Title

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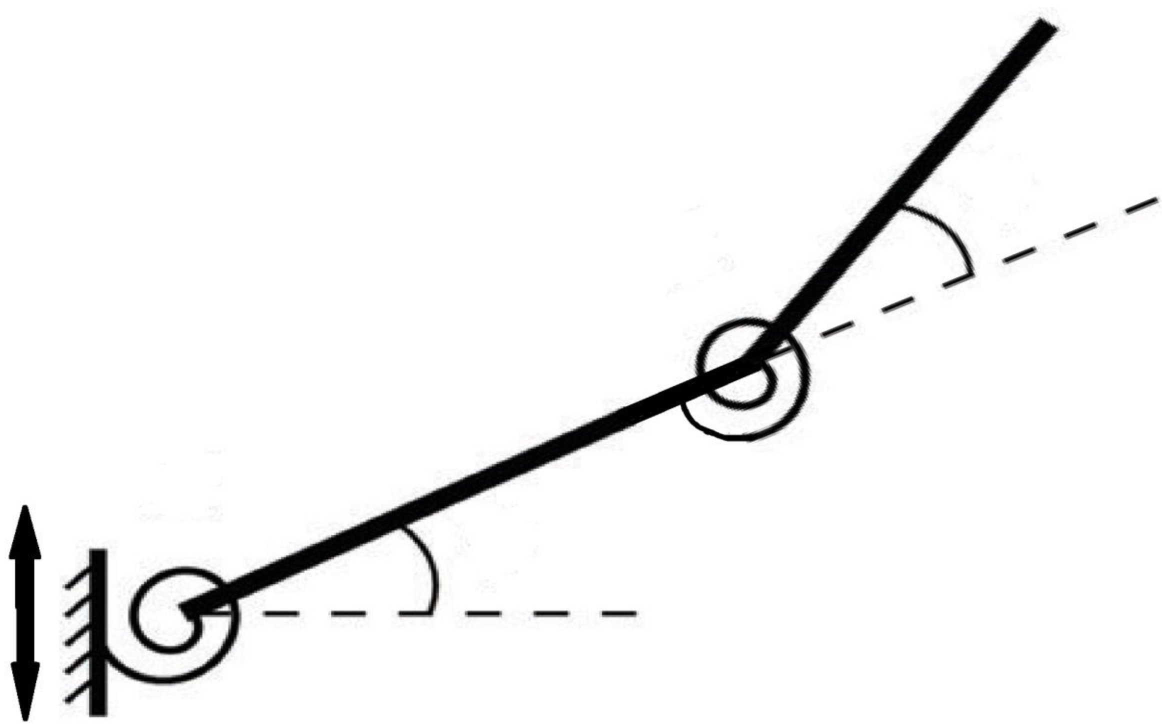

Figure 1: Double-link flapper made of two rigid slender filaments and two torsional springs, under periodic boundary-actuation.

At low Reynolds number, due to the absence of inertia, micro-organisms have to incorporate flexibility into their bodies in order to generate propulsion. Attempts have been done to predict the optimal bending stiffness of a filament in this regime in order to produce maximum propulsion. In this work, we examine how propulsive performance in this regime can be predicted, using a double-link flapper which has the configuration of two rigid filaments joined by one torsional spring in between, and attached to another torsional spring at the base of the first filament. Due to the localized flexibility, the swimmer no longer leads to zero propulsion even under periodic boundary actuation, as so constrained by Purcell's "scallop theorem". Mathematical models were developed based on physical principles and simulated results are obtained using MATLAB. The results reveal useful information for developing design principles for maximizing propulsion at low Reynolds numbers, which could be applicable to synthetic micro-swimmers development for various biomedical applications.

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