

A Globally Optimal Particle Tracking Technique for Stereo Imaging Velocimetry Experiments



A Globally Optimal Particle
Tracking Technique for Stereo
Imaging Velocimetry Experiments

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BiblioGov. Paperback. Book Condition: New. This item is printed on demand. Paperback. 28 pages. Dimensions: 9.7in. x 7.4in. x 0.1in. An important phase of any Stereo Imaging Velocimetry experiment is particle tracking. Particle tracking seeks to identify and characterize the motion of individual particles entrained in a fluid or air experiment. We analyze a cylindrical chamber filled with water and seeded with density-matched particles. In every four-frame sequence, we identify a particle track by assigning a unique track label for each camera image. The conventional approach to particle tracking is to use an exhaustive tree-search method utilizing greedy algorithms to reduce search times. However, these types of algorithms are not optimal due to a cascade effect of incorrect decisions upon adjacent tracks. We examine the use of a guided evolutionary neural net with simulated annealing to arrive at a globally optimal assignment of tracks. The net is guided both by the minimization of the search space through the use of prior limiting assumptions about valid tracks and by a strategy which seeks to avoid high-energy intermediate states which can trap the net in a local minimum. A stochastic search algorithm is used in place of back-propagation of error to further reduce the chance of being trapped in an energy well. Global optimization is achieved by minimizing an objective function, which includes both track smoothness and particle-image utilization parameters. In this paper we describe our model and present our experimental results. We compare our results with a nonoptimizing, predictive tracker and obtain an average increase in valid track yield of 27 percent. This item ships from La Vergne, TN. Paperback.

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