

# Facilities for *in-situ* painting diagnostics and monitoring

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*We present here an example of the application of two very well-known image diagnostics, X-ray radiograph and macro photography, attempting to be movable and easily used in museum environments.*

**Keywords:** X-ray scanner; macro photography

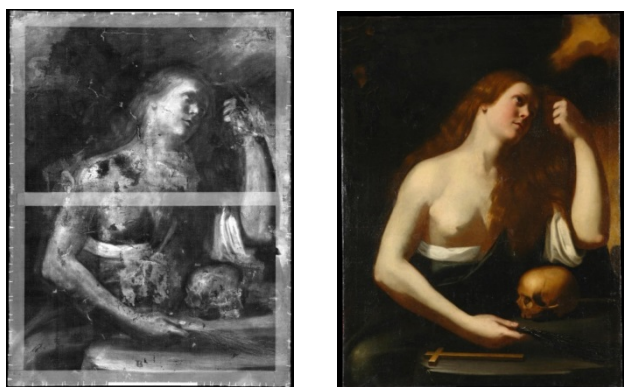
## 1. Introduction

Designing a physics instrument to be applied to Cultural Heritage, you will face with at least two typical characteristics of works of art: no limits in dimension, no availability to be moved. We have found solutions that can move and use the tools *in situ*, in an absolutely non-invasive way. Some further innovations have also been added.

## 2. Digital X-ray radiography by scanner

A RX scanner is needed if you want to be able to get radiographical images from a painting of any size, but this is a 3-fold exercise in remote controlling. In fact, a remote control has to be provided for X-ray irradiation, digital image acquisition and movement of both X-ray generator and detector. These three features need to be timed and synchronized because any image has to be acquired firmly, when the irradiation is fired. The subsequent movement must take place after the shot.

In the post-production stage, the correction and stitching of some hundreds of digital images needs a good automatic software and a fairly good computer facility. The result is surely better than the old-fashioned mosaic of large radiographic plates in the analogue era [1].



**Fig. 1** *Penitent Magdalene*, XVII century painting on canvas by anonymous: digital X-ray image by scanner and photo

A typical painting, of about one square meter, can be scanned by some 200 X-ray shots in 3 hours, with a smallest perceptible detail of 0.1 mm. The device has demonstrated its ability to radiograph very large paintings with the X-ray of *Paolo and Francesca* (1920) by Gaetano Previati, of 6 m<sup>2</sup> [2].

## 3. Calibrated Macro Photography

Calibrated Macro photography is a way to get quantitative measurements from a traditionally qualitative image diagnostics, in order to control potentially dangerous movement of the painted layer and of its support. Its implementation is indeed easy: to have the pixel pattern calibrated in microns, simply move the camera between two shots of a known distance and identify the shift in the homologous details.

To monitor the movement of the pictorial layer it is useful to use the defects of the same layer: the cracks, the fractures, the craquelé, which are effective indicators of the state of health of the layer.

The sensitivity of the methods has reached 2 microns/pixel for *The Onions of Socrates*, by F. De Pisis, oil on cardboard of the Filippo De Pisis Museum of Ferrara Municipality, a very stable painting in a stabilized frame [3].

## 4. Conclusions

The X-ray scanner has been useful in instances where limited time and painting size could prevent any radiographic procedure. The Calibrated Macro Photography has proven to be invaluable to monitor the state of health of painting layers before/after restoration or travels for exposition.

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## References

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