

Abstract Submitted
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Self-propulsion of a heaving and pitching flexible flag BOYOUNG KIM, SUNG GOON PARK, HYUNG JIN SUNG, KAIST — Flapping motions of flexible flags are widespread in nature. Birds, fish, and insects use their wings, fins, or bodies to stay afloat and to advance forward in the surrounding fluids. In the present study, a self-propelled flexible flag with heaving and pitching motions in a quiescent flow has been simulated by using the immersed boundary method. The flexible flag can move freely in the horizontal direction and the body of the flexible flag moves passively along the head. The motion of the head of the flag was described as a harmonic heaving oscillation in the vertical direction. The motion of the angle of the head was described as a harmonic oscillation with a moving clamped condition for the heaving and pitching flag. The cruising speed and the swimming efficiency of the self-propelled flag were determined as functions of the bending coefficient (γ), the heaving amplitude (A_h), the pitching amplitude (A_p), the heaving frequency (St), and the phase difference ($\Delta\phi$) between A_h and A_p . We conducted a parametric study on the optimized the cruising speed and the swimming efficiency with respect to γ , St , A_h , A_p , and $\Delta\phi$

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