Crawling and sidewinding on sand

Daniel I. Goldman, School of Physics, Georgia Institute of Technology

Locomotion of animals and robots is well studied in environments composed of hard ground, air, and water; less is known about principles of movement in granular materials, collections of a-thermal particles that display solid, fluid, and gas-like features. I will discuss two examples which illustrate the sensitivity of granular locomotion to changes in movement strategies and substrate properties (like compaction and incline angle). Specifically, I will discuss studies of a limbless snake-like robot (in collaboration with Prof. Howie Choset, CMU) and a flipper based crawling robot. We use these robots as physical models of biological organisms; I will discuss how the robot studies give insight into neuromechanical control principles governing high performance of the animals, in particular the ability of the organisms to control ground reaction forces to remain below granular yield forces.