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Lightweight robot locomotion on granular media TINGNAN ZHANG, FEIFEI QIAN, JEFFREY SHEN, CHEN LI, Georgia Institute of Technology, AARON HOOVER, Olin College, PAUL BIRKMEYER, RONALD FEARING, University of California at Berkeley, DANIEL GOLDMAN, Georgia Institute of Technology — We present an experimental and computer simulation study of a small, light-weight, biologically inspired robot running on a model granular medium (GM), 3 mm diameter glass particles. The six-legged RoACH robot (10 cm long, 25 grams) utilizes an alternating tripod gait to run at speeds up to 25 cm/sec. Forward speed increases with increasing limb frequency $0 < f < 12$ Hz. An experimentally validated discrete element method (DEM) simulation of the device captures the observed mechanics. Observation from high speed video and simulation reveals that at low f, there is little slip of the limb through the GM, and forward speed is set by step length. At higher f, limbs slip continuously through the GM and fluidize the surrounding material. In this regime, speed is dominated by fluid-like thrust forces.

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