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Combined turning and propulsion of a flexible plate in viscous fluid ALEXANDER ALEXEEV, PETER YEH, Georgia Institute of Technology — We use three dimensional computer simulations to study the flow and structural deformation of an oscillating elastic rectangular plate submerged in a viscous fluid. The elastic plate is actuated at the root near the first natural frequency and undergoes a combined sinusoidal plunging and twisting motion. This complex motion results in not only a forward propulsive force, but also a force perpendicular to the swimming direction. The latter force leads to turning. We find that the strength of the turning force depends on oscillation amplitudes as well as the phase difference between the plunging and twisting oscillations. Our simulations reveal an optimal phase difference and twisting amplitude that leads to maximum turning potential. These results can be used to design a basic mechanism for changing direction in a micro underwater autonomous vehicle actuated using flexible fins.

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