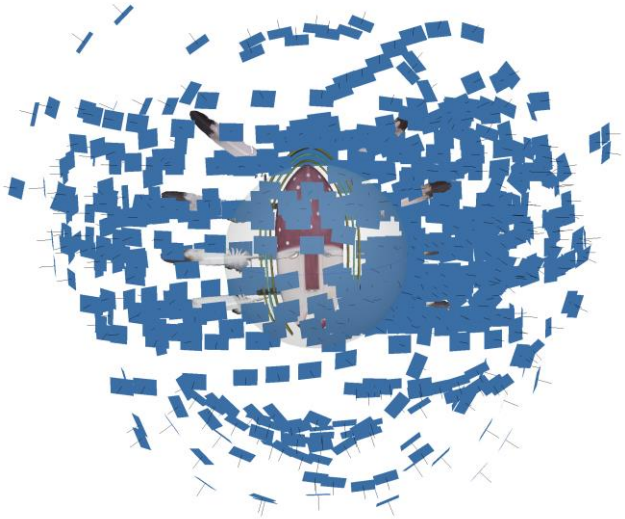
Photo Modeling

A method of modeling that uses highly overlapping photos of an object or landscape



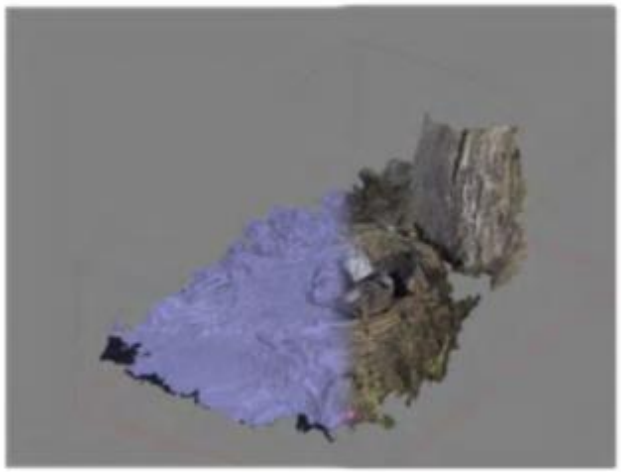
Positive: creates a high fidelity model that is accurate and requires minimal field equipment

Negative: costly software ($3499), DSLR cameras recommended, and a high-end desktop computer is needed to build complex models

Canon
EOS
5D
Mark II
Canon
TY-50X
SIRUI

Sparse Point Cloud

Dense Point Cloud



Left Half: Mesh; Right Half: Textured Model

3D PDF

Summary of Techniques

Photo modeling generally gives best results in terms of geometric fidelity and appearance

Modeling with the Kinect V1 can be a quick way to get a model, but is low resolution, and requires both a laptop and an AC power source

Modeling with the NextEngine provide models with excellent detail but is time consuming and it is the least portable

0.448 m
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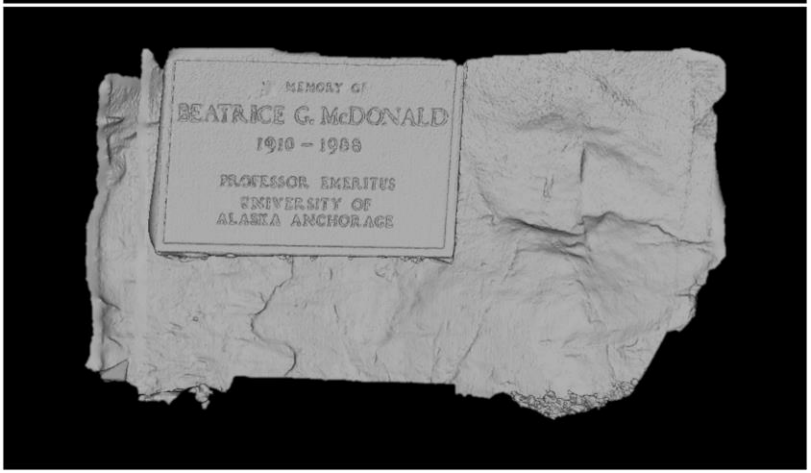
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XBOX 360
KINECT

3D SCANNER
NEXTENGINE

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