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Tesis: **"COMPARISION OF 3 TECHNIQUES USED FOR THE ESTIMATION OF DISPLACEMENT IN PIV"**

Resumen:

In the velocimetry laboratory there is interest in developing a professional software for the computation of displacement fields from images mainly of particle image velocimetry (PIV) and digital image correlation (DIC). Currently, for that task, there are basically two numerical methods, which have their strengthens and their weaknesses. These two algorithms are studied in this work in order to assess their performance and do a comparison. The algorithms are the correlation technique, the Lucas-Kanade algorithm and a hybrid Lucas-Kanade, which incorporates an artificial intelligence algorithm. The correlation technique is the traditional technique in PIV and DIC. It uses the concept of correlation to measure the displacement of the particles, and this statistical measure of the displacement can be done by applying the Fourier transform. The Lucas-Kanade algorithm computes the displacement by performing a least squares minimization routine. The hybrid Lucas-Kanade includes an algorithm called particle swarm optimization algorithm. The idea here is that the particle swarm optimization algorithm helps Lucas Kanade to improve and optimize its result. To compare these three algorithms, several parameters are evaluated: size of the scan window, size of the diameter, magnitude of the displacement, noise level, contrast of the image, etc. The evaluation considers three types of displacement distribution: constant displacement, sinusoidal displacement and vortex-like displacement. The main results of this work are that the correlation technique in general yields more accurate results and that the hybrid Lucas-Kanade is especially accurate for low-contrast images (but with heavier processing). Therefore, it is worth to incorporate both algorithms in a future version of processing software.