

Nonholonomic acceleration and chaotic dynamics of locomotion

Alexey Borisov, Ivan Mamaev, Ivan Bizyaev, Alexander Kilin

Abstract: An analysis is made of the dynamics of nonholonomic systems with mass distribution periodically varying with time. This analysis is carried out by considering the rolling of a rigid body and the motion of a wheeled vehicle. In these problems, various types of motion, including those associated with strange attractors, are observed. A detailed treatment is given of the problem of unbounded acceleration (an analog of Fermi's acceleration) by periodic action. We also show the possibility of chaotic dynamics related to strange attractors of equations for generalized velocities, which is accompanied by a two-dimensional random walk of the platform in a laboratory reference system.

-
- 1) Alexey Borisov, Professor: Moscow Institute of Physics and Technology, 9 Institutskiy per., Dolgoprudny, Moscow Region, 141701, Russia (RU), borisov@rcd.ru .
 - 2) Ivan Mamaev, Professor: Kalashnikov Izhevsk State Technical University, 426034 Izhevsk, Universitetskaya str., 1, Russia (RU), mamaev@rcd.ru .
 - 3) Ivan Bizyaev, Professor: Moscow Institute of Physics and Technology, 9 Institutskiy per., Dolgoprudny, Moscow Region, 141701, Russia (RU), bizaev_90@mail.ru .
 - 4) Alexander Kilin, Professor: Udmurt State University, 426034 Izhevsk, Universitetskaya str., 1, Russia (RU), aka@rcd.ru .