Optimal motions of bodies controlled by internal moving masses

F.L. Chernousko

Ishlinsky Institute for Problems in Mechanics of the Russian Academy of Sciences, Moscow

Locomotion of robots in a resistive medium can be based on special motions of auxiliary internal masses inside the main body of the robot. This locomotion principle is used in micro-robots and vibro-robots moving in tubes. In the paper, optimal motions of systems controlled by internal moving masses are considered. One-dimensional optimal motions are examined for systems moving in media in the presence of external resistance, including dry friction and resistant forces depending on the velocity of the moving body. Two-dimensional motions are considered for bodies subject to dry friction and containing internal moving masses. Optimal motions of a two-body system are obtained for the case where external forces are negligible. This situation is a model for the re-orientation of a spacecraft containing a moving internal mass.