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Propulsion of rotationally actuated soft magnetic microswimmers

KIARASH SAMSAMI, SEYED AMIR MIRBAGHERI, Univ of Utah, FARSHAD MESHKATI, University of Nevada, Reno, HENRY FU, Univ of Utah — Micro-robotic swimmers have been the subject of many studies recently because of their possible biomedical applications such as drug delivery and micro manipulation. We examine rigid magnetic microrobots that are propelled by rotation induced by a rotating magnetic field, thought to be the most promising class of microrobots. Previous studies have considered ferromagnetic swimmers with permanent magnetizations and paramagnetic swimmers, but many experimental realizations are in fact soft magnets. Here we investigate how soft magnetic swimmers differ from ferromagnetic and paramagnetic swimmers. We specifically investigate the behavior of step-out frequencies, velocity-frequency response, and the stability and multiplicity of stable swimming modes for microrobots with nonmagnetic helical tails and ellipsoidal soft magnetic heads.

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