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Ankündigung eines Gastvortrages

zum Thema:

Periodic and Chaotic Dynamics of Coupled Pendulums

Ort:

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Dozent:

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Abstract

Numerical investigations of ODEs governing dynamics of a triple physical pendulum with and without rigid limiters of its motion are carried out. Although a single or a double pendulum is quite often studied both numerically and experimentally, the triple physical pendulum moving in a plane is rather rarely investigated. There are two aspects of the interest in the pendulum dynamics. The first case is that the single and in particular coupled pendulums serve as very rich sources of many interesting phenomena of non-linear dynamics. Second aspect regards the possibility of modeling of various natural and technical objects using a system of coupled pendulums.

Experimental rig of the triple pendulum with the first body driven periodically is built. Mathematical model composed of three second order strongly non-linear ODEs is derived, and friction in pendulum joints is modeled as a composition of dry (Coulomb-like) friction and viscous damping. Model parameters are estimated by matching the output signals from the model and the experiment. Good agreement between both numerical simulation results and experimental measurements have been obtained and presented. A few chaotic zones have been detected and confirmed well by the experiment. Experiment verifies positively the boundaries of the particular chaotic windows as well as some qualitative features of chaotic solutions like performing (or not) the full chaotic rotations by individual links. It leads to conclusion that the used mathematical model of triple pendulum with its estimated parameters can be applied as a tool for quick searching for various phenomena of nonlinear dynamics exhibited by a real pendulum as well as for explanation of its rich dynamics.