



SUSTAINABLE HERITAGE NETWORK

2015 ATALM POST-CONFERENCE WORKSHOP

NOTES

SESSION: Photogrammetry and Archival 3D Imaging

SPEAKER: Michael Ashley, Director, Center for Digital Archaeology (CoDA).

DATE: Monday, 9/14, 3:30pm-5:00pm

Wants to focus on practical, doable things

3D imaging

- amazing technology, so much progress
- Michael used to be a photographer, could not do the same things

Adobe Lightroom

- Great program
- All materials will be available

Archeology

- Destroy one layer to get to the next
- Generate 3d model to preserve the whole, digitally
- Can do it quickly, simply

Examples

- Objects - can view, spin around, manipulate
- Cultural heritage items - spread over the globe
- Flat image, can see more detail, light and shadow

Example from ATALM

- Found models of kodiak boats
- 3d imaged it
- Built actual size boats

Camera used in the field: Sony NEX 6 \$300

4x4 area of excavation

PDFs have 3d viewers built in

GIS - in the field,

- take 3d models,
- process and drop 4x4 models into place
- used to sit and draw each section

How would you use?

- Artifacts
- Markings on the bottom of something - turn upside down
- Oral history project - land (trenches/hills)
- Exhibits
- At risk items
- Books from 1800s - whole
- City landscapes
- Firefighting
- Indigenous mapping - place names, remapping territories
- Use kite for aerial shots

Question:

- File size - archival images are the basis for 3d images
- 30-35mb

WHY 3D imaging

- Archival imaging
 - individual images, combined via 3d imaging software
- measurable - easy to do this
- protection of object, site, sacred place
 - -reasons not to make surrogate of sacred things
 - -but sometimes need to preserve before they are gone
- sharing, education, research
- fun! kids love the technology

Photogrammetry - more than one camera pointed at an object, blend the images to create a 3D image

Scale - able to zoom to a high degree

Produce models

What Photogrammetry can do for my project?

- documentation
- visualization
- reconstruct historic photos

Was used in the 1800s - stereographs, forms of photography

1990s - expensive

Today: SIFT

Images need 60-80% overlap

Switch from side to side, rightside up, upside down - remove distortion

What do you need? 80% overlap

-Flat - strip technique

-Objects - point camera towards, all the way around, getting angles

What do you need?

- Contiguous photos - 80% overlap
- Move camera
- Minimize/eliminate moving shadows
- Static light source
- Diffuse light

Materials/Equipment

- Color Checker
- Expodisc - light balance filter (can use other materials for less involved photography)
- Object of known length
- Camera
 - manual focus
 - fixed lens
 - medium aperture (f/8)
 - fixed ISO
 - locked exposure
- Targets

Will my camera work?

- Digital SLRs

Format Size

- Resolution - need a high level of resolution

Data Processing

1. Take photos
2. Full resolution jpeg files
3. Create "cloud of points"
4. Mesh
5. Annotate and
 - Sometimes need to correct photos
 - Bad photos, unfortunate processing

What about iPad/iPhone?

Problems:

- rolling shutter
- poor resolution
- autofocus
- auto exposure
- jpeg
- excellent for documentation though!

Other tools:

Adgasoft

123D Catch

Photoscan

Theodolite app

Adobe Lightroom

Hands on

- Metadata on housing
- Wood duck
- Note with duck and info on bottom of duck - metadata
 - Type of duck
 - Name of creator -
 - Price
 - Used for hunting, trick more ducks into coming into water
 - Broken neck
- What about photographer- creator
 - Contributor = artist who made the duck
- 3D imaging duck
- Stage area
 - Backdrop
 - Lazy susan
 - targets
- Equipment
 - color checker - angle so it is representative

Allowed a camera - get as much data as you can

Checklist

- change iso
- change aperture ~10
- autofocus on
- focus
- then turn autofocus off

- tape zoom (sometimes tape focus)
- take picture of filter light balance filter > set white balance to light balance picture
- **Remote software for canon to take pictures remotely
- 1.Rotate lazy susan
- 2.Take picture
- Repeat 1 and 2

Lightroom workflows - michael will share

Select all images

- set white balance
- turn off sharpening
- enable profile corrections - correct lens
- turn off distortion correction

When exporting - remove geolocation information

Lightroom will export to smaller file size - 40mb to 8mb

PhotoScanPro

open images

align photos

- finding points
- making points

JPEG mini

DATE: Tuesday, 9/15, 3:30pm-5:00pm

3D Imaging

**Michael will be providing a screencast of most of this session as well.

**EVERYONE should get Adobe Lightroom

- The only standalone Adobe product these days
- There are non-profit and educational pricing options, and Michael can provide other advice as well...
- <https://www.adobe.com/products/photoshop-lightroom/versions.html>

Archaeology

- In order for us to learn, we must destroy

Photogrammetry allows us to take 3D images with a regular camera!

- Can use a decent, sub-\$300 camera, even some point and shoot models
- Can even use for “2D” images like paintings that aren’t really flat
- Same techniques apply, from sub-microscopic to satellite scale
- Can embed these images into regular PDFs for 3D viewing
- Adding in GIS data gives us true representations of space

Why 3D imaging?

- Conservation, dealing with very fragile objects, use to build custom mounts
- Virtual research environments
- Some kind of virtual representation
- Education
- Archival imaging
 - It’s just digital imaging, so you get all those pictures too!
- Measurable
 - Unlike a picture, if we use targets and a known-length object, you get scale and hard numbers
- Protection of objects/sacred spaces
 - Can document things you may only get one chance to access
- Fun!

Adobe lightroom

- Designed to handle many thousands of images
- Can copy and paste metadata
- Very powerful for editing photos, can roll back all your edits
- Allows imaging in series

DCC in a box

- Start with collections
- Receive and sift them with lightroom
- Transform raw files into archival tiffs, etc...
- Keep DNG (Digital Negatives) as masters
- Add all kinds of metadata
- Export
- Store in Mukurtu (for us)

Step 1 - processing

Step 2 - publishing

- Originals
- Archival tiffs
- Full jpegs
- Representational jpegs
- Sequences

Can make non-destructive changes to the original photos (eg: master TIFF)

- Note file sizes
 - RAW 40 MB
 - TIFF 120 MB
 - jpeg 7 MB

Folder Structure (Michael's)

- Follows OAIS principles
- Ingest into Sources: things that people give you, samples, etc...
- Then move into distinct inboxes as needed
- Numbered folders.... for ease of sorting
- Include sections for backups,
- And sections for archiving
- Have a consistent naming scheme!
 - eg: OARS Original, Archival, Representation, Sequence

Back to 3D imaging...

Process

- Have a clear chain of custody and ownership
- “box excavation” example activity to create metadata
- How should we handle it?
 - By hand, without gloves, with clean hands
- Examine the mallard
- Who is creator?
 - photographer?
 - fabricator?
 - Copyright is nasty, doesn't represent multiple creators

Imaging

- Use a high contrast background
- Take a series of pictures in flat light
- Really would need 3 series of photos (middle, top, bottom angles)

You can get a **visualization** (eg: green bird model)

- Did not use targets
- Can't actually measure it

But for a digital surrogate

- Need a littttle bit more work, but get something much more useful
- Need markers, and reference objects of known size

PhotoScan Pro

- Partial model of capital
- Just from a series of photos
- Need in focus, decent (f8) aperture, consistent ISO for all photos
- <http://www.agisoft.com/>

Contact Michael for other options and ways to get imaging software...