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Single-View Super-Resolution Whole-Field Velocity and Scalar Mapping Technique

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Innovative technique consists of two major components. First, a new algorithm, which relies on the accurate recovery of location, diameter and intensity provided by each individual tracer particle image spot has been proposed and experimentally demonstrated. Second, a novel single-view particle tracking velocimetry technique enhanced by pairs matching based on tracer particle random size variety has been established and experimentally demonstrated. Feasibility, limitations and most attractive embodiments of this technique are evaluated. Employing mask-free defocusing for pure 3-D volumetric visualization, it is an attractive alternative not only to well-established stereoscopy, recently developed defocusing by aperture masking digital particle image velocimetry, but also to holography, tomography, magnetic resonance imaging, etc., for a number of particular applications ranging from micro fluids to large scale industrial facilities. Adding two-color pyrometry for whole-field velocimetry/thermometry, it is a competitive alternative for more sophisticated technologies (e.g. filtered Rayleigh scattering, Coherent anti-Stokes Raman Scattering, etc.).

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