Towards higher tracer densities for PTV in turbulent flows

Increasing tracer density in tracking based methods such as 2D-PTV, 3D-PTV or hybrid tomo-PIV/PTV (Shake-The-Box, [Schanz et al. 2016]) has always been the ultimate goal to reach a high spatial resolution for the measurement of turbulent flows. However, the overlapping of particle image is one of the main obstacle that limits the tracer density of these techniques.

A new method for particle identification and localization in a PTV/PIV image will be presented. I termed this method PIR : Particle Image Reconstruction. The approach is based on the particle position reconstruction through the inversion of a linear model connecting the recorded image with a particle-based representation of the 3D-to-2D projection. Simulation tests using synthetically generated images are carried out to assess the robustness of the proposed method to characteristic experimental parameters such as, the particle image density, the particle image size, the model image size, and/or background noise. Its ability to provide better detection performances with high reliability than conventional techniques (CCM, DTB) is demonstrated.

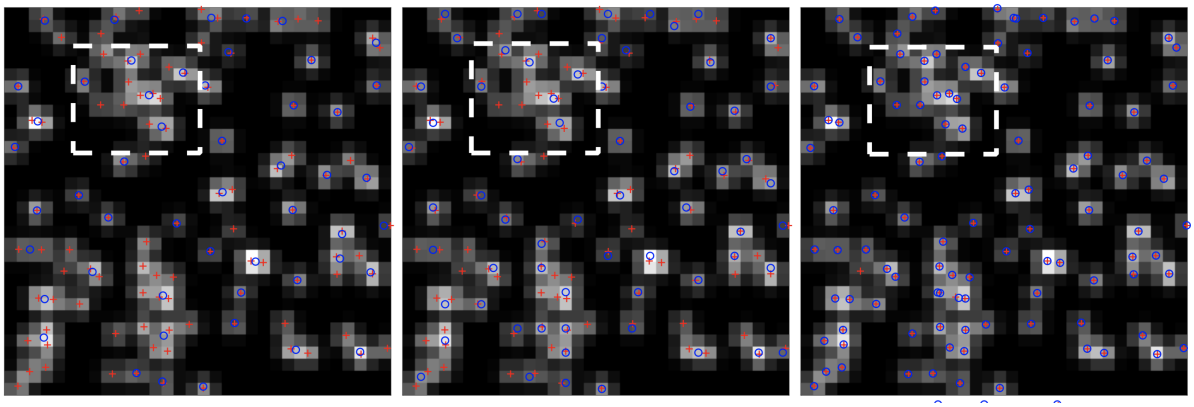

Figure 0.1: Synthetic 32 $\times$ 32 pixel images on which are superimposed the localizations of the particles (red $\times$) and those of the detections (blue $\circ$). From left to right: CCM, DTB and the new PIR_{NNLS} methods.