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Non-iterative volumetric particle reconstruction near moving bodies LEAH MENDELSON, Harvey Mudd College, ALEXANDRA TECHET, MIT — When multi-camera 3D PIV experiments are performed around a moving body, the body often obscures visibility of regions of interest in the flow field in a subset of cameras. We evaluate the performance of non-iterative particle reconstruction algorithms used for synthetic aperture PIV (SAPIV) in these partially-occluded regions. We show that when partial occlusions are present, the quality and availability of 3D tracer particle information depends on the number of cameras and reconstruction procedure used. Based on these findings, we introduce an improved non-iterative reconstruction routine for SAPIV around bodies. The reconstruction procedure combines binary masks, already required for reconstruction of the body's 3D visual hull, and a minimum line-of-sight algorithm. This approach accounts for partial occlusions without performing separate processing for each possible subset of cameras. We combine this reconstruction procedure with three-dimensional imaging on both sides of the free surface to reveal multi-fin wake interactions generated by a jumping archer fish. Sufficient particle reconstruction in near-body regions is crucial to resolving the wake structures of upstream fins (i.e., dorsal and anal fins) before and during interactions with the caudal tail.

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