

Table of Contents

PREFACE	i
SECTION I: (A) INELASTICITY, HYSTERESIS, WEAR	1
Keynote Lecture – N. Kikuchi, University of Michigan, USA Constitutive Modeling of Polymeric Foams for Impact-Contact Problems	3
<i>J. Zhang, Z. Lin, A. Wong, N. Kikuchi, V.C. Li, A.F. Yee (University of Michigan, USA), and G.S. Nusholtz (Chrysler Corporation, USA)</i>	
Shape Differential Equation for Viscoelastic Flows	9
<i>N. Gomez (INRIA, FRANCE), and J-P. Zolesio (Institut Non Lineaire de Nice, FRANCE)</i>	
Analysis of Contact Damage Around Scratches in Glass	13
<i>T.N. Farris, S. Chandrasekar (Purdue University, USA)</i>	
Remodeling Around Pressurized Holes: Prediction	17
of Adaptive Elasticity <i>K. Firoozbakhsh (University of New Mexico, USA)</i>	
Evaluation of Fretting Stresses Through Full-Field	21
Temperature Measurements <i>M.P. Szolwinski, G. Harish, T.N. Farris (Purdue University, USA), and T. Sakagami (Osaka University, JAPAN)</i>	
Non-Gaussian Equivalent Linearization for Nonstationary	25
Random Vibration of a 2-DOF Hysteretic System <i>K. Kimura, S. Tamura (Tokyo Institute of Technology, JAPAN)</i>	
“Soft” Reliability Assessment of Existing Transmission Lines	29
<i>I. Hathout (Ontario Hydro, CANADA)</i>	

Soil-Foundation Interaction Literature Review	35
<i>H.R. Hamidzadeh (South Dakota State University, USA), and M. Dehghani, (Lawrence Livermore National Laboratory, USA)</i>	
Moment-Rotation Hysteresis Behavior of Semi-Rigid	39
Steel Building Frame Connections <i>A.R. Kukreti, A. Abolmaali (University of Oklahoma, USA)</i>	
SECTION I – (B) STABILITY AND STRUCTURES	43
Keynote Lecture – J.A.C. Martins, Instituto Superior Tecnico, PORTUGAL	
Stability of Finite Dimensional System with Unilateral	45
Contact and Friction: Theoretical Results & Illustrative Examples of Small Dimension <i>J.A.C. Martins, A. Pinto da Costa (Instituto Superior Tecnico, PORTUGAL)</i>	
Response of a Vibroimpact System With Secondary	53
Structure to a White-Noise Excitation: Case of Inelastic Impacts <i>M.F. Dimentberg, H.G. Haenisch (Worcester Polytechnic Institute, USA), and D.V. Iourtchenko (Raytheon Company, USA)</i>	
Assessment of Linear Joint Effects on Space Structures	57
<i>A. El-Saadani, I.I. Orabi (University of New Haven, USA)</i>	
The Incorporation of Hysteretic Damping in Structural	63
Analysis and Design <i>F.C. Nelson (Tufts University, USA)</i>	
Multi-Linear and Smooth Hysteretic Models for Degrading	69
Structures <i>M.V. Sivaselvan, K. Skliros, A.M. Reinhorn (State University of New York (SUNY), USA)</i>	
Disk Brake Squeal (by a Model of a Rotating Disk and a Beam)	73
<i>M. Suganami, M. Nakai, (Kyoto University, JAPAN), M. Yokoi, (Osaka Sangyo University, JAPAN), T. Miyahara, (Matsushita Electric Co., JAPAN), and H. Matsui, I. Yamazaki (Nissan Motor Co., JAPAN)</i>	
Modelling and Stability Analysis of an Airplane Engine	77
with a 4-Blade Propeller <i>D. Boulahbal, F. Gohnaraghi, A. Khajepour, T. Haskett, T. Zelenka, (University of Waterloo, CANADA)</i>	

Motion of Beams with Unilateral Contact Constraints and Wear	81
<i>L. Johansson (Linköping University, SWEDEN)</i>	
Control of Impacting Elastic Elements	85
<i>C. Diaconescu, D.B. Marghitu (Auburn University, USA), and A. Guran (Institute for Structronics, CANADA)</i>	
SECTION II – (A) NONLINEAR DYNAMICS AND VIBRATIONS	89
Keynote Lecture – R. Rand, Cornell University, USA The Dynamics of Resonance Capture	91
<i>R. Rand (Cornell University, USA)</i>	
Stick-Slip Oscillations - Quo Vadis	95
<i>H. Dankowicz, A.B. Nordmark (Royal Institute of Technology, SWEDEN)</i>	
Nonconvergence in Assumed-Mode Projections of	99
a Distributed Sliding System <i>C.M. Jung, B.F. Feeny (Michigan State University, USA)</i>	
Interactions of Harmonic Waves with a Dry	103
Friction Support <i>M.J. Leamy, J.R. Barber, N.C. Perkins (University of Michigan, USA)</i>	
Railway Wheel Squeal and Competition in Species	109
for Population Biology <i>M. Nakai (Kyoto University, JAPAN)</i>	
Relaxing Nonholonomic Constraints	113
<i>R. Rand, D. Ramani (Cornell University, USA)</i>	
Dynamics of the “Wild Mouse”	117
<i>Th. Rossmann, A. Stieglmejr, F. Pfeiffer (Technische Universita Munchen, GERMANY)</i>	
Controlling Chaos in a Piece-Wise Linear Oscillator	121
<i>H. Yabuno (University of Tsukuba, JAPAN), T. Okada (Mitsubishi Heavy Industry, JAPAN), and N. Aoshima (University of Tsukuba, JAPAN)</i>	

A History of Friction in Dynamics	125
<i>B.F. Feeny (Michigan State University, USA),</i>	
<i>A. Guran (Institute for Structronics, CANADA), and</i>	
<i>N. Hinrichs, K. Popp (University of Hannover, GERMANY)</i>	

SECTION II – (B) NONLINEAR DYNAMICS AND EXPERIMENTS 129

Keynote Lecture – Y. Ishida, Nagoya University, JAPAN	
Nonlinear Phenomena in Rotor Systems due to Clearance,	131
Friction and Impact	
<i>Y. Ishida (Nagoya University, JAPAN)</i>	

Non-Smooth, Non-Reversible Dry Friction Oscillator:	135
Design and Measurements	
<i>M. Wiercigroch (University of Aberdeen, SCOTLAND),</i>	
<i>W.T.V. Sin (Siemens Components Ltd., SINGAPORE), and</i>	
<i>F.K.Z. Liew (Dactt Engineering Ltd., SINGAPORE)</i>	

Recent Signal Processing Techniques for the Detection	141
of Localized Faults in Gearboxes	
<i>D. Boulahbal, F. Golnaraghi, F. Ismail</i>	
<i>(University of Waterloo, CANADA)</i>	

Dynamics of the Impact Force Generator	145
<i>B. Blazejczyk-Okolewska, K. Czolczynski, T. Kapitaniak</i>	
<i>(Technical University of Lodz, POLAND)</i>	

Dimension Estimation of an Impacting Rotor/Stator System	149
<i>C. Craig, R.D. Neilson, J. Penman</i>	
<i>(University of Aberdeen, SCOTLAND)</i>	

Stability of Sliding with Coulomb Friction Law	155
<i>H. Cho, J.R. Barber (University of Michigan, USA)</i>	

Tracking Parameter Drift in a Vibro-Impact System	159
<i>A. Chatterjee, J.P. Cusumano, D. Chelidze</i>	
<i>(Penn State University, USA)</i>	

Nonlinear Resonances and Self-Excited Oscillations of	163
a Rotor due to Radial Clearance and Impact in Bearings	
(Experiments and Numerical Simulations)	
<i>Y. Ishida (Nagoya University, JAPAN),</i>	
<i>M. Inagaki (Toyota Central R&D Labs., JAPAN), and</i>	
<i>R. Ejima (Nagoya University, JAPAN)</i>	

Proper Orthogonal Modes of a Beam with Frictional Excitation167
R.V. Kappagantu, B.F. Feeny (Michigan State University, USA)

SECTION III – (A) ANALYSIS, RIGID BODIES, MULTI-BODY SYSTEMS, MECHANICS, CONTACT MODELS173

Keynote Lecture – L.-E. Andersson, Linköping University, SWEDEN
A Review of Some Existence Results for Quasistatic Contact 175
Problems with Friction
L.-E. Andersson (Linköping University, SWEDEN)

Collision Between Rigid Bodies - Comparing Some Models179
E. Cataldo, R. Sampaio (PUC-Rio, BRAZIL)

Realizability of Arbitrary Local Mass Matrices in183
Single-Point Rigid Body Collisions
*A. Chatterjee (Penn State University, USA), and
A. Ruina (Cornell University, USA)*

Control of Joint Forces of Planar Mechanism with187
Clearances at Joints for Reducing Vibration and Impact at Joints
B. Feng, N. Morita, T. Torii (Shizuoka University, JAPAN)

Optimization of Shaking Force and Shaking Moment 191
of Planar Linkages for Vibration Reduction Using
Genetic Algorithms
G. Guo, N. Morita, T. Torii (Shizuoka University, JAPAN)

Modeling of Multiple Impacts 195
*A.P. Ivanov (Moscow State Academy of Device and
Informatics, RUSSIA)*

Analysis of Frictional Impact in Constrained199
Multibody Mechanical Systems
*H. Lankarani, S. Ahmed (Wichita State University, USA),
and M. Pereira (Technical University of Lisbon, PORTUGAL)*

An Equation of Volterra in the Impact of Two Rigid Bodies 203
R. Souchet (Laboratoire de Modelisation, FRANCE)

A Variational Principle for Equation of Hertz's Theory of Impact 207
*T.M. Atanackovic (University of Novi Sad, YUGOSLAVIA),
A. Guran (Institute for Structronics, CANADA), and
D.T. Spasic (University of Novi Sad, YUGOSLAVIA)*

Analytical Mechanics with Multi-valued Constraints	211
and Elastic Impacts – The Convex Case	
<i>P.D. Panagiotopoulos (Aristotle University, GREECE),</i>	
<i>and (RWTH, GERMANY)</i>	

SECTION III – (B) APPLICATIONS, ROTATING SYSTEMS 219

Keynote Lecture – B.S. Myers, Duke University, USA	
Neck Dynamics and Injury Mechanisms Following Head Impact	221
<i>B.S. Myers, R.W. Nightingale (Duke University, USA)</i>	

Development of an Intelligent Vibro-Impact Machine	229
for Ground Moling Based on Vibro-Impact Dynamics	
<i>R.D. Neilson, A.A. Rodger (University of Aberdeen, SCOTLAND)</i>	

Towards a Model for Self-Excited Solitary Waves	233
in a Spinning Flexible Disk	
<i>D. Boulahbal (University of Waterloo, CANADA)</i>	

Applications of Friction to Vibration Control of	237
Civil and Aerospace Structures	
<i>G. Ahmadi (Clarkson University, USA)</i>	

The Effect of Friction on the Dynamic Behavior	243
of Spindle Motor in Data Storage Devices	
<i>J.H. Wang, C.H. Chang (National Tsing Hua University, TAIWAN)</i>	

Intelligent Control of Man-Machine for Stability of	247
Industrial Vehicle	
<i>K. Tsujioka, A. Nagamatsu (Tokyo Institute of Technology, JAPAN)</i>	

Dynamics of Vehicle Suspension with Valves Providing	251
Frequency-Dependent Damping	
<i>G. Popov (GEPOL Mechanical Engineering Consulting, CANADA)</i>	

Bounce Phenomena in Electrical Switching Devices	257
<i>K. Suzuki (Fuji Electric Corporate R&D Ltd., JAPAN), and Y. Itoh</i>	
<i>(Kanagawa Industrial Technology Research, JAPAN)</i>	

Impact of Structures and Rigid Bodies Undergoing	261
Large Rotations for Vehicle Applications	
<i>J.A.C. Ambrosio (IDMEC Polo Instituto Superior Tecnico,</i>	
<i>PORTUGAL)</i>	

SECTION IV – (A) MODELING, COMPUTATIONS 273

Keynote Lecture – A. Soom, State University of New York
(SUNY), USA
The Role of Tribology in the Modeling of Dynamic 275
Contact Problems ... and Vice Versa
A. Soom (State University of New York (SUNY), USA)

Finite Element Treatment of Tribological Problems 277
N. Strömberg (Linköping University, SWEDEN)

Efficient Computation of General Hertzian Traction Integrals 281
M. Törmänen (Chalmers University of Technology, SWEDEN)

On Modeling Rapid Granular Flows 285
G. Ahmadi (Clarkson University, USA)

Dynamic Normal Loads and Friction in Plowing Contacts 289
D.P. Hess (University of South Florida, USA)

Identification of Friction Models from Experimental 293
Data: A Case Study
D.M. McFarland, A.V. Srinivasan (Strategic Technolitics Inc., USA)

A New Contact Surface Smoothing Procedure for the 297
Implicit Finite Element Analysis of Frictional Contact
V. Padmanabhan, T.A. Laursen (Duke University, USA)

Modeling Contact Forces During Impact on Flexible Systems 301
*S. Shivaswamy (Cessna Aircraft Co., USA), and
H.M. Lankarani (Wichita State University, USA)*

Contact Stiffness and the Thermomechanical Response 305
of Sliding Rings
*C.I. Serpe, G. Dargush, A. Soom (State University of
New York (SUNY), USA)*

SECTION IV – (B) POSTER SESSION 309

A New Shape Memory Allow Rotary Actuator: Design 311
and Modelling
*A. Khajepour, H. Dehestani, F. Golnaraghi
(University of Waterloo, CANADA)*

Application of Graph Theoretic Modelling to Industrial Belt-Driven Gantry Robots <i>A. Khajepour, J. Dunlop (University of Waterloo, CANADA)</i>	315
A Friction Failure Criterion for Two-Dimensional Granular Structures <i>M.A.S. Mohamed (Arab Academy for Science and Technology, EGYPT)</i>	319
The Effect of Shape Memory Alloys in Vibration Suppression of a Cantilever Beam <i>J.O. Salichs, C. Shakeri, M.N. Noori (Worcester Polytechnic Institute, USA), and H. Davoodi (University of Puerto Rico, PUERTO RICO)</i>	323
Nonlinear Vibrations of Moderately Thick Circular Plates <i>M. Sathyamoorthy (Clarkson University, USA)</i>	327
Constitutive Description of Granular Materials <i>Q.S. Yang (The Hong Kong University of Science and Technology, HONG KONG)</i>	333
Applications of Active Noise and Vibration Control in Precision Machining <i>R. Ghanadan (Bell Laboratories, USA)</i>	335