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From documenting to reconstructing appearance**

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Scanning and printing a painting's appearance – from documenting to reconstructing appearance

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A three-dimensional landscape of paint

A painting is not a solely a static depiction. The painting as an artefact is in fact a three-dimensional landscape of paint, with varying appearance properties across its surface, including color, topography, gloss and translucency variations. This effect can be intentional – for instance using paint to create a 3D effect – or the consequence of drying, hardening, or degradation. Aging, environmental influences, handling, but also conservation treatments have and will continue to influence the appearance of a painting. Currently, the documentation of a painting's complete appearance is generally limited to archival photography, representing it as a 2D image. A more extensive documentation of appearance – and changes over time – is generally not captured.

Appearance reproduction, reconstruction and documentation

Recent work has focused on capturing and reproducing a painting's appearance attributes including color, topography and gloss (e.g.[1], [2]) (see Figure 1 and Figure 2). Furthermore, a reconstruction of the original size of the painting *Saul and David* by Rembrandt van Rijn (c.1651-1654 and c.1655-1658) was exhibited at the Mauritshuis, The Netherlands [3]. More recently, three 3D scanning techniques were used to capture Johannes Vermeer's *Girl with a Pearl Earring* (c.1665), as part of the 'Girl in the Spotlight' research initiative [4]. These techniques were compared and evaluated on their ability to support documentation and visualization of the craquelure of paintings (see Figure 3).

Future research directions

Work is continued on the (3D) scanning of appearance for documentation purposes, and further evaluated for their applicability to support conservation, restoration, and potentially the formulation of better substantiated preservation guidelines. Future work on appearance reproduction is envisioned regarding transparency capturing and reproduction. Furthermore, research will be directed to exploring more possibilities of appearance reconstruction and using appearance data in a virtual context.

Keywords

3D scanning, 3D printing, Cultural Heritage, Appearance Reproduction, Gloss

References

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Material Appearance Workshop

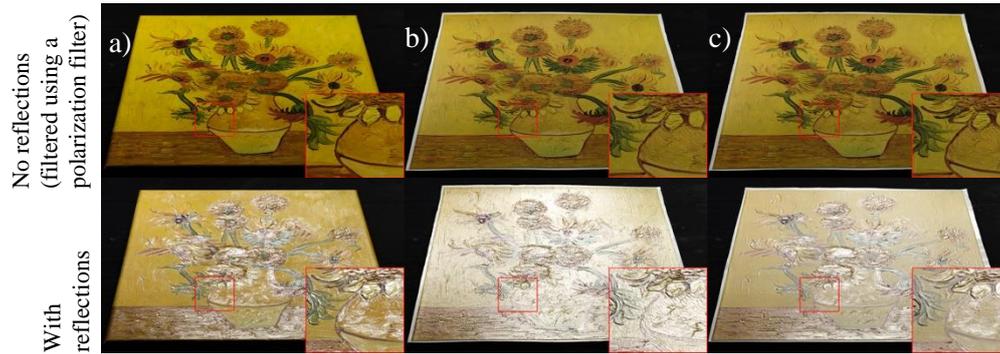


Figure 1: Appearance reproduction of (a) the painting ‘Sunflowers’ by W. Adam (in the style of Vincent van Gogh), compared to (b) a print without gloss modulation layers and (c) a print with gloss modulation layers.



Figure 2: Photographs of (a) the painting ‘Fruit Still Life’ by Cornelis de Heem (Courtesy of Mauritshuis/photographer Ellen Nigro), (b) a reproduction featuring color, topography and spatially-varying gloss, taken during restoration.



Figure 3: Comparison of original documentation (a-b) and virtual renderings (c-e), visualizing surface heightvariations of Johannes Vermeer’s ‘Girl with a Pearl Earring’. (a) Raking light photograph, (b) hand-traced crack image, (c) rendering (similar to raking light) using color and topography data, (d) rendered as a matte, white surface, and (e) rendered using a color map, to enhance the height variations. Note that for the renderings the height variations are exaggerated relative to the lateral scale, to increase their visibility.