3D Data Acquisition, Visualization, and Archiving of Selected Lithics from the Caldwell Collection of North African Stone Points

Michael J. Bennett

University of Connecticut - Storrs, michael.bennett@uconn.edu

Follow this and additional works at: https://opencommons.uconn.edu/libr_pres

Part of the Archaeological Anthropology Commons, Archival Science Commons, and the Photography Commons

Recommended Citation


https://opencommons.uconn.edu/libr_pres/55
3D DATA ACQUISITION, VISUALIZATION, AND ARCHIVING OF SELECTED LITHICS FROM THE CALDWELL COLLECTION

A Strategic Framework Implementation Project

Michael J. Bennett
Head of Digital Imaging and Conservation
University of Connecticut Library, Storrs, USA
June 30, 2021
Description

*Interdisciplinary, cross-campus working group made up of faculty from the *Anthropology Department*

...staff from the *Connecticut State Museum of Natural History* and *Office of the State Archaeologist*...

...and the *University Library*.
Members

Library: Michael J. Bennett (lead), Rhonda Kauffman, Michael Kemezis

Anthropology Dept.: Prof. Christian Tryon

Office of State Archaeology: Dr. Sarah P. Sportman, Dr. Jacqueline Veninger-Robert

CT State Museum of Natural History: Dr. Erin Kuprewicz
Goal: run 10 - 20 stone artifacts from the State Museum's Caldwell Collection through a newly developed 3D digitization workflow that will produce 3D assets for eventual online classroom use by members of the Anthropology Dept. and archaeology educators and scholars at large.
Challenge

Close focus = narrow depth of field = blurring and the loss of spatial resolution... ≠ successful photogrammetric 3D reconstructions.
X - full stack before going to Y
Y - one turn before going to X

X: Ready - 42 photos of 500 um
Y: Ready - 35 moves of 10.0 deg

Reshoot  Start
FOCUS STACKING
Photogrammetry...

...is basically the creation of 3D data from 2D images.

Depending upon methods employed, this 3D data can be rendered with very high levels of precision and accuracy.
### Metrics

<table>
<thead>
<tr>
<th>Object</th>
<th>Max Height (mm)</th>
<th>Max Width (mm)</th>
<th>GSD mm/pix</th>
<th>Estimated Smallest Resolvable Detail (mm) *</th>
<th>RMS Reprojection Error (pix)</th>
<th>Total Images Captured</th>
<th>Total Capture Time (minutes)**</th>
<th>Camera/Lens Combo (ISO 400, f/11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005_002_007_bag5a_pt425</td>
<td>30.13</td>
<td>18.95</td>
<td>0.00952</td>
<td>0.02856</td>
<td>0.38182</td>
<td>5,040</td>
<td>514</td>
<td>Canon 6D, Zeiss Milvus 100mm</td>
</tr>
</tbody>
</table>

- **Sampling rate** = 9.52µ
- **Estimated resolution** = 28.56µ
- **Total images captured** = 5,040

Lots of required computation...
But with lots of source data and computation come lots of potential re-use...
What was learned?

A novel combined focus stacking/photogrammetry technique can consistently work for full 3D views of small lithics. This workflow can also be operationalized, and its rendered outputs can have direct use in online class instruction.
What was learned? (con.)

Though a great hosting and access option for the project’s smaller comprehensive data sets, CTDA repository use for the > 60GB data sets remains an ongoing effort.
Additional Resources

Rendered .obj 3D models of 19 small stone artifacts from the Connecticut State Museum of Natural History’s Caldwell Collection as selected by Professor Tryon (note some lithics are available in two versions):

https://skfb.ly/6Vr9D
Datasets of 19 small stone artifacts from the Connecticut State Museum of Natural History’s Caldwell Collection as selected by Professor Christian Tryon (CTDA uploads and download functionality work is ongoing): [http://hdl.handle.net/11134/20006:Caldwell](http://hdl.handle.net/11134/20006:Caldwell)
Additional Resources (con.)


VI. Acknowledgements

The author wishes to thank University of Connecticut colleagues, Professor Christian Tryon, Department of Anthropology, for selecting the study’s original stone points, and Dr. Jacqueline Veninger-Robert, Office of State Archaeology, for facilitating the viewing and lending of artifacts from the Caldwell Collection. The author would also like to express his appreciation to Rhonda Kauffman, Metadata Management Librarian, for her assistance in creating and deploying the project’s 3D data sets’ metadata schema, and to Michael Kemezis, Repository Manager, Connecticut Digital Archive, for his help with the study’s data sets uploads to the CTDA.
FUTURE WORK???
Thank You!

Michael J. Bennett
Head of Digital Imaging and Conservation
University of Connecticut Library, Storrs, USA

michael.bennett@uconn.edu