

# Reconstructing a Colossus of Ramesses II from Laser Scan Data

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## Abstract

We present a new method to solve a 3D ‘jigsaw puzzle’, building a colossus from scans of its fragmentary ruins in Thebes, Egypt.

## 1 Field Work in Egypt

While one of the largest colossi ever built by ancient Egyptian hands, a colossus of Ramesses II now lies in a ruinous state at the site of the Ramesseum in Thebes, Egypt. Under the site direction of Dr. Christian Leblanc (CNRS), our team assembled a detailed digital reconstruction of the fallen statue for use in evaluating pending physical restoration work on this important monument.

Of the many hundreds of extant fragments, we selected 90 for detailed documentation. Our method relied on active optical triangulation scanning to derive 3D models as shown below:

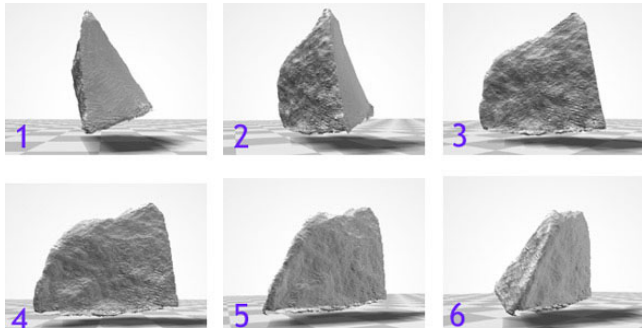


Figure 1. Turntable views of a digital leg fragment.

Many viewpoints (~40) were scanned for each fragment; the resulting polygonal meshes were then aligned via ICP and volumetrically merged into a single isosurface [Curless, Levoy].

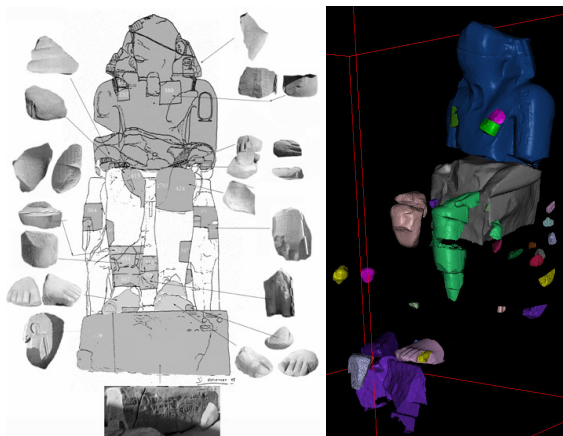


Figure 2. Exploded view (left), false color model (right).

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## 2 Process, Results and Future Work

Once the individual fragments of the colossus had been modeled, our team began to assemble the ‘jigsaw pieces’ under the direction of the French Egyptologist Dr. Philippe Martinez using software kindly provided to our team by Dr. Levoy at Stanford University.



Figure 3. The assembled 3D model of the colossus.

In order to correctly deduce the spatial relationship between fragments, we scanned the Northern Memnon colossus in Thebes to use as a 3D reference template for our reconstruction. The proportions of our reconstruction above reflect this template data.



Figure 4. Comparison between actual and digital fragments.

In many cases we were able to digitally rejoin destroyed pieces of a larger whole, as seen above where two fragments are joined along a break. The void regions in our model will be filled in our future work, and this colossus model will be rendered into its proper relation with the Ramesseum, which was also documented with optical triangulation during our field work.

## References

CURLLESS, B., LEVOY, M. 1996. A volumetric method for building complex models from range images. In *Proceedings of SIGGRAPH 1996*, ACM Press / ACM SIGGRAPH, 303-312