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Modeling an elastic swimmer driven at resonance PETER YEH, ALEXANDER ALEXEEV, George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology — Flexibility plays a vital role in the locomotion of aquatic animals. Using three dimensional computer simulations, we examine a flexible swimmer submerged in a viscous fluid with Reynolds number 100. The swimmer is modeled as a thin elastic rectangular plate, actuated at its leading edge to oscillate in a sinusoidal motion vertically at constant frequency and amplitude. The Lattice Boltzmann model is used to simulate an incompressible viscous fluid. The swimmer is free to move horizontally, and we measure the resulting steady state forward velocity, input power, and swimming performance. Our calculations reveal that both steady swimming velocity and performance strongly depend on the actuated frequency. Specifically, the maximum forward velocity is achieved near resonance, but the performance is maximized at a frequency about 1.8 times that at resonance. We visualize the vortex structures emerging in the fluid around swimmer and show how they contribute to the swimmer's forward motion.

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