Close Range Photogrammetry vs. 3D Scanning for Archaeological Documentation

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Rachel Opitz Research Associate Center for Advanced Spatial Technologies 341 JBHT, University of Arkansas Fayetteville, AR 72701 479.575.4416 (office) - 479.575.5218 (fax) rachel@cast.uark.edu Close-range photogrammetry vs. 3D scanning for archaeological documentation: comparing data capture, processing and model generation in the field and the lab

Abstract

The proliferation of terrestrial laser scanners on the market over the past few years has been accompanied by a rapid adoption of the technology by archaeologists. This increased archaeological use has come with growing number of arguments against the use of 3D scanning as a practical means of documentation by archaeologists, preservationists, conservators and architects. More recently the introduction of several affordable and/or free close-range photogrammetric software packages that require minimal processing labor has generated much discussion regarding how useful such a cheap and easy 3D capture solution is for archaeologists. When confronted with multiple options for 3D documentation, several questions arise: How much can be gained from using a $150,000 laser scanner over photogrammetry with a digital camera and free processing software when documenting an excavation or ceramic vessel? Can a mid-range scanner capture sufficient detail on rock art for general documentation? How does the accuracy and repeatability of these newer close-range photogrammetry options compare with 3D scanning? Many factors can influence which technology is most appropriate for a given application and when a combined approach may be more productive. This presentation addresses these questions and compares and contrasts data collection and processing for photogrammetry and 3D scanning documentation in archaeology for both site and object scale case examples. A variety of non-metric, close-range photogrammetric data capture methods (e.g. calibrated vs. non-calibrated, wide-angle vs. normal lens, etc.) will be reviewed through a comparison of at least three photogrammetric software packages including Eos Systems' PhotoModeler Scanner, AutoDesk's 123D Catch and AgiSoft's PhotoScan. The resulting data sets will be compared to scan data of the same objects as captured by a Leica C10 mid-range laser scanner and the Breuckmann SmartScan HE close-range scanner. Test data will include rock art and architecture from Knowth, Ireland; Defiance House Ruin, United States; architectural sculptures from El Zotz, Guatemala; as well as controlled lab tests.

In addition, these 3D documentation methods will be compared to traditional documentation in terms of cost and potential products/deliverables and also consider the advantages and drawbacks of the data produced by the two methods. While 3D data sets are of course vastly richer than line drawings or photographs, the sheer immensity of a full-resolution point cloud is burdensome to process and

manipulate, and includes extraneous information which can obscure, rather than clarify, the most important features in a line drawing. Thus, vector extraction techniques for the rapid creation of digital line drawings from large point clouds will be discussed. We will close with a summary of 3D scanning and photogrammetry metadata standards as developed by the Center for Advanced Spatial Technologies for the Digital Archaeological Record (tDAR) and the Archaeological Data Service (ADS). Thank you, Katie --