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3D Scan Data of Caddo Burial Vessels from the McSpadden Site near Frankston, Texas

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In the spring of 2013, three Caddo burial vessels from an unrecorded site near Frankston, Texas were documented at the McSpadden residence in College Station, Texas. All three vessels are intact and are not reconstructed. Scan data was collected using a ZScanner 700CX running VXElements 2.0 via the scanner direct control function in Geomagic Design X. Post-processing of these data occurred in Design X, and quality control for missing data leveraged both Design X and Verify. These data will be used in a study aimed at the 3D geometric morphometric analysis of Caddo vessels. In addition to the study of geometric morphometrics, these data can augment a wide variety of projects in the digital humanities and archaeology.

Keywords: 3D, 3D Documentation, 3D Modeling, American Southeast, Caddo

(1) Overview

Context

Spatial Coverage
Description: Anderson County, Texas

Temporal Coverage
Late Caddo, ca. AD 1400-1680

(2) Methods

All data were collected with a ZScanner700CX running VXElements 2.0 via the scanner direct control function in Geomagic Design X. Upon completion of the scan, the texture file was saved (.obj) then removed pursuant to instructions by the Caddo Nation of Oklahoma that no texture (color) data be made publicly accessible without express written permission of the Caddo Nation. The uniform color scans were saved as an ASCII.stl prior to beginning post-processing.

Steps

To align each scan, a reference vector (revolving axis) was inserted, followed by a reference point at the confluence of the vector and the mesh (using a projection) at the central base. Region groups were then used to define the basal plane. All three elements (vector, point and plane) of reference geometry were then utilized for an interactive alignment, with the reference plane as the moving plane, the reference vector as the moving vector, and the reference point as the moving point (Figure 1). Alignment has proven to be an important factor in downstream analyses, particularly when making the transition from Geomagic Design X and Verify to SolidWorks or other CAD-based platform.

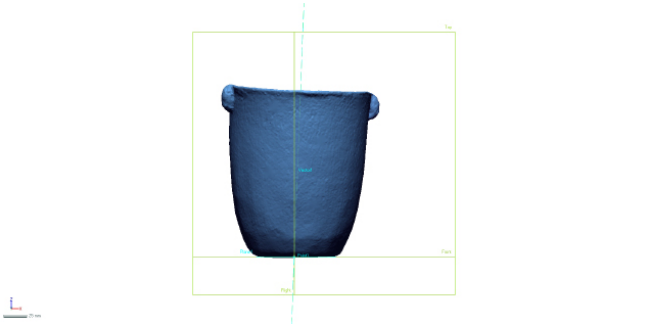

Figure 1. Aligned scan illustrating position and placement of reference vector, reference point and reference plane for McSpadden_Jar.

Post-processing of each 3D mesh began with the healing wizard function in Design X, which corrects problematic issues with non-manifold poly-vertices, folded poly-faces, dangling poly-faces, small clusters, small poly-faces, non-manifold poly-faces, crossing poly-faces, and small tunnels. While the settings for each of these can be customized, the default settings were used in this instance. Once post-processing was complete, all meshes were decimated by 50 percent prior to saving each as an ASCII.stl and an ASCII.ply. Screenshots of each mesh accompany each entry, and are uniform in color. These were produced using the screen capture function in GeomagicDesign X.

Sampling strategy

All Caddo burial vessels from the McSpadden site were scanned and documented.

Quality control

Missing data (holes) in the poly-vertices were remedied by using one of three functions: defeature, edit boundaries, or fill holes. For large holes >5mm, each of these functions was tested by cutting a hole in an adjacent part of the mesh with similar geometry, then filling the hole using each of the three methods. Those data were then imported into Geomagic Verify, where the original mesh (nominal data) could be contrasted with outputs (scan data) from each of the three functions. The function found to have the lowest deviation from the original mesh surface was then used to fill the area of missing data.

Constraints

Due to the nature of 3D scanning technology, it is impossible to gather data from the interior of some bottles, jars and globular carinated bowls. In this case, there is a single vessel that is missing scan data for the lower interior (JarStrap).

(3) Dataset description

Object name
McSpadden

Data type
3D scans of primary data (Caddo burial vessels)

Format names and versions
ASCII .ply (3D mesh) and TIFF (color photograph)

Creation dates
March 2013

Dataset Creators
Robert Z. Selden Jr., Stephen F. Austin State University

Language
English

License
Creative Commons Attribution

Publication date
June 1, 2015

Repository locations

To access the various datasets, click on the name of the repository below each vessel. Each contains a link to those data associated with each vessel.

McSpadden_Jar
CRHR:ARCHIVE
ScholarWorks
Zenodo

McSpadden_JarStrap
CRHR:ARCHIVE
ScholarWorks
Zenodo

McSpadden_CB
CRHR:ARCHIVE
ScholarWorks
Zenodo

(4) Reuse potential

Those data from this project have long-term and wide-ranging research potential, with many potential applications that have not yet been contemplated. These data have significant potential in the digital humanities where they can augment more qualitative studies of decorative design and motif. They also hold promise for clarifying questions of vessel shape and form that can be addressed using 3D geometric morphometrics. Having these vessels in a 3D format affords investigators with a wide variety of new possibilities, including novel avenues of inquiry that enlist the various elements of these dynamic data.

Acknowledgments

I would like to express my gratitude to the McSpadden family for the requisite permissions and access needed to document this collection.