Contents

Part I  Biomechanical Engineering

Design and Implementation of a Low-Cost Mechatronic Shoe for Biomechanical Analysis of the Human Locomotion 3
P. Boscariol, A. Gasparetto, N. Giovanelli, S. Lazzer and L. Scalera

A Study of Feasibility for a Limb Exercising Device 11
G. Carbone, C. Aróstegui Cavero, M. Ceccarelli and O. Altuzarra

DARTAGNAN a Self-balanced Rehabilitation Robot Able to Work in Active and Passive Modes on Both Sides of Upper and Lower Limbs 23
M. Perrelli, P. Nudo, M. Iocco and G. Danieli

Dynamic Analysis of Handcycling: Mathematical Modelling and Experimental Tests 33

A Kinematic Solution of a Novel Leg Mechanism with Parallel Architecture 41
Matteo Russo and Marco Ceccarelli

Multi-target Planar Needle Steering with a Bio-inspired Needle Design 51
Christopher Burrows, Fangde Liu, Alexander Leibinger, Riccardo Secoli and Ferdinando Rodriguez y Baena

Development of an Active Force Plate for Testing Lower-Limb Prostheses 61
Cristiano Marinelli, Hermes Giberti and Ferruccio Resta

Determination of the Human Arm Stiffness Efficiency with a Two Antagonist Muscles Model 71
Daniele Borzelli, Stefano Pastorelli and Laura Gastaldi
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design of a Miniaturized Safety Clamping Device</td>
<td>79</td>
</tr>
<tr>
<td>for Portable Kidney Replacement Systems</td>
<td></td>
</tr>
<tr>
<td>P. Boscariol, G. Boschetti, R. Caracciolo, M. Neri, D. Richiedei, C. Ronco and A. Trevisani</td>
<td></td>
</tr>
<tr>
<td>Conceptual Design of a Mechatronic Biomedical Wearable Device</td>
<td>89</td>
</tr>
<tr>
<td>for Blood Ultrafiltration</td>
<td></td>
</tr>
<tr>
<td>Design of an Underactuated Hand Exoskeleton</td>
<td>97</td>
</tr>
<tr>
<td>with Joint Estimation</td>
<td></td>
</tr>
<tr>
<td>Mine Sarac, Massimiliano Solazzi, Daniele Leonardis, Edoardo Sotgiu, Massimo Bergamasco and Antonio Frisoli</td>
<td></td>
</tr>
<tr>
<td>Standard and Natural Motion Protocols for the Kinetic Measurements of the Squat</td>
<td>107</td>
</tr>
<tr>
<td>Nicola Sancisi, Marco Cocconcelli, Riccardo Rubini and Vincenzo Parenti-Castelli</td>
<td></td>
</tr>
<tr>
<td>Design and Simulation of an Assisting Mechanism for Arm Exercises</td>
<td>115</td>
</tr>
<tr>
<td>B. Chaparro-Rico, D. Cafolla, M. Ceccarelli and E. Castillo-Castaneda</td>
<td></td>
</tr>
<tr>
<td>Part II History of Mechanism and Machine Science</td>
<td></td>
</tr>
<tr>
<td>Role of Scientific-Technical Museums in the Future of Mechanical</td>
<td>127</td>
</tr>
<tr>
<td>Alberto Rovetta and Edoardo Rovida</td>
<td></td>
</tr>
<tr>
<td>An Analysis of the Hydraulic Saw of Hierapolis</td>
<td>135</td>
</tr>
<tr>
<td>Cesare Rossi, Sergio Savino and Francesco Timpone</td>
<td></td>
</tr>
<tr>
<td>Part III Linkages and Mechanical Controls</td>
<td></td>
</tr>
<tr>
<td>Riccati Equation Based Nonlinear Filter: A Case Study for Hydraulic Actuators in the Presence of Dead-Zone</td>
<td>145</td>
</tr>
<tr>
<td>Salvatore Strano and Mario Terzo</td>
<td></td>
</tr>
<tr>
<td>Trajectories Generation with Constant Extrusion Rate for Experimentations on AM Techniques and Extrusion Based Technologies</td>
<td>153</td>
</tr>
<tr>
<td>H. Giberti, L. Sbaglia and M. Parabiaghi</td>
<td></td>
</tr>
<tr>
<td>Preliminary Design of a Simplified Pneumatic Actuator</td>
<td>161</td>
</tr>
<tr>
<td>G.A. Naselli, M. Zoppi and R. Molfino</td>
<td></td>
</tr>
</tbody>
</table>
Part IV  Multi-Body Dynamics

Multibody Model of Under-Actuated Tendon Driven Finger to Study the Antagonist Tendon ........................................ 175
Sergio Savino

A Model Reduction Strategy for Flexible-Link Multibody Systems .... 183
Ilaria Palomba, Dario Richiedei and Alberto Trevisani

Part V  Reliability

Topology Optimization and Analysis of Static Transmission Error in Lightweight Gears .............................................. 195
Jakub Korta, Domenico M undo, Giuseppina Ambrogio, Barbara Folino, Shadi Shweiki and Luigino Filice

A Strategy for Moving Cable Driven Robots Safely in Case of Cable Failure .......................................................... 203
Giovani Boschetti, Chiara Passarini and Alberto Trevisani

Approaches to the Detectability of Faults in Railway Pantograph Mechanism ..................................................... 213
G. Santamato, M. Gabardi, M. Solazzi and A. Frisoli

Behaviour of Tilting-Pad Journal Bearings in Case of Large Manufacturing Errors .................................................. 221
Steven Chatterton, Phuoc Vinh Dang, Paolo Pennacchi and Andrea Vania

Part VI  Robotics and Mechatronics

A New Automated 2 DOFs 3D Desktop Optical Scanner .......... 231
Maria Cristina Valigi, Silvia Logozzo and Gabriele Canella

Adam’s Hand: An Underactuated Robotic End-Effector .......... 239
Giovanni Antonio Zappatore, Giulio Reina and Arcangelo Messina

Automatic System for Fibers Extraction from Brooms .......... 247
P.F. Greco, G. La Greca, G. Larocca, S. Meduri, B. Sinopoli, D. Battaglia, A. Caseti, A. Aloise, G. Chidichimo and G. Danieli

Functional Design of a Robotic Gripper for Adaptive Robotic Assembly ................................................................. 257
F. Oscari, S. Minto and G. Rosati

Optimal Design of a Reconfigurable End-Effector for Cable-Suspended Parallel Robots ............................................ 267
Luca Barbazza, Damiano Zanotto, Giulio Rosati and Sunil K. Agrawal

Kinematic Optimization of a 2DoF PRRRP Manipulator .......... 277
Simone Cinquemani, Hermes Giberti and Giovanni Legnani
Optimized Trajectory Planning of Pick and Place Operations to Be Performed by Cable-Driven Parallel Robots

Luca Barbazza, Fabio Oscari, Simone Minto and Giulio Rosati

An Innovative Method for Sizing Actuating Systems of Manipulators with Generic Tasks

E. Fiore, H. Giberti and G. Bonomi

Experimentally Based Design of a Manually Operated Baler for Straw Bale Construction

Walter Franco, Giuseppe Quaglia and Carlo Ferraresi

Part VII Transportation Machinery

Fast Calibration Procedure of the Dynamic Model of an Autonomous Underwater Vehicle from a Reduced Set of Experimental Data

Benedetto Allotta, Riccardo Costanzi, Luca Pugi, Alessandro Ridolfi and Andrea Rindi

Braking Energy Recovery in High Speed Trains: An Innovative Model

Amedeo Frilli, Enrico Meli, Daniele Nocciolini, Simone Panconi, Luca Pugi and Andrea Rindi

Dynamic Model and Instability Evaluation of an Articulated Mobile Agri-Robot

G. Carabin, R. Vidoni, F. Mazzetto and A. Gasparetto

NVH Analysis of Automotive Components: A Carbon Fiber Suspension System Case

Alessandro Fasana, Massimiliana Carello, Alessandro Ferraris, Andrea Airale and Davide Berti Polato

Dynamics of a Tethered Rover on Rough Terrain

Stefano Seriani, Paolo Gallina and Armin Wedler

Wind Propulsion for Robot Surface Mobility

Mario Foglia, Giulio Reina and Giovanni Boschetti

Anti-dive Front Suspension for Agricultural Tractors: Dynamic Model and Validation

Francesco Biral, Riccardo Pelanda and Alberto Cis

Dynamic Model of an Independent Carts System

Jacopo Cavalaglio Camargo Molano, Stefano Rossi, Marco Cocconcelli and Riccardo Rubini
Tyre-Road Adherence Conditions Estimation for Intelligent Vehicle Safety Applications .......................................................... 389
Mojtaba Sharifzadeh, Francesco Timpone, Arash Farnam, Adolfo Senatore and Ahmad Akbari

Part VIII Tribology

Tilting Pad Journal Bearing TEHD Analysis: An Innovative Model .................................................. 401
Amedeo Frilli, Enrico Meli, Daniele Nocciolini, Simone Panconi, Luca Pugi, Andrea Rindi and Stefano Rossin

Thermo-Hydrodynamic Analysis of Tilting Pad Journal Bearing with General Purpose CFD Software ........................................ 411
Marco Del Chiaro, Paola Forte, Francesco Torrigiani and Enrico Ciulli

Multiple Holes Rectangular Gas Thrust Bearing: Dynamic Stiffness Calculation with Lumped Parameters Approach ..................... 421
Federico Colombo, Mona Moradi, Terenziano Raparelli, Andrea Trivella and Vladimir Viktorov

Theoretical and Experimental Study of a Rectangular Grooved Pocketed Air Pad .............................................................. 431
Federico Colombo, Danial Ghodsiyeh, Terenziano Raparelli, Andrea Trivella and Vladimir Viktorov

Experimental Identification of an Aerostatic Thrust Bearing .................. 441
Federico Colombo, Luigi Lentini, Terenziano Raparelli and Vladimir Viktorov

Experimental Analysis of the Influence of the Electrical Arc on the Wear Rate of Contact Strip and Contact Wire in a.c. System .................. 449
Giuseppe Bucca, Andrea Collina and Ezio Tanzi

Part IX Vibrations

Low-Cost Experimental Assessment of Forces in the Contact Bridge-Soundboard of Stringed Musical Instruments ..................... 459
Enrico Ravina

Vibration Modes of Piezoelectric Bimorphs: A Sensitivity Analysis .... 467
Alberto Borboni, Cinzia Amici, Valter Cappellini and Rodolfo Faglia

Concurrent Active Control and Dynamic Structural Modification in the Design and the Optimization of Vibrating Systems .................. 475
Roberto Belotti, Roberto Caracciolo and Dario Richiedei
A Vibration Isolator Based on Magneto-Rheological Elastomer ........ 483
Renato Brancati, Giandomenico Di Massa and Stefano Pagano

A Physical Analytical Model to Study the Elasto-Kinematic
Behaviour of a MacPherson Suspension ....................... 491
Francesco Timpone

A Smart System for Shock and Vibration Isolation of Sensitive
Electronic Devices On-Board a Vehicle ....................... 503
M. De Michele, G. Di Massa, G. Frisella, S. Lippolis, S. Pagano,
G. Pisani and S. Strano

Wavelet Analysis of Gear Rattle Induced by a Multi-harmonic
Excitation .......................................................... 513
Renato Brancati, Ernesto Rocca, Sergio Savino and Francesco Timpone

Part X Special Session in Honor of Prof. Aldo Rossi
for his 70th Birthday

Analytical and Multibody Modelling of a Quick-Release Hook
Mechanism ........................................................... 523
Luca Bruzzone, Davide Bonatti, Giovanni Berselli and Pietro Fanghella

Evolution of a Dynamic Model for Flexible Multibody Systems .... 533
P. Boscariol, P. Gallina, A. Gasparetto, M. Giovagnoni, L. Scalera
and R. Vidoni

Anti-hedonistic Mechatronic Systems .......................... 543
Lorenzo Scalera, Paolo Gallina, Alessandro Gasparetto
and Marco Giovagnoni

On the Use of Cable-Driven Robots in Early Inpatient Stroke
Rehabilitation ....................................................... 551
G. Rosati, S. Masiero and A. Rossi
Advances in Italian Mechanism Science
Proceedings of the First International Conference of
IFToMM Italy
Boscetti, G.; Gasparetto, A. (Eds.)
2017, XIV, 558 p. 322 illus., Hardcover
ISBN: 978-3-319-48374-0