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A Globally Optimal Particle Tracking Technique for Stereo Imaging Velocimetry Experiments

By Mark McDowell

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...



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