Springer Proceedings in Mathematics & Statistics

Jan Awrejcewicz *Editor*

Applied Non-Linear Dynamical Systems

Springer

Springer Proceedings in Mathematics & Statistics

Volume 93

More information about this series at http://www.springer.com/series/10533

Springer Proceedings in Mathematics & Statistics

This book series features volumes composed of select contributions from workshops and conferences in all areas of current research in mathematics and statistics, including OR and optimization. In addition to an overall evaluation of the interest, scientific quality, and timeliness of each proposal at the hands of the publisher, individual contributions are all refereed to the high quality standards of leading journals in the field. Thus, this series provides the research community with well-edited, authoritative reports on developments in the most exciting areas of mathematical and statistical research today.

Jan Awrejcewicz
Editor

Applied Non-Linear Dynamical Systems

Springer

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

ISSN 2194-1009 ISSN 2194-1017 (electronic)
ISBN 978-3-319-08265-3 ISBN 978-3-319-08266-0 (eBook)
DOI 10.1007/978-3-319-08266-0
Springer Cham Heidelberg New York Dordrecht London

Library of Congress Control Number: 2014951679

Mathematics Subject Classification (2010): 34-xx, 34A12, 34A26, 34A34, 34A35, 34A36, 34B15, 34C15, 34C23, 34C25, 34C29, 34Dxx, 34D06, 34D08, 34D10, 34D20, 24D23, 34E13, 34F10, 34F15, 34H10,37-xx, 37Bxx, 37B55, 37C27, 37C70, 37C75, 37D45, 37Gxx, 37G15, 37H20, 37Jxx, 37J20, 37J25, 37J55,70-xx, 70Exx, 70Hxx, 70Jxx, 70Kxx, 74-xx, 74Gxx, 74Jxx

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

12th CONFERENCE
Dynamical Systems - Theory and Applications
December 2-5, 2013. Lodz, POLAND.

paper id: ENG11

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 Poincar \'{e} 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.