Unstructured Light Field Rendering:
Enhanced Photogrammetry using On-Camera Flash
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This workshop will demonstrate the use of image based rendering software that can be used to obtain a dynamic three dimensional representation of an artifact that preserves the photorealism of the original images that were used to produce the model and permits the object to be relighted using arbitrary lighting setups. The software works in conjunction with photogrammetry software such as Agisoft PhotoScan, but it provides a far more realistic and flexible rendition of the object than is possible with this and other similar commercial tools. When it is used to record a single static lighting setup, the software simply interpolates amongst the photographs that were taken. In this case the lighting is "baked into" the photographs and cannot be changed in the computer graphic rendition. If relighting is desired, the object is photographed using a camera mounted strobe light. By cleverly selecting and blending these flash photographs the software is able to create a real time playback in which the lighting can be altered.

In this workshop we will lead the participants through the steps that are necessary to photograph the object, process the images, and display and relight the results on a laptop. The software has been developed in a collaboration between the Minneapolis Institute of Art and the University of Minnesota, and it has been tested as part of the typical photographic workflow at the museum. Participants will learn how this approach can be used to acquire, at one time, all of the imagery that is necessary to document an artifact and produce novel renditions of it, now or in the future. They will also see how simple the method is to apply, particularly for museums that do not have a professional photographic staff. For those who would like to learn how to use the software themselves, instructions will be provided on how to download and install the software from our website (https://sites.google.com/site/ulfrenderer/). More details about the software are available in papers that were presented at the Digital Heritage 2015 Conference and the Graphics and Cultural Heritage 2016 Conference. Links to these papers and to screen captured videos are provided below:

Michael Tetzlaff and Gary Meyer. Using Flash Photography and Image-Based Rendering to Document Cultural Heritage Artifacts, Eurographics Workshop on Graphics and Cultural Heritage, 137-146, 2016.

Seth Berrier, Michael Tetzlaff, Michael Ludwig, and Gary Meyer. Improved Appearance Rendering for Photogrammetrically Acquired 3D Models, Digital Heritage 2015 Volume 1, 255-262, 2015.

Tiger Hat (relighted)

Celestial Horse (relighted)

[Unstructured Lumigraph (no relighting)](#)