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Mechanical diffraction of a snake-like robot through an array of pegs JENNIFER RIESER, PERRIN SCHIEBEL, Georgia Institute of Technology, ARMAN PAZOUKI, California State University, Los Angeles, ALEX HUBBARD, FEIFEI QIAN, ZACHARY GODDARD, TINGNAN ZHANG, ANDREW ZANGWILL, Georgia Institute of Technology, DAN NEGRUT, University of Wisconsin-Madison, DANIEL GOLDMAN, Georgia Institute of Technology — Snakes successfully navigate through a diversity of environments which can include hard ground, loose sand, twigs and leaf litter. Despite the seeming simplicity of this movement, the interaction with the ground coupled with intermittent obstacle collisions can give rise to complex dynamics. We study these interactions in a model system, in which a 13-segment snake-like robot interacts with a row of five evenly-spaced vertical pegs oriented perpendicular to the robot's initial direction of motion. The robot is placed at different positions within a region with lateral and longitudinal dimensions set by the peg spacing and distance traveled in one undulation cycle. Forces imparted to the pegs are recorded as a function of time, revealing that the robot preferentially applies forces to the sides of the pegs and that contributions from all segments are significant. Despite the complexity of these interactions, we find that the robot emerges along preferred paths, which we characterize by the angle of rotation of the direction of travel, and that these angles decrease with increasing peg spacing. Numerical simulations are in excellent agreement with experiments and allow for a more thorough exploration of this dependence.

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