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Fully resolved simulation of self-propulsion of aquatic organisms
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We present a computational approach for fully resolved simulation of self-propulsion of organisms through a fluid. Our implicit algorithm solves for the translational and rotational motion of the organism for prescribed deformation kinematics. In addition, the solution for the surrounding flow field is also obtained. The approach is easy to apply to the body forms of a variety of organisms. Our final goal is to use this computational tool to help in understanding the mechanisms of movement and its control in aquatic animals. In this abstract we present validation of this method for different organisms. To validate the method with respect to analytical solutions, we consider two cases: 1) a flagellum which propagates plane waves, and 2) a flagellum that propagates helical waves. To validate the method with respect to empirical measurements we consider data from two organisms: 1) jellyfish (data from John Dabiri at Caltech), and 2) zebrafish (data from Melina Hale at The University of Chicago).

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