REFLECTANCE TRANSFORMATION IMAGING: AN ACCESSIBLE TECNOLOGY FOR THE DOCUMENTATION AND CONSERVATION OF TEXTURAL SURFACES

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Introduction

Texture is, along with color and form, an important visual cue that helps perception identify the physical characteristics of everything around us. Texture qualities also reveal the ways an artist has manipulated some materials to create an artwork or cultural object, and the transformations they have experienced over time, including deterioration. Unfortunately, documenting texture remains a challenge since what the sight perceives of it is the result of a dynamic interplay between surface patterns and illumination conditions. For this reason, finding imaging tools capable of recording and helping conservators examine textures in a precise, integral, yet practical and accesible manner is crucial. One such a tool is *Reflectance Transformation Imaging* (RTI), an innovative computational photography technique that creates an interactive and highly accurate digital model of an object, which conveys tridimensional information of its surface texture and color. Implementing RTI at the Conservation of Cultural Heritage Department of the Universitat Politècnica de València, conservators created 70 RTIs of 36 artworks under treatment. Considering the production process and resulting images, researchers evaluated the viability, advantages, and potential applications of this technique as a documental and analytical tool in conservation tasks.

Main results

As a means of documentation, RTI proved effective to register and transmit accurate three-dimensional information about texture, color, shape, and surface gloss. Since it uses conventional photographic equipment, open-source software, and highly automated processes, RTI is relatively simple and quick to implement in routine conservation workflows. Also, it is very affordable, so it can be adopted by individual conservators as well as institutions with limited budgets.

RTI offers many advantages over raking light photography because it contains thousands of potential images on a compact file. Since RTI images are Interactive, they allow each researcher to manipulate a virtual light on screen to illuminate surfaces from different angles and to use a variety of filters to highlight specific attributes, according to their particular interests; regardless of the lighting directions and objectives followed by the photographer during capture. This provides a more versatile way to study and compare an object after it has been treated or has suffered any changes due to age or deterioration.

As a non-invasive analytical tool, RTI provides exact color, texture, and reflectance information of a surface which is not accessible with other photographic techniques, light spectrums, magnification devices, or even with 3D scanners. The combination of rendering filters, magnification, and lighting angles offers conservators a greater ability to perceive and study surfaces in a very detailed, dynamic, and intuitive manner that closely resembles the actual experience of direct observation of the object.

The RTI images created during this project were key in discovering new clues of constituent materials and manufacturing techniques (Fig. 1). They served to establish and record more accurate condition assessments (Fig. 2); and to make more objective evaluations of the surface transformations due to conservation treatments (Fig. 3). RTI images would also constitute part of a comprehensive graphic record of the conservation process.

In conclusion, RTI is an accurate, accessible, and affordable method. It has a tremendous potential as an analytical and documentation tool of surfaces in the conservation of cultural property. The resulting high resolution digital replicas of the objects can provide conservators with new evidences of surface patterns, helping them make more objective comparisons and to be better prepared to introduce accurate theoretical interpretations about their origin, condition, and above all, of the effectiveness of their conservation treatments.

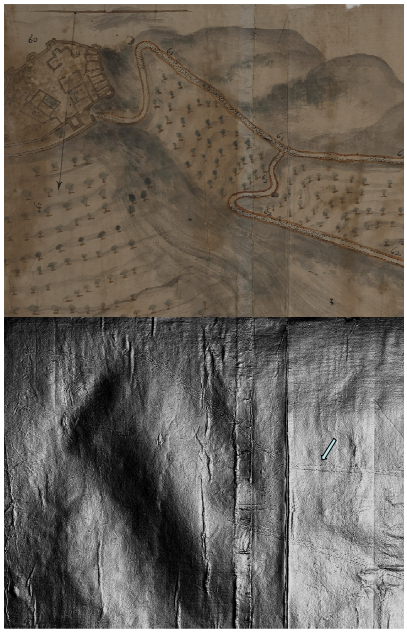

Fig. 1 *Detail of watercolor, seen in RTI without filter (top) and specular filter (bottom). By reducing color values, the outlines made with a harder tool are detected on the support. Paper deformations and other damages are also better observed.*

Fig. 2 *Detail of oil on panel seen in RTI without filter (left) and specular enhancement (right). RTI enhances texture features to denote deformations of the support, cracking, losses, cupping, scratches, and other surface damages to help conservators carry out more precise condition assessment.*

Fig. 3 *Three details of a blistered paint layer, seen in RTI before (left column) and after (right column) planar correction. RTI provides better visualization of textural detail and brightness to make more objective comparisons and assessments of the effectiveness of the intervention processes.*