

# Towards Digital Epigraphy for Egyptian Hieroglyphics

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## Abstract

Archaeological use of non-contact scanning has been successfully demonstrated for sites and objects [Levoy et al]. In this short paper, we consider the novel application of laser scanning to the field of archaeological epigraphy, the study of inscriptions.

## 1 Introduction and Source Data

Detailed line drawings are a currently accepted method for documenting wall inscriptions. Such drawings (below, center) offer the viewer a graphic representation of the wall. Photographs (below, left) are another common method for epigraphic documentation and convey other information, such as color. Laser scanning (below, right), represents a third kind of documentation.

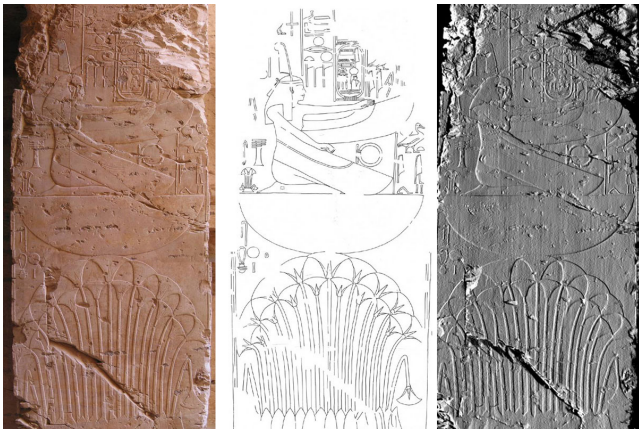


Figure 1. Traditional and digital and epigraphic techniques.

A 3D model built from scan data can be viewed and lighted from different angles, in contrast to photos or drawings. Scan data can also be used to precisely document wall damage, as shown below:



Figure 2. Rendering of ~1mm polygon mesh.

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## 2 Extracting Epigraphy from Scan Data

Laser scan data can effectively serve as a 3D epigraphic record. However, since epigraphic study today is largely based on line drawings, it is useful to extract 2D line drawings from 3D scan data. Below, we present images from our epigraphic field work in the tomb of Ramesses II in the Valley of the Kings, Egypt.

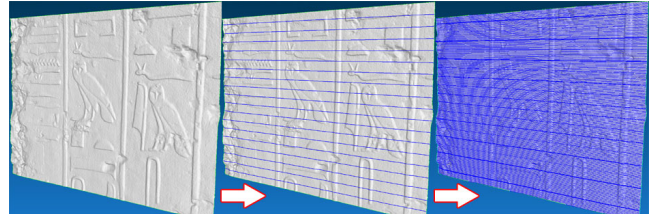


Figure 3. Projecting curves on a scan data surface.

After aligning and merging scan data for a section of inscriptions, we project horizontal curves on the resulting mesh. In Fig. 3, we show meshed point data (left), 20 curves on surface (center), and 200 curves on surface (right). This ‘synthetic scanning’ step is used to recover depth measurements as a quantized U,V grid.

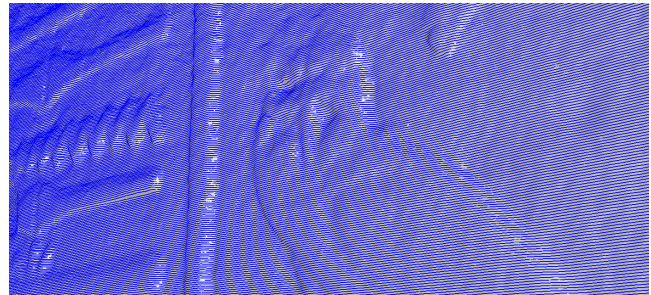


Figure 4. Detail of densely spaced curves on surface.

Additionally, it is possible to incrementally traverse the extracted curves in succession, using changes in the curve normal (i.e., the surface’s profile) to detect edges that would be rendered by hand in a conventional epigraphic line drawing.

## 2 Future Work

We are currently exploring algorithms to efficiently plot all detected edges as a 2D epigraphic drawing. Care is being paid to algorithms that can faithfully parse and retain edge profiles which represent carved relief while automatically discarding edges which represent damage to the wall surface itself.

## References

LEVOY, M, GINSBERG, G, SHADE, J, FULK, D. ET AL. 2000. The digital Michelangelo project. In *Proceedings of SIGGRAPH 2000*, ACM Press / ACM SIGGRAPH, ACM, 131–144