

Use of Image Pro Plus 7 software to determine the densities of a radiographic film

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Keywords: neutron radiography, radiographic films, density, grey levels.

Densitometer is the equipment normally used to measure the density of radiographic films. It is proposed in this work to develop a method to determine the density of these films by scanning them with the Epson Expression 12000XL scanner.

The development of this technique will make it possible to determine densities of neutron radiographies [1]. Neutron radiographies use X-ray films in contact with a neutron converter to get the images. The films are irradiated in the J-9 channel of the Argonauta Reactor/SEREA/ IEN and the research is carried out in the Neutron Radiography Laboratory/SEREA/ IEN.

The first step to get the results is to calibrate in grey levels the image. A standard negative plate in grey levels [2], that was available from the scanner manufacturer (Figure 1), was scanned and its digital image is obtained. Afterwards, the digital image of the standard will be associated with the digital image of a desirable neutron radiography digital image, both digital images should be scanned at the same conditions. The digital images will be processed using the software Image-Pro Plus 7 [3].



Figure 1. Gray levels scheme used to calibrate the scanner Epson XL12000 [2].

It is intended to make the correspondence between grey levels of the digital image and its density. In an optical densitometer, numeric values are assigned from 0 to 3 units of optical density [4] associated with the amount of light that can pass through an area of the film. As dark is the film, greater is its density.

Determining the density of a film, it can be built the sensitivity curve of any radiographic film and can also be found what is the best running

time for its irradiation to produce neutron radiographies with the best image quality.

In 8-bit depth images (2^8) there are 256 values (256 possible grayscale values from 0 to 255). Thus, when performing the analysis of the grey level available [2] (Figure 1), it was obtained the result of the intensity varying from 20 to 229. The darkest tone had a minimum value of 20.58 and the lightest tone the value obtained was approximately 229 (Figure 2).

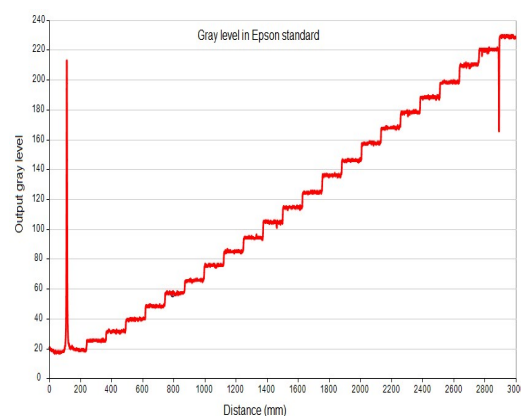


Figure 2. Grey level profile distribution according to the width of each step of the pattern image (figure 1).

Therefore, when comparing the results with theoretical data of grey levels scale (0–255), it demonstrates satisfactorily that the methodology to assess grey tones has been established and it is able to analyze the images to be obtained by neutron radiography.

This work has the financial support of Fundação de Inovação e Pesquisa (FINEP) and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq).

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