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Swimming of bio-inspired micro robots in circular channels SERHAT YESILYURT, FATMA ZEYNEP TEMEL, Sabanci University — In recent years, bio-inspired micro swimming robots have been attracting attention for use in biomedical tasks such as opening clogged arteries, carrying out minimally invasive surgical operations, and carrying out diagnostic tasks. There have been a number of experimental and modeling studies that address swimming characteristics of micro swimmers with helical tails attached to magnetic heads that rotate and move forward in rotating external magnetic fields. We carried out experimental studies with millimeter long helical swimmers in glass tubes placed in between Helmholtz coils, and demonstrated that swimming speed increases linearly with the frequency of the external field up to the step-out frequency. In order to study interaction of the swimmer with the circular boundary we used a computational fluid dynamics model. In simulations we compared swimming speeds of robots with respect to the frequency of the external magnetic field, wavelength and amplitude of the helical tail, and distance to the channel wall. According to simulation results, as the swimmer gets closer to the boundary swimming speed and efficiency improve. However step-out frequency decreases near the wall due to increased torque to rotate the swimmer.

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