

Modelling of Snake-Like Locomotions

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Abstract: Multibody mechanical systems with two, three, and many links are considered which can perform snake-like locomotions along a horizontal plane in the presence of dry friction between the system and the plane. It is shown that, under certain conditions, these systems can move from a given initial state to any prescribed terminal position and configuration in the plane. Periodic longitudinal, lateral, and rotational motions are designed and analyzed. For mechanisms with two or three links, these periodic motions consist of slow and fast phases. For multilink mechanisms with more than four kinks, slow wavelike motions are possible. Displacements, the average speed, and the required control torques are evaluated. Theoretical results are confirmed by the computer simulation of the nonlinear dynamics of the multink systems as well as by the experimental data.

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