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Development of multiple-color fluorescence image velocimetry YUSUKE OTSU, JUN SAKAKIBARA, Meiji University, VIVEK MUNGUNDHAN, SIGURDUR THORODDEN, King Abdullah University of Science and Technology — Scalar image velocimetry (SIV) is the technique to extract velocity vectors from scalar field measurements. The usual SIV involves minimizing a cost function, that penalizes the deviation from the one scalar transport equation. This method can lead to multiple solutions and additional condition must be applied to select the best one if the full scalar gradient is zero over the volume. In addition, this technique is not applied for images with large displacement between two instances. Here we propose to minimize these problem with the reconstruction of the velocity field by using two different dyes and image deformation. Conceptually, we argue that having a double set of convergence criteria will result in a much more accurate velocity field. This improved SIV scheme is applied to the coaxial round free jet in liquid phase. The spatial velocity fields $\mathbf{u}(\mathbf{x},\mathbf{t})$ thus obtained demonstrate the good agreement of the velocity field solution with the continuity condition$\nabla \cdot \mathbf{u} = \mathbf{0}$. The correlations between $\partial u_i/\partial x_i$ and $\sum_{j\neq i} -\partial u_j/\partial u_j$ lie in the range 0.94-0.96 for the proposed method. The PDF of velocity fields also represent Gaussian distribution.

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