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Design of helical magnetically rotated microswimmers for controllability HENRY FU, University of Nevada, Reno — Microswimmers or microrobots have recently received much attention due to their possible applications in microscale sensing and actuation, including many biomedical applications such as drug delivery, in vivo diagnostics, and tissue manipulation. We have developed a modeling framework to describe the dynamics of rigid microswimmers that can be propelled through bulk fluid (rather than only near surfaces) when rotated by an external magnetic field. Here, this modeling framework is used to identify stable steady rotating orbits of the helical microswimmers under development by many research groups. I investigate how the swimming properties depend on the magnetization direction and geometry (pitch and radius) of the helix. In general, these swimmers have nonlinear dependence of velocity on frequency due to changes in the rotation axis of the swimmer as frequency is changed. However, a linear dependence would enhance velocity control and precise positioning of these swimmers. I identify magnetization directions which keep the rotation axis constant as a function of frequency, hence lead to linear velocity-frequency dependence. I also identify helical geometries which lead to maximal swimming velocities and rotation axes closest to the helical axis of the swimmer.

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