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Maximizing the propulsive thrust of a driven filament at low Reynolds number through non-uniform flexibility ZHIWEI PENG, GWYNN ELFRING, University of British Columbia, ON SHUN PAK, Santa Clara University — In the low Reynolds number regime, periodic boundary actuation of a rigid filament leads to a reciprocal motion and hence produces zero propulsive thrust. Introducing flexibility into the filament results in filament deformation enabling propulsion in the absence of inertia. For a given actuation frequency and filament length, an optimal bending stiffness of the filament can be determined to produce the largest propulsive force. However, the possibility of further improving the propulsion by allowing variable flexibility along the filament remains largely unexplored. In this work, we perform a theoretical investigation of flexibility distributions that can maximize propulsive thrust of a driven filament at low Reynolds number.

On Shun Pak
Santa Clara University

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