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An improved cross-correlation method for (digital) particle image velocimetry

by

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ABSTRACT

Cross-correlation (digital) particle image velocimetry (PIV) has become a well-known and widely used experimental method. It has been already documented that difficulties arise in accuracy and spatial resolution. An improved method that brings enhancement in accuracy and spatial resolution for the interrogation of (digital) PIV images is described. This method is based on cross-correlation with discrete window offset. It makes use of a translation of the interrogation window and rebuilds the second interrogation window considering rotation and shear. This paper also presents the limits of conventional cross-correlation method in accuracy and spatial resolution, and explains the expected enhancement in terms of them. The accuracy and spatial resolution are compared by interrogation of synthetic (digital) PIV images with the conventional cross-correlation method and the present, improved cross-correlation method. This improved cross-correlation with discrete window offset is applied to real PIV data and the results are discussed.