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Title DEVELOPMENT OF IMAGE PROCESSING TECHNIQUES
FOR PARTICLE IMAGE VELOCIMETRY

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Abstract

This report describes the development of software for processing the double/multiple exposed PIV images from single or dual frames. The particle images in the 'gif' or 'tif' format with eight bit gray scale depth are processed using frequency domain based methods. The pre-processing for the image enhancement include stretching and histogram equalization. The images of the weak unpaired and out of plane particles are suppressed using 2D filtering methods. In the case of multiple exposed single frame images, auto correlation using 2D FFT is carried out to get the pixel displacement and hence 2D velocity vector. In the case of dual frame double exposed images, cross correlation using three Fourier transforms is used for the vector extraction. The estimation of centroid in the correlation plane provided sub-pixel accuracy of the correlation peaks. This greatly enhances the accuracy of results. The graphical user interfaces provided easy selection of various input parameters such as grid size, overlap and various processing parameters such as type of filters, threshold etc. The program was tested with simulated as well as experimentally obtained data and found to give accurate results.