



PREFACE

This issue 1/2018 of the journal “Romanian Journal of Mechanics” is dedicated to the stability and chaos of nonlinear dynamic systems. The diversity of research is driven in mechanical, civil, automotive and aerospace engineering, where the stability can be lost due to the undesirable resonances phenomena.

Complexity in engineering involves analysis and design from the perspective of building systems with added value and superior properties in terms of strength, safety and stability. The selection of papers for the special issue has been focused on the contributions covering various representative areas in which the stability has to be taken into account. The papers in this issue discuss the control of Kerr oscillators, the bouncing ball dynamics, the elastic string pendulum, the role of perpetual points in stability and chaos of systems, the nonholonomic systems and the self-focusing and self-defocusing materials.

The first paper “Optimal Vibration Control of Kerr oscillators” by Ligia MUNTEANU and Grigore SECRIERU is studying the coupling of Kerr oscillators and Kerr fibers that exhibit various quantum properties such as squeezing of vacuum fluctuations, sub-Poissonian statistics, collapses, and revivals. The behavior of coupled Kerr oscillators is sensitive to the initial conditions, so that minor differences in initial conditions can drive the system to chaos.

Dynamics of two bouncing balls (a light ball and a much heavier ball) vertically aligned and simultaneously dropped on a moving lower boundary is analyzed by Ruxandra ILIE and Iulian GIRIP in the second paper “On the bouncing ball dynamics”. The balls are subjected to gravitational field. The floor-collisions together to the velocity discontinuity to impacts can lead the motion of the system ball to chaos.

The paper “On the dynamics of an elastic string pendulum” by Cornel BRIȘAN and Veturia CHIROIU focuses on the motion of a pendulum consisted by of a rigid body attached to an extensible string with distributed mass and elasticity which permit the axial deformation. The coupling dynamics between the motion of the rigid body and the strings’ deformation and displacement shows a complex behavior with a clear tendency to chaos.

The next paper “Applications of the perpetual points in dynamics” by Polidor BRATU and Ligia MUNTEANU considers the dissipative nonlinear systems in which the equilibrium points have a significant role in the transient behaviour. The perpetual points are defined as points for which at least one of the velocity is different than zero and all accelerations of the system are zero. This paper investigates the perpetual points for a coupled pendulum.

“On the Chetaev nonholonomic systems” by Rodica IOAN and Valeria MOȘNEGUȚU treat the ideal bilateral Chetaev nonholonomic constraints as initial conditions attached to the Appell equations of motion of a dynamical system. The rolling disk without sliding on a horizontal plane is solving by using the cnoidal method.

The last paper “The behaviour of the self-focusing and self-defocusing materials” by Petru ȘTIUCĂ, Cristian RUGINĂ, Andrei VASILESCU represents a short review on a special class of Cantor-like materials under resonance and pulse-mode conditions. These materials are highly nonlinear and hysteretic, exhibiting the intriguing phenomena like self-focusing and self-defocusing.

The guest editor, Ligia MUNTEANU, would like to thank all authors and co-authors for their contributions to this special issue. In addition, we would like to thank the reviewers for their valuable comments, which have led to increased quality of this special issue.

Editors