

Space-time approach to locomotion in deformable environments

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While most studies of locomotion treat the environment and the locomotor separately, there exist a class of self-propelled systems which change the environment so dramatically that a treatment of them as a single entity is more natural. We study the dynamics of a robo-physical car driving around a central depression in a deformable membrane. Inspired by its observed orbits, which mimic dynamics in general relativistic systems, we recast the propulsion problem as geodesics of a test particle in a fiducial space-time. This view enables us to understand the character of robot dynamics as that of motion in curved space-times, opening the door toward an Einsteinian motivated framework for locomotion in deformable surfaces.