

Thermal Quasi-Reflectography, a new imaging technique for noninvasive analysis of artworks: principles and applications

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Infrared imaging is widely used in heritage diagnostics allowing the non-invasive analysis of extended painted surfaces. Wide-field techniques and the selective use of an appropriate infrared band enable the mapping of many features both at surface and subsurface levels, according to the specific radiation interaction properties of the artwork materials. In particular, near-infrared reflectography, by exploiting the capability of the near-infrared spectrum (0.8-2.5 μm) to penetrate the different paint layers, is able to reveal hidden features such as preparatory drawings, pentimenti of the artist, or subsequent repaintings. It is well known that for the study of canvas and panel paintings, this technique is one of the most powerful tools in the hands of the art historian and the restorer. The more recent spectral techniques have further improved near-infrared imagery.

We have recently demonstrated a novel tool for artwork infrared imaging, named Thermal Quasi-Reflectography. The underpinning idea is to extract information from the mid-infrared energy (3-5 μm) reflected by the object, which is strongly related to the surface material properties. The thermal band is conventionally being used in non-destructive testing in relation to the emissive behaviour of the target object, and widely applied to artworks for the inspection of structural defects (inner support or paint delamination). Here the concept of classic thermography, where the radiation emitted by the surface is recorded and then correlated to the temperature distribution (the thermogram) is taken on reverse. Effectively, it is Thermal Quasi-Reflectography, in which the emitted radiation is minimized in order to properly record the reflected quote. The mid-infrared spectrum carries back information related to the absorption bands of the different materials of the pictorial surface. The result is the mid-infrared reflectogram, which allows the discrimination of many features in the pictorial layers, related both to the artwork materials and technique as well as deterioration of the artwork surface.

Thermal Quasi-Reflectography is very effective on mural paintings, where traditional reflectography is less effective due to the effect of the not-reflective plaster background. Examples of the results obtained on fresco models and on notable genuine artworks are shown. The technique provides the selective mapping of painting materials, finishing touches, and a clear detection of differently aged organic painting integrations. Different execution techniques, e.g. fresco or tempera, also exhibit different behaviours.

In this lecture, we trace the key-points of this new diagnostic method: 1) introduction of the basic principle and the instrumentation to enable operative measurements; 2) presentation of the main diagnostic results and discussion of the future potentialities.

Thermal quasi-reflectography is demonstrated to have strong potential, which surely underlines the need for further developments and applications in the field. An interdisciplinary effort is needed.

BASIC REFERENCES

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