

Abstract Submitted
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Efficient biomimetic propulsors with combined internal-external actuation¹ OLUWAFIKAYO OSHINOWO, ERSAN DEMIRER, ALEXANDER ALEXEEV, Georgia Institute of Technology — Bio-inspired robotic swimmers can be propelled by periodic oscillations of an elastic caudal fin. Conventional designs use an external actuation source to create heaving motion. Recently the emergence of smart materials enables bio-inspired fins to be actuated by internal source such as a bending piezoelectric moment. We use three-dimensional computer simulations to probe the effect of combining these two distinct types of fin actuation. The fin, represented by a rectangular elastic plate, is actuated at the root with a harmonic heaving motion and by a distributed internal bending moment. The two actuations share an equal frequency. We vary the magnitude and phase difference between the actuation methods to investigate the resulting hydrodynamic thrust and efficiency. We find that the hybrid actuation can outperform either of the actuation methods. We identify the parameter space in which the synergy of the two actuation methods results in the enhanced hydrodynamic performance.

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Ersan Demirer
Georgia Institute of Technology

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