LOUIS-PHILIPPE SAUMIER DEMERS, University of Victoria
Optimal Transport for Particle Image Velocimetry

We present a new method for particle image velocimetry, a technique using successive laser images of particles immersed in a fluid to measure the velocity field of the fluid flow. The main idea is to recover this velocity field via the solution of the L^2-optimal transport problem associated with each pair of successive distributions of tracers. We model the tracers by a network of Gaussian-like distributions and derive rigorous bounds on the approximation error in terms of the model's parameters, i.e. the uncertainty in the position of the particles and the noise level in the measurements. We also display the results of numerical experiments based on synthetic flow fields. The numerical solution is obtained by employing Newton's method to solve the Monge-Ampère equation associated with the transport problem.