ASSESMENT OF IMPROVED VOLUMETRIC PARTICLE TRACKING VELOCIMETRY

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ABSTRACT: A technique for full-three dimensional flow mapping based on a tomographic reconstruction of the observation volume is developed by Elsinga [1]. Based on the projection of multi-camera system with their orientation known from prior calibration procedure, the 3D light intensity distribution of the observation volume are reconstructed. A 3D observation space reconstruction is performed by iterative reconstruction techniques like MART (multiplicative algebraic reconstruction technique) algorithm. The method is further modified to a rapid and less memory intensive reconstruction technique [2].These algorithms have been modified to apply for PTV [3, 4]. The objective of the present work is to modify and incorporate this tomographic reconstruction schemes in time resolved volumetric particle tracking and thereby performing full 3D flow diagnostics. The partcile mask correration operator is used to extract particles from the reconstructed intensity clusters while the reconstruction noise is reduced by iteratively updating the reconstructed intensity. The extracted particle constellation in the observation volume are shown in Figure 1. By repeating the process at each instantaneous time steps, a complete time-resolved 3D voxel space representation of the object space is possible and the matching of the intensity clusters is done on the basis of calculated particle center using optimization schemes. The algorithm is tested with synthetic flow image sets and an assessment of the computational effort and of the reconstruction accuracy is done.

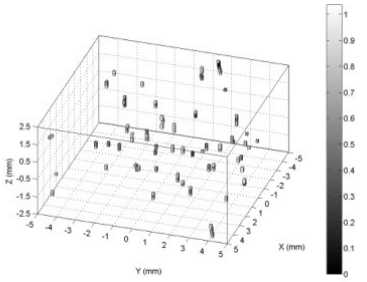

Fig. 1 Reconstruction and detection of the particles in object space

References

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