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Visual hull method for tomographic PIV of flow around moving objects[1] DEEPAK ADHIKARI, ELLEN LONGMIRE, University of Minnesota — Measurement of velocity around arbitrarily moving objects is of interest in many applications. This includes flow around marine animals and flying insects, flow around supercavitating projectiles, and flow around discrete drops or particles in multiphase flows. We present a visual hull technique that employs existing tomographic PIV reconstruction software to automate identification, masking and tracking of discrete objects within a three-dimensional volume, while allowing computation and avoiding contamination of the surrounding three-component fluid velocity vectors. The technique is demonstrated by considering flow around falling objects of different shape, namely a sphere, cube, tetrahedron and cylinder. Four high-speed cameras and a laser are used to acquire images of these objects falling within liquid seeded with tracer particles. The acquired image sets are then processed to reconstruct both the object and the surrounding tracer particles. The reconstructed object is used to estimate the object location at each time step and mask the reconstructed particle volume, while the reconstructed tracer particles are cross-correlated with subsequent particle volumes to obtain the fluid velocity vectors.

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