Les Carnets de l'ACoSt

Association for Coroplastic Studies

12 | 2014

Varia

(Re)Constructing Antiquity : 3D Modeling the Terracotta Figurines from Athienou-Malloura, Cyprus

Erin Walcek Averett and Derek Counts

Electronic version

URL: <http://journals.openedition.org/acost/225>

DOI: 10.4000/acost.225

ISSN: 2431-8574

Publisher

ACoSt

Printed version

Date of publication: 15 December 2014

Electronic reference

Erin Walcek Averett and Derek Counts, « (Re)Constructing Antiquity : 3D Modeling the Terracotta Figurines from Athienou-Malloura, Cyprus », *Les Carnets de l'ACoSt* [Online], 12 | 2014, Online since 12 March 2015, connection on 21 April 2019. URL : <http://journals.openedition.org/acost/225> ; DOI : 10.4000/acost.225

This text was automatically generated on 21 April 2019.

Les Carnets de l'ACoSt est mis à disposition selon les termes de la licence Creative Commons Attribution - Pas d'Utilisation Commerciale - Pas de Modification 4.0 International.

(Re)Constructing Antiquity : 3D Modeling the Terracotta Figurines from Athienou-Malloura, Cyprus

Erin Walcek Averett and Derek Counts

- 1 The Athienou Archaeological Project has been investigating long-term cultural change at the site of Athienou-Malloura and the surrounding region since 1990 through systematic excavation and pedestrian survey. The site was occupied for nearly 3,000 years, beginning in the early first millennium BCE.
- 2 Our investigations have unearthed domestic, religious, and funerary contexts, with an impressive assemblage of material remains. The focus of excavations for the last decade has been the extra-urban sanctuary, which has revealed an extensive history of use from the eighth century B.C.E. to the 4th century CE. The artifact assemblage from the sanctuary includes ceramic vessels, coins, animal bones, and other cult objects. Most importantly, excavations have recovered over 3 000 fragments of terracotta figurines and limestone sculpture, which are the focus of our 3D imaging project. The approximately 800 terracotta figurines, most handmade and dating to the Cypro-Archaic period, depict predominantly male types (warriors, chariot groups, horse-and-riders, votaries, etc), while over 2 500 fragments from limestone dedications depict predominantly male votaries and deities (so-called Cypriot Herakles, “Bes,” Apollo, and Pan).

Fig. 1 –Map of Cyprus

- 3 As we undertake the final publication of this impressive and diverse corpus of figural art, the careful analysis of fragments, along with the consideration of archaeological context and ritual practice, has been remained at the core. Visual documentation has always played a critical role in archiving and interpreting material culture. Although archaeologists have embraced technology for this purpose since the discipline's inception, there has been a proliferation in cost-effective multidimensional imaging technologies and the use of computerized applications in recent years. The utilization of imaging technologies presents many practical advantages, from research analysis to virtual presentation, in an international field that rarely permits archaeological finds and objects to be removed from their country of origin.

Fig 2–The custom-made, structured light set-up in the workroom of the Larnaka District Museum, Cyprus. The object is placed on a turn-table while the projector emits patterns of light while scanning.

This is repeated every 45 degrees and on the top and bottom of the object. The ten scans are merged in the post-processing phases using custom software developed by the University of Kentucky's Center for Visualization and Virtual Environments.

- 4 In summer 2014, we initiated a pilot research project that utilized structured light scanning to produce 3D images of Archaic-Roman votive offerings dedicated in the

Malloura sanctuary. This project is a collaboration between Creighton University (Omaha, NE, USA), the University of Milwaukee-Wisconsin (Milwaukee, WI, USA), and the University of Kentucky's Center for Visualization and Virtual Environments. This research project – which brings together archaeologists, art historians, and computer scientists – represents an innovative, problem-oriented approach to reconstructing the fragmented past of the Malloura sanctuary, applying the latest technology in 3D modeling and computer-aided vision. Using a relatively inexpensive, custom-built, structured light scanner (fig. 2), we have begun to produce high-resolution 3D images of fragments from both terracotta and limestone votives (figs. 3-4). These images, and the significant metadata they preserve with respect to shape, scale, and surface appearance, will then be employed to : a) identify and match unique joins (*i.e.*, broken fragments that can be pieced back together) to help reconstitute limestone and terracotta statues, b) create computer-aided, hypothetical reconstructions of fragmentary sculptures based on established typologies, and c) explore surface treatments (paint, fingerprints, carving marks) to understand better technological aspects of production.

Fig. 3, Fig. 4–Frontal and back view merged 3D image of a head from a terracotta Frontal and back view statuette, AAP-AM-3600

- 5 For this pilot phase, a close-range projection structured light scanning system customized with both hardware and software packages was developed by the Center for Visualization and Virtual Environments at the University of Kentucky under the direction of Drs. Brent Seales and Ruigang Yang. Our work in the Larnaka District Museum and the Athienou Municipal Museum greatly benefitted from the help of graduate and undergraduate research assistants : Kevin Garstki (University of Wisconsin-Milwaukee, Ph.Dc in Anthropology), Adam Whidden (University of Kentucky, computer science major), and Caitlyn Ewers (Creighton University, Art History major). Our portable set-up consisted of a Flea3 8.8 MP Color camera, a BenQ 1080p projector to illuminate each object with a known pattern, and purpose-built software written by Bo Fu and Qing Zhang (both from

UK's Center for Visualization) to scan, reconstruct, mesh, texture map, and visualize objects. The advantages of this system over a commercial scanner are the cost and adaptability. This summer we were able to develop protocols and a set of best practices for the scanning process and generate a small but accurate sample corpus of 3D images. The metadata contained in the 3D images (which record the geometry and shape of an object to approximately 0.5mm accuracy, as well as surface appearance) has already proven to be a powerful tool. As just one example, final images can be measured with a digital ruler to mm accuracy across any part (or the whole) of the object. We have also successfully virtually reconstituted two known, fragmentary joins from a life-sized limestone statue base.

- 6 Subsequent phases of this project will experiment with developing a predictive data processing algorithm that will use geometric dimensions, surface texture, and break patterns to propose potential joins among our thousands of terracotta and limestone fragments. We also plan to mine the considerable data contained within the 3D images to consider questions of manufacturing technique and surface treatment.
- 7 Our pilot season was generously funded by a George F. Haddix grant from Creighton University and a Faculty Research and Creative Activities Support award from the University of Wisconsin-Milwaukee, in conjunction with the on-going support of Davidson College and the Athienou Archaeological Project and its Director, Dr. Michael Toumazou. For facilitating our scanning work, special thanks go to Dr. Anna Satraki, Archaeological Officer of the Department of Antiquities, Cyprus, and her staff of the Larnaca District Museum, as well as mayor Dimitris Papapetrou and Noni Papiasanti, curator of the Kallinikeio Municipal Museum of Athienou. The project would have not been possible without the collaborative efforts of our colleagues at the University of Kentucky's Center for Visualization and Virtual Environments ; we take this opportunity to acknowledge again the significant contributions of Professor Ruigang Yang, Bo Fu and Qing Zhang, who built the scanner and wrote the programs necessary to make it work.

INDEX

Keywords: Cyprus, terracotta figurine, religious, funerary, sanctuary, archaic, new technology

AUTHORS

ERIN WALCEK AVERETT

Creighton University
erinaverett@creighton.edu

DEREK COUNTS

University of Wisconsin-Milwaukee
dbc@uwm.edu