

# OPTIMAL MOTION OF A BODY CONTROLLED BY INTERNAL MOVEMENTS

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A mechanical system is considered that consists of a rigid body which can move in a resistive medium, and an internal mass moving within a bounded volume inside the body. Special periodic internal motions are analyzed that ensure a progressive motion of the system as a whole in the desired direction.

Different assumptions about external resistance forces are considered including Coulomb's dry friction, linear and nonlinear resistance. Optimal periodic internal motions are obtained that maximize the average velocity of the body under various bounds imposed on the relative displacement, velocity, and acceleration of the internal mass.

The obtained results are of interest with respect to special kinds of mobile robots.