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A Lagrangian approach to vortex identification in swimming and flying animal wakes. JIFENG PENG, JOHN DABIRI, California Institute of Technology — The fluid wakes of swimming and flying animals are generally time-dependent. The Eulerian velocity field, which can be measured by existing DPIV measurement techniques, does not directly indicate the flow geometry in this type of unsteady flows. In this study, a Lagrangian approach is developed to determine the Lagrangian Coherent Structures, which are physical boundaries separating flow regions with distinct dynamics, including vortices. The determination of morphology and kinematics of vortices is necessary in estimating time-dependent locomotive forces (Dabiri, J. Exp. Bio., 2006). It also provides information in studying fluid transport in animal swimming and flying. The application of the method is demonstrated by studying the wake of a bluegill sunfish pectoral fin and that of a free-swimming jellyfish.

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