SECOND PRIZE

Shroud Analysis

Texture Characterization by Means of the Wavelet Transform

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The aim of this work is to improve the digital images quality, in particular those relating to the Turin Shroud. ù

The problem with Shroud images is that they are characterised by very low variations of the luminance of the various pixels. These almost unperceptible variations, cause great difficulty in analysing the images with the naked eye. Therefore some kind of elaboration becomes necessary. The main effects causing noise are relative to the fabric, because it has spatial frequencies higher than the ones of the impressed image. It is clear that the value of spatial frequency becomes the most important parameter to make a distinction between the signal and the various defects.

The most important part of this work concerns the determination of the frequencies to be attributed to the vertical, horizontal and diagonal lines crossing the image. The basic idea is to apply the same an algorithm to eliminate the residual texture effects and avoiding the application of some color correction techniques.

The results of this study are presented. Then the entire Shroud is analyzed, by means of a technique which is thoroughly explained.

Conclusions:

-The determination of the frequencies corresponding to the defects by means of the Continuous Wavelet Spectrum has proved to be efficient.

- The elimination of the frequencies found has been performed using the Mallat pyramidal algorithm.

- The elimination of particular combinations of frequencies corresponding to vertical and horizontal defects causes diagonal lines to appear as a noise effect. Therefore the results obtained using wavelet filtering were improved applying some other filtering techniques like the Gaussian filter or the Fast Fourier Transform filter.

- The results obtained in this work have been shown and refer both to the sample images and to the entire Shroud of Turin.