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Modular microrobot for swimming in heterogeneous environments U KEI CHEANG, Drexel University, FARSHAD MESHKATI, HENRY FU, University of Nevada, Reno, MINJUN KIM, Drexel University, DREXEL UNIVERSITY TEAM, UNIVERSITY OF NEVADA, RENO TEAM — One of the difficulties in navigating in vivo is to overcome many types of environments. This includes blood vessels of different diameters, fluids with different mechanical properties, and physical barriers. Inspired by conventional modular robotics, we demonstrate modular microrobotics using magnetic particles as the modular units to change size and shape through docking and undocking. Much like the vast variety of microorganisms navigating many different bio-environments, modular microswimmers have the ability to dynamically adapt different environments by reconfiguring the swimmers' physical characteristics. We model the docking as magnetic assembly and undocking mechanisms as deformation by hydrodynamic forces. We characterize the swimming capability of the modular microswimmer with different size and shapes. Finally, we demonstrate modular microrobotics by assembling a three-bead microswimmer into a nine-bead microswimmer, and then disassemble it into several independently swimming microswimmers..

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