14th INTERNATIONAL CONFERENCE

DYNAMICAL SYSTEMS
THEORY AND APPLICATIONS

ŁÓDŹ, DECEMBER 11-14, 2017

ABSTRACTS

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DSTA 2017

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on
DYNAMICAL SYSTEMS
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POLAND

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PREFACE

This is the fourteen time when the conference "Dynamical Systems – Theory and Applications" gathers a numerous group of outstanding scientists and engineers, who deal with widely understood problems of theoretical and applied dynamics.

Organization of the conference would not have been possible without a great effort of the staff of the Department of Automation, Biomechanics and Mechatronics. The patronage over the conference has been taken by the Committee of Mechanics of the Polish Academy of Sciences and the Ministry of Science and Higher Education.

It is a great pleasure that our invitation has been accepted by so many people, including good colleagues and friends as well as a large group of researchers and scientists, who decided to participate in the conference for the first time. With proud and satisfaction we welcome nearly 250 persons from 38 countries all over the world. They decided to share the results of their research and many years experiences in the discipline of dynamical systems by submitting many very interesting papers.

This booklet contains a collection of 375 abstracts, which have gained the acceptance of referees and have been qualified for publication in the conference proceedings. Included abstracts belong to the following topics:

- asymptotic methods in nonlinear dynamics,
- bifurcation and chaos in dynamical systems,
- optimization problems in applied sciences
- control in dynamical systems,
- dynamics in life sciences and bioengineering,
- engineering systems and differential equations,
- non-smooth systems
- mathematical approaches to dynamical systems
- original numerical methods of vibration analysis,
- stability of dynamical systems,
- vibrations of lumped and continuous systems,
- experimental/industrial studies,
- mechatronics.

Our previous experience shows that an extensive thematic scope comprising dynamical systems stimulates a wide exchange of opinions among researchers dealing with different branches of dynamics. We think that vivid discussions will influence positively the creativity and will result in effective solutions of many problems of dynamical systems in mechanics and physics, both in terms of theory and applications.

Every two years we extend scope and recognition of the conference. This time, we have opened 6 special sessions gathering 62 presentations.

We do hope that DSTA 2017 will contribute to the same extent as all the previous conferences to establishing new and tightening the already existing relations and scientific and technological co-operation between both Polish and foreign institutions.

On behalf of both Scientific and
Organizing Committees

Chairman
Professor Jan Awrejcewicz

Mathematical modeling of the action of a medium on a conical body

Maxim V. Shamolin

Abstract: We consider a mathematical model of a plane-parallel action of a medium on a rigid body whose surface has a part which is a circular cone. We present a complete system of equations of motion under the quasi-stationarity conditions. The dynamical part of equations of motion form an independent system that possesses an independent second-order subsystem on a two-dimensional cylinder. We obtain an infinite family of phase portraits on the phase cylinder of quasi-velocities corresponding to the presence in the system of only a nonconservative pair of forces.

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[1] Maxim V. Shamolin, Professor: Institute of Mechanics, Lomonosov Moscow State University, 1 Michurinskii Ave., 119192, Moscow, RUSSIAN FEDERATION (shamolin@rambler.ru), the author presented this contribution at the conference in the special session: "Advanced approaches to mathematical modeling of systems interacting with a medium" organized by L. Klimina, Y. Selyutskiy and M. Dosaev.

Non-smooth first integrals of dynamical systems with dissipation

Maxim V. Shamolin

Abstract: We study nonconservative systems for which the usual methods of the study, e.g., Hamiltonian systems, are inapplicable. Thus, for such systems, we must ``directly'' integrate the main equation of dynamics. We generalize previously known cases and obtain new cases of the complete integrability in transcendental functions of the equation of dynamics of a rigid body in a nonconservative force field. We obtain a series of complete integrable nonconservative dynamical systems with nontrivial symmetries. Moreover, in almost all cases, all first integrals are expressed through finite combinations of elementary functions; these first integrals are transcendental functions of their variables. In this case, the transcendence is understood in the sense of complex analysis, when the analytic continuation of a function into the complex plane has essentially singular points. This fact is caused by the existence of attracting and repelling limit sets in the system (for example, attracting and repelling focuses). We detect new integrable cases of the motion of a rigid body, including the classical problem of the motion of a spherical pendulum in a flowing medium. This activity is also devoted to general aspects of the integrability of dynamical systems with variable dissipation.

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