

**13th Conference
on
DYNAMICAL SYSTEMS
Theory and Applications
DSTA 2015**

ABSTRACTS

EDITORS

J. Awrejcewicz, M. Kaźmierczak, P. Olejnik, J. Mrozowski

Łódź, December 7-10, 2015

POLAND

ORGANIZING COMMITTEE

Lodz University of Technology, Faculty of Mechanical Engineering
Department of Automation, Biomechanics and Mechatronics
1/15 Stefanowski Str., 90-924 Łódź, Poland
Phone: +48 42 631-22-25, Fax: +48 42 631-24-89
<http://abm.p.lodz.pl>

Jan Awrejcewicz — chairman
Magdalena Jastrzębska — secretary
Marek Kaźmierczak
Paweł Olejnik
Jerzy Mrozowski

© Department of Automation, Biomechanics and Mechatronics
Technical editor and cover design: *Marek Kaźmierczak*

Printed by:
ARSA Druk i Reklama
90-270 Łódź, ul. Piotrkowska 4
tel./fax (042) 633 02 52
marta@arsa.net.pl
www.arsa.net.pl

ISBN 978-83-7283-705-9

SCIENTIFIC COMMITTEE

H. Altenbach – Germany
M. Alves – Brazil
I.V. Andrianov – Germany
J. Awrejcewicz – Chairman, Poland
J.M. Balthazar – Brazil
T. Burczyński – Poland
Cz. Cempel – Poland
F. Chernousko – Russia
F. Dohnal – Switzerland
V.-F. Duma – Romania
I. Elishakoff – USA
M. Fečkan – Slovakia
N. Ferreira – Portugal
B. Gallacher – UK
O. Gendelman – Israel
O. Gottlieb – Israel
P. Hagedorn – Germany
K. (Stevanovic) Hedrih – Serbia
L. Kolar-Anić – Serbia
I. Kovacić – Serbia
J. Kowal – Poland
J. Kozanek – Czech Republic
P. Krasilnikov – Russia
V.A. Krysko – Russia
W. Lacarbonara – Italy
L.V. Kurpa – Ukraine
C.-H. Lamarque – France
S. Lenci – Italy
G.A. Leonov – Russia
A. Luo – USA
E. Macau – Brazil
J.A. Machado – Portugal
N.M.M. Maia – Portugal
L.I. Manevitch – Russia
A.A. Martynyuk – Ukraine
S. Maruyama – Japan
G.I. Mikhasev – Belarus
Y. Mikhlin – Ukraine
G. Olivar – Colombia
M. Pascal – France
Ch. Pierre – USA
V.N. Pilipchuk – USA
C.M.A. Pinto – Portugal
J. Przybylski – Poland
S. Radkowski – Poland
B. Radziszewski – Poland
P. Ribeiro – Portugal
R. Sampaio – Brazil
A. Seyranian – Russia
Ch.H. Skiadas – Greece
S. Theodossiades – UK
J.J. Thomsen – Denmark
J.J. Trujillo – Spain
A. Tylikowski – Poland
F. Udwadia – USA
T. Uhl – Poland
A.F. Vakakis – USA
F. Verhulst – The Netherlands
J. Warmiński – Poland
M. Wiercigroch – UK
E. Wittbrodt – Poland
H. Yabuno – Japan
H.M. Yehia – Egypt
K. Zimmermann – Germany

Manuel Braz Cesar, Rui Barros

| | |
|---|----|
| <i>Vibration control of asymmetric structures using MR dampers</i> | 77 |
| Łukasz Breńkacz, Grzegorz Żywica <i>The sensitivity analysis of the method for identification of bearing dynamic coefficients</i> | 78 |
| Andrzej Buchacz <i>Characteristics of model freight wagon subsystems of transverse vibrating complex mechanical system determined by approximate method and their correction</i> | 79 |
| Andrzej Buchacz, Andrzej Baier, Krzysztof Herbuś, Michał Majzner, Piotr Ociepka <i>Investigations of composite panels mounted in the cargo space of a freight wagon</i> | 80 |
| Andrzej Buchacz, Andrzej Baier, Krzysztof Herbuś, Michał Majzner, Piotr Ociepka <i>Investigation of motion of a freight wagon aimed to identify the forces acting on the side wall of the wagon</i> | 81 |
| Andrzej Buchacz, Andrzej Wróbel, Marek Płaczek <i>Analysis of dynamical response of the freight wagon</i> | 82 |
| Andrzej Buchacz, Andrzej Wróbel, Marek Płaczek <i>Project of laboratory stand, and preliminary studies of vibration shell freight wagon</i> | 83 |
| Vytautas Bučinskas, Andrius Dzedzickis, Nikolaj Šešok, Ernestas Šutinys, Igor Iljin <i>Research of modified mechanical sensor of atomic force microscope</i> | 84 |
| Vytautas Bučinskas, Andrius Dzedzickis, Nikolaj Šešok, Ernestas Šutinys, Igor Iljin, Artur Kazickij <i>Two-axis mechanical vibration harvester</i> | 85 |
| Radek Bulín, Michal Hajžman, Štěpán Dyk, Miroslav Byrtus <i>Nonlinear dynamics of the car driving system with a sequential manual transmission</i> | 86 |
| Radek Bulín, Michal Hajžman, Pavel Polach <i>Analysis of vibrations of a cable-pulley system using the absolute nodal coordinate formulation</i> | 87 |
| Rafał Burdzik <i>Application of original method of vibration analysis for investigation on passenger car suspension as nonlinear dynamical system</i> | 88 |
| Rafał Burdzik, Łukasz Konieczny, Jan Warczek, Witold Cioch <i>Adaptation of linear decimation procedures for identification of characteristics components of non-stationary vibration signals in car's suspension</i> | 89 |
| Andrzej Burghardt, Dariusz Szybicki, Piotr Gierlak, Krzysztof Kurc, Magdalena Muszyńska <i>Robotic automation of the turbo-propeller engine blade grinding process</i> | 90 |

Vibration control of asymmetric structures using MR dampers

Manuel Braz Cesar, Rui Barros

Abstract: This paper is devoted to study the effectiveness of semi-active control systems with MR dampers to reduce lateral-torsional responses of irregular structures, in particular plan asymmetric building structures. Basic concepts and the analytical formulation of asymmetric structural systems are initially provided. Then, several numerical simulations comprising a two-story, one bay building structure excited by an earthquake ground motion will be used to demonstrate the effectiveness of a non-collocated passive and semi-active control systems in mitigating seismic-induced vibrations. The passive configurations are accomplished using the MR damper as passive energy dissipation devices while the semi-active configurations make use of the controllable nature of this type of actuators. The numerical results achieved with uncontrolled and passive configurations are compared with those of several semi-active controllers to evaluate the performance of each control scheme in reducing the coupled lateral-torsional response of the plan asymmetric structure due to seismic loading.

¹⁾ Manuel Braz Cesar, M.Sc. (Ph.D. student): Polytechnic Institute of Bragança, Quinta de S. Apolónia, 5300-253 Bragança, PORTUGAL (brazcesar@ipb.pt), the author presented this work at the conference.

²⁾ Rui Barros, Associate Professor: Faculty of Engineering of the University of Porto, Rua Roberto Frias, s/n, 4200-465 Porto, PORTUGAL (rcb@fe.up.pt).