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Jan Awrejcewicz *Editor*

Applied Non-Linear Dynamical Systems



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Jan Awrejcewicz
Editor

Applied Non-Linear Dynamical Systems

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Editor

Jan Awrejcewicz
Department of Automation, Biomechanics
and Mechatronics
Łódź University of Technology
Łódź, Poland

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Dynamical pendulum-like nonconservative systems

Maxim V. Shamolin

Abstract: We have elaborated the methods for the qualitative study of dissipative systems and systems with anti-dissipation that allow us to obtain conditions for bifurcation of birth of stable and unstable auto-oscillations and also conditions for absence of any singular trajectories. We succeeded in generalizing the method for studying plane topographical Poincaré systems to higher dimensions. In two- and three-dimensional rigid body dynamics, we have discovered complete lists of first integrals of dissipative systems and systems with anti-dissipation that are transcendental (in the sense of classification of their singularities) functions that are expressed through elementary functions in a number of cases. We have obtained multi-parameter families of topologically nonequivalent phase portraits arising in purely dissipative systems (i.e., systems with variable dissipation and nonzero (positive) mean). Almost every portrait of such families is (absolutely) rough. We have discovered new qualitative analogs between the properties of motion of free bodies in a resisting medium that is fixed at infinity, and bodies in an over-run medium flow.

¹⁾ Maxim V. Shamolin, Professor: Lomonosov Moscow State University, Institute of Mechanics, Michurinskii Ave., 1, 119192, Moscow, RUSSIAN FEDERATION (shamolin@rambler.ru), the author gave a presentation at the conference.