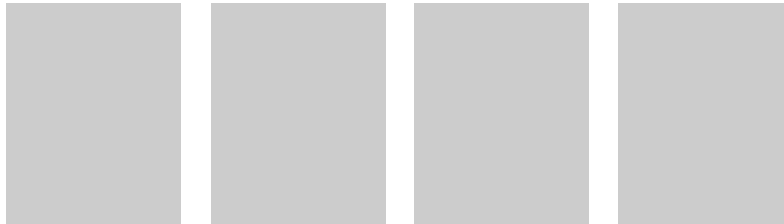


MEASUREMENT OF DISPLACEMENT FIELDS WITH SUB-PIXEL ACCURACY BY COMBINING CROSS-CORRELATION AND OPTICAL FLOW

A. M. R. Sousa¹, J. Xavier¹, M. Vaz², J. J. L. Morais¹, V. M. J. Filipe¹

¹ CITAB, Engineering Department, University of Trás-os-Montes and Alto Douro

² Mechanical Engineering Department, Faculty of Engineering of University of Porto



ABSTRACT

This paper presents a method to measure the displacements fields on the surface of a planar object with sub-pixel resolution, by combining image correlation and a differential technique. First, a coarse approximation of the pixel level displacement is obtained by cross correlation (CC). Two consecutive images, taken before and after the application of a given deformation, are recursively split in sub-images, and the CC coefficient is used as the similarity measure. Secondly, a fine approximation is performed in order to assess the sub-pixel displacements by means of an optical flow method based on a differential technique. This differentiation is achieved in a window of pixels that will typically define the displacement spatial resolution of the method. In order to validate the effectiveness and robustness of the proposed method, numerical tests, consisting of a rigid-body translation test and a rotation test, were carried out on computer generated images.