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Control of Multibody Systems Moving along a Plane

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Plane multibody systems are considered that consist of several rigid bodies connected by prismatic and/or revolute joints. Control forces and/or torques are created by actuators installed at the joints. The dynamics of possible motions of the systems along the horizontal plane is investigated in the presence of dry friction acting between the system and the plane. The respective control algorithms are proposed. Two-link and three-link systems can perform various periodic motions by alternating slow and fast phases. For multilink systems, wavelike locomotion is possible. Displacements, the average speed, and the magnitude of required controls are estimated. Optimal values of geometrical and mechanical parameters are determined that correspond to the maximum speed of motion. The obtained results are confirmed by computer simulation and experimental data. These results are related to the biomechanics of snake-like locomotion and are of interest for transportation systems and mobile robots.

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