Active filtering applied to radiographic images unfolded by the Richardson-Lucy algorithm

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Degradation of images caused by systematic uncertainties can be reduced when one knows the features of the spoiling agent. Typical uncertainties of this kind arise in radiographic images due to the *non-zero* resolution of the detector used to acquire them, and from the non-punctual character of the source employed in the acquisition, or from the beam divergence when extended sources are used. Both features blur the image, which, instead of a single point exhibits a spot with a vanishing edge, reproducing hence the *point spread function - PSF* of the system. Once this spoiling function is known, an inverse problem approach, involving inversion of matrices, can then be used to retrieve the original image. As these matrices are generally ill-conditioned, due to statistical fluctuation and truncation errors, iterative procedures should be applied, such as the Richardson-Lucy algorithm [1, 2]. This algorithm has been applied in this work to unfold radiographic images acquired by transmission of thermal neutrons and gamma-rays. After this procedure, the resulting images undergo an active filtering which fairly improves their final quality at a negligible cost in terms of processing time. The filter ruling the process is based on the matrix of the correction factors for the last iteration of the deconvolution procedure [3, 4]. Synthetic images degraded with a *known* PSF, and undergone to the same treatment, have been used as benchmark to evaluate the soundness of the developed active filtering procedure. The deconvolution and filtering algorithms have been incorporated to a Fortran program, written to deal with real images, generate the synthetic ones and display both.

References

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