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The effect of input perturbations on swimming performance ANDREA M. LEHN, George Washington University, PATRICK J.M. THORNYCROFT, GEORGE V. LAUDER, Harvard University, MEGAN C. LEFTWICH, George Washington University — The influence of flexibility and fluid characteristics on the hydrodynamics of swimming has been investigated for a range of experimental systems. One investigative method is to use reduced-order physical models—pitching and heaving hydrofoils. Typically, a smooth, periodic, input signal is used to control foil motion in experiments that explore fundamental factors (aspect ratio, shape, etc.) in swimming performance. However, the significance of non-smooth input signals in undulating swimmers is non-trivial. Instead of varying external properties, we study the impact of perturbed input motions on swimming performance. A smooth sinusoid is overlaid with high frequency, low amplitude perturbations as the input signal for a heaving panel in a closed loop flow tank. Specifically, 1 cm heave amplitude base sinusoids are added to 0.1 cm heave perturbations with frequencies ranging from 0.5 to 13 Hz. Two thin foils with different stiffness are flapped with the combined input signals in addition to the individual high heave and low heave signals that were added to create the combined inputs. Results demonstrate that perturbations can increase thrust and that adding the perturbed signal to a base frequency alters wake structure.

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