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Snehal A. Padhye

Rochester Institute of Technology

James A. Ferwerda

Rochester Institute of Technology

David Messinger

Rochester Institute of Technology

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Digital Modeling of Cultural Heritage Objects

Snehal A. Padhye*
Rochester Institute of Technology

James A. Ferwerda
Rochester Institute of Technology

David Messinger
Rochester Institute of Technology

Abstract — Cultural heritage objects are a rich source of information about human history. Due to the physical nature of these often old and typically rare or unique objects, humanity is at risk of losing this history. Given their importance, preservation is an active area of interest in the research community. While, digitally capturing images of the objects is com-mon practice, we propose a more comprehensive approach to preserving these objects. It involves creating digital models that represent both the three- dimensional shapes of the objects and the materials they are made of.

Keywords — cultural heritage objects, digital modeling, realistic- rendering, interactive computer graphics

OVERVIEW

The basic idea is to capture sets of images in a defined illumination pattern and use these images as data to model the geometric (shape, texture) and radiometric (color, gloss, trans- lucency) properties of the objects under con- sideration. Rendering these models using computer graphics creates realistic represen- tations of the objects. Our current set up is shown in Fig. 1. It is a Linear Light Reflec- tometer (LLR) (based on earlier work by Gardner, Tchou, Hawkins, and Debevec 2003, 749-758); consisting of two linear light sources; that is used to capture images at dif- ferent illumination angles. A sample result can be seen in Fig. 2.

CONCLUSION

Our system can be used to create interac- tive and realistic representations of cultural

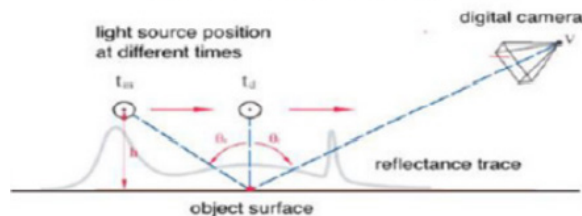
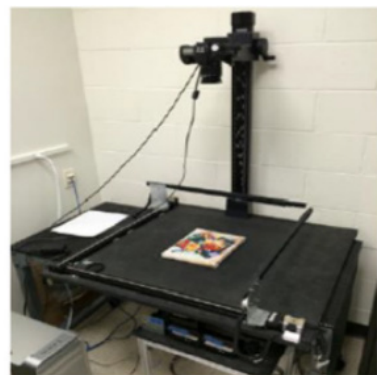


Fig.1. Linear Light Reflectometer (top), and reflectance trace (bottom) used to model surface properties.

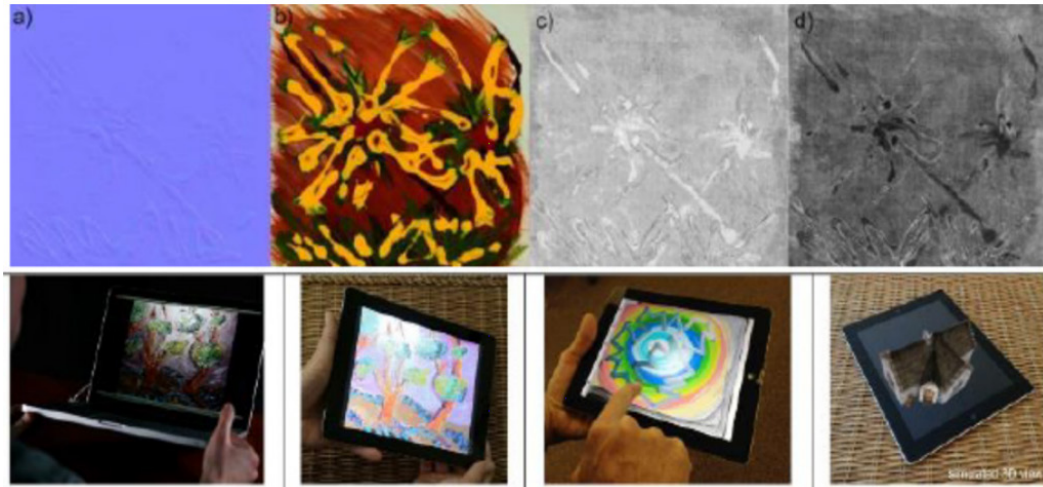


Fig. 2. Top - Surface normal(a) and (diffuse(b), specular(c) and roughness(d)) maps produced by the LLR. Bottom - Examples of Tangible Display Systems

heritage objects. These systems can be used in libraries, museums and teaching platforms. This would reduce direct handling of the fragile documents, further adding value to their conservation. Our goal ahead is to upgrade the system to reduce complexity to make it more practical to use. These improvements include reduction in number of images required to extract the material properties, a more portable capture system and extending it over non- planar cultural heritage objects.

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