

EngOpt 2018 Proceedings of the 6th International Conference on Engineering Optimization

H. C. Rodrigues · J. Herskovits
C. M. Mota Soares · A. L. Araújo
J. M. Guedes · J. O. Folgado
F. Moleiro · J. F. A. Madeira
Editors

EngOpt 2018 Proceedings of the 6th International Conference on Engineering Optimization

Editors

H. C. Rodrigues
Mechanical Engineering Department
Instituto Superior Técnico
University of Lisbon
Lisbon, Portugal

J. Herskovits
Federal University of Rio de Janeiro
Rio de Janeiro, Brazil

C. M. Mota Soares
Instituto Superior Tecnico
University of Lisbon
Lisbon, Portugal

A. L. Araújo
Instituto Superior Tecnico
University of Lisbon
Lisbon, Portugal

J. M. Guedes
Instituto Superior Tecnico
University of Lisbon
Lisbon, Portugal

J. O. Folgado
Instituto Superior Tecnico
University of Lisbon
Lisbon, Portugal

F. Moleiro
Instituto Superior Tecnico
University of Lisbon
Lisbon, Portugal

J. F. A. Madeira
IST
IDMEC – Instituto de Engenharia Mecânica
Lisbon, Portugal

ISBN 978-3-319-97772-0 ISBN 978-3-319-97773-7 (eBook)
<https://doi.org/10.1007/978-3-319-97773-7>

Library of Congress Control Number: 2018953565

© Springer Nature Switzerland AG 2019

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

This book contains the edited and reviewed versions of papers presented and discussed at the 6th International Conference on Engineering Optimization “ENGOPT2018”, September 17–19, 2018, Instituto Superior Tecnico, Lisbon, Portugal.

The series of EngOpt conferences are a forum for engineers, mathematicians, and computer scientists to share research and innovations, promoting interdisciplinary activities in all fields of engineering optimization. EngOpt conferences periodically bring together engineers, applied mathematicians, and computer scientists working on research, development, and practical application of optimization methods in all engineering disciplines and applied sciences.

Modern engineering design processes and tasks are highly complex, multi- and interdisciplinary, requiring the cooperative effort of different specialists from engineering, mathematics, computer science, and even social sciences. Optimization methodologies are vital instruments to tackle this complexity, giving us the possibility to synergistically unite team member’s contributions and thus decisively facilitate the solution of new engineering problems. Within this context, the primary goal of this EngOpt conference is to join engineers, applied mathematicians, computer, and other applied scientists working on research, development, and practical application of optimization methods applied to all engineering disciplines, in a joint scientific forum to present, analyze and discuss their latest developments.

The papers in this book are organized around the following major sections:

- Numerical Optimization Techniques
- Design Optimization and Inverse Problems
- Efficient Analysis and Reanalysis Techniques
- Sensitivity Analysis
- New Challenges in Derivative-free Optimization Methods for Engineering Optimization
- Optimization of Composite Structures
- Optimization Methods in Biomechanics and Biomedical Engineering
- Industrial Applications

We take this opportunity to extend our recognition to the scientific committee members, session chairs, lecturers, and conference participants for the scientific success of this event. Their active participation in the discussions and the numerous interesting presentations were vital to attaining the scientific meeting objectives.

Our indebtedness is also due to Ms Paula Jorge for all her efforts and commitment to the successful running of the conference.

September 2018

The Editors

Organization

EngOpt2018 Organizing Committee

Hélder C. Rodrigues (Chairman)	IST, IDMEC, Portugal
José Herskovits (Co-chairman)	COPPE/UFRJ, Brazil
Cristóvão M. Soares (Co-chairman)	IST, IDMEC, Portugal
José Miranda Guedes	IST, IDMEC, Portugal
Aurélio Araújo	IST, IDMEC, Portugal
João Folgado	IST, IDMEC, Portugal
Filipa Moleiro	IST, IDMEC, Portugal
José Aguilar Madeira	ISEL, IDMEC, Portugal

EngOpt2018 International Scientific Committee

W. Achtziger, Dortmund, Germany
G. Allaire, Palaiseau, France
R. Ansola, Bilbao, Spain
C. C. António, Porto, Portugal
S. Azarm, Maryland, USA
A. A. Bandeira, Salvador, Brazil
C. Barbarosie, Lisboa, Portugal
H. J. C. Barbosa, Petrópolis, Brazil
A. Ben-Tal, Haifa, Israel
P. Beremlijski, Ostrava, Czech Republic
J. Blachut, Liverpool, UK
I. F. Bustos, Bilbao, Spain
A. Canelas, Montevideo, Uruguay
C. F. Castro, Porto, Portugal
G. Chapiro, Juiz de Fora, Brazil

G. Cheng, Dalian, China
K. K. Choi, Iowa, USA
M. Colaço, Rio de Janeiro, Brazil
A. L. Custódio, Lisboa, Portugal
R. Das, Auckland, New Zealand
A. Diaz, East Lansing, USA
Z. Dimitrovová, Lisboa, Portugal
J. Du, Beijing, China
G. Dulikravich, Miami, USA
P. Duysinx, Liège, Belgium
G. Dzierzanowski, Warsaw, Poland
P. Eberhard, Stuttgart, Germany
A. Elkamel, Waterloo, Canada
A. Faria, S. José dos Campos, Brazil
J. R. Faria, João Pessoa, Brazil
C. M. Fonseca, Coimbra, Portugal
J. Guest, Baltimore, USA
S. Gutierrez, Santiago, Chile
N. Imam, Oak Ridge, USA
M. L. Indrusiak, S. Leopoldo, Brazil
K. Ivanov, Almaty, Kazakhstan
B. Ivorra, Madrid, Spain
H. Jensen, Valparaíso, Chile
F. Jouve, Paris, France
Y. Y. Kim, Seoul, Korea
A. Klarbring, Linköping, Sweden
J. P. Kuzhichalil, Lisbon, Portugal
A. C. C. Lemonge, Juiz de Fora, Brazil
A. Leski, Warsaw, Poland
J. Logo, Budapest, Hungary
E. Lund, Aalborg, Denmark
N. Maïzi, Paris, France
A. C. Marta, Lisboa, Portugal
J. R. R. A. Martins, Michigan, USA
N. F. M. Martins, Lisboa, Portugal
C. A. Mota Soares, Lisboa, Portugal
A. Nastase, Aachen, Germany
H. Orlande, Rio de Janeiro, Brazil
P. Papalambros, Michigan, USA
N. Pedersen, Lyngby, Denmark
P. Pedersen, Lyngby, Denmark
J. Pinter, Bethlehem, USA
M. P. Saka, Isa Town, Bahrain
A. Secchi, Rio de Janeiro, Brazil
E. C. N. Silva, São Paulo, Brazil

T. Sokol, Warsaw, Poland
 A. Suleman, Lisboa, Portugal
 M. Tanaka, Santarém, Brazil
 T. Tanyimboh, Johannesburg, South Africa
 A.-M. Toader, Lisboa, Portugal
 D. Tortorelli, Urbana, USA
 F. Van Keulen, Delft, Netherlands
 D. Vucinic, Brussels, Belgium
 G. W. Weber, Poznan, Poland
 G. H. Yoon, Seoul, Korea

Organized by



Endorsed by



Sponsored by



Caixa Geral de Depósitos

Contents

Numerical Optimization Techniques

A Generalized SNC-BESO Method for Multi-objective Topology Optimization	3
David J. Munk, Timoleon Kipouros, and Gareth A. Vio	
Alternatives to Evolutionary Optimization Algorithms in the Context of Traditional Stochastic Optimization Methods in Smart Area Technical Equipment Applications	15
Bohumír Garlík	
Vehicle Configuration Design Using Cellular-Division and Level-Set Based Topology Optimization	29
Ramana V. Grandhi, Hao Li, Marcelo Kobayashi, and Raymond M. Kolonay	
A Surrogate-Assisted Cooperative Co-evolutionary Algorithm for Solving High Dimensional, Expensive and Black Box Optimization Problems	41
Julien Blanchard, Charlotte Beauthier, and Timoteo Carletti	
Finite Element Mesh Size Optimization for Steel Bolted Connection . . .	53
Mario Galić, Hrvoje Draganić, and Tihomir Dokšanović	
Network's Trip Demand Estimation as a Problem of Combinatorial Optimization	61
Alexander Yu. Krylatov and Anastasiya P. Shirokolobova	
Elasto-Plastic Topology Optimization Under Stochastic Loading Conditions	70
B. Blachowski, P. Tauzowski, and J. Lógó	
Applications of Iterative Nondifferentiable Optimization to Some Engineering Approximation Problems	80
Stefan M. Stefanov	

Performance Assessment of Metaheuristic Algorithms for Structural Optimization Taking into Account the Influence of Control Parameters	93
Wouter Dillen, Geert Lombaert, Nathalie Voeten, and Mattias Schevenels	
A Differential Evolution to Find the Best Material Groupings in Truss Optimization	102
José P. G. Carvalho, Afonso C. C. Lemonge, Patrícia H. Hallak, and Dênis E. C. Vargas	
Hydraulic Design and Optimization of a LNG Hydraulic Turbine Runner	115
Ning Huang and Zhenlin Li	
Optimal Search Strategies for Rescue Drones Based on Swarm Behaviour of Different Ethics	122
Florian Roesner, Clein Alexander Sarmiento Castrillón, Ronny Hartanto, and Alexander Struck	
Algorithmic System Design of Thermofluid Systems	132
Jonas B. Weber and Ulf Lorenz	
Effect of Different Agent-Behaviour on a Traffic Simulation Framework	144
Yu-Jeng Kuo, Arindam Mahanta, Anoshan Indreswaran, Alexander Struck, and Ronny Hartanto	
A Macro-scale Topology Optimization Method for Flows Through Solid Structure Arrays	153
Paul Lacko, Geert Buckinx, and Martine Baelmans	
Optimization of Polyacrylamide Based Multicomponent Hydrogels Synthesis Using a Neuro-Evolutionary Strategy	164
Elena Niculina Drăgoi, Gabriel Dan Suditu, and Silvia Curteanu	
Multi-objective Control Problems for Optimal Isolation of Elastic Structures from Vibration	172
Dmitry V. Balandin, Ruslan S. Biryukov, and Mark M. Kogan	
The Performance of a Modified Harmony Search Algorithm in the Structural Identification and Damage Detection of a Scaled Offshore Wind Turbine Laboratory Model	185
Mahmoud Jahjouh and Raimund Rolfes	
Adaptive Strategies for Fail-Safe Topology Optimization	200
Olaf Ambrozkiwicz and Benedikt Kriegesmann	
Optimization of Heat Exchanger Flow Paths Using a Novel Integer Permutation Based Genetic Algorithm	212
Zhenning Li and Vikrant Aute	

Penalty-Free Self-adaptive Search Space Reduction Method for Multi-objective Evolutionary Design Optimization of Water Distribution Networks	224
Tiku T. Tanyimboh	
Reliability Based Design Optimization by Using Metamodels	236
Niclas Strömberg	
A Feasible Direction Interior Point Method for Generalized Nash Equilibrium with Shared Constraints	248
Carolina Effio, Jean Rodolphe Roche, and José Herskovits	
Discontinuous Petrov-Galerkin Methods for Topology Optimization . . .	260
Anton Evgrafov	
An Algorithm for Constrained Optimization with Applications to the Design of Mechanical Structures	272
Cristian Barbarosie, Sérgio Lopes, and Anca-Maria Toader	
Multi-objective Optimization of Industrial Processes	285
Zainab Al Ani, Ashish M. Gujarathi, G. Reza Vakili-Nezhaad, and Talal Al Wahaibi	
HPC Implementation of the Multipoint Approximation Method for Large Scale Design Optimization Problems Under Uncertainty	296
Vassili Toropov, Yury Korolev, Konstantin Barkalov, Evgeny Kozinov, and Victor Gergel	
Bayesian Method for the Solution of an Engineering Design Inverse Problem	307
Iwona Nowak	
 Design Optimization and Inverse Problems	
A Study on the Impact of Balancing the Number of Elements of the Clusters on the Uncapacited p-medians Location Problem Using GRASP with Path-Relinking	317
Caroline Nascimento Parajara, Gustavo Barbosa Libotte, Geraldo Galdino de Paula Jr., and Gustavo Mendes Platt	
Parallel Robots like a Portable Reorientation System for Tracking Satellites	329
Jhonatan Fernando Eulopa Hernandez, Eusebio Eduardo Hernandez Martinez, and Jorge L. Garrido Téllez	
Mathematical Modelling for an Optimal Monitoring Design in Quality Control of Traffic	342
Miguel E. Vázquez-Méndez, Lino J. Alvarez-Vázquez, Gerardo Casal, Néstor García-Chan, and Aurea Martínez	

Optimal Control of Phytoremediation Techniques for Heavy Metals Removal in Shallow Water	352
Lino J. Alvarez-Vázquez, Aurea Martínez, Carmen Rodríguez, Miguel E. Vázquez-Méndez, and Miguel A. Vilar	
Combined Length Scale and Overhang Angle Control in Minimum Compliance Topology Optimization for Additive Manufacturing	361
Jeroen Pellens, Geert Lombaert, Boyan Lazarov, and Mattias Schevenels	
A Flexible Overhang Constraint for Topology Optimization of Compliant Mechanisms. Advantages of Controlling the Additive Manufacturability/Performance Ratio	372
Alain Garaigordobil and Rubén Ansola	
The Combination of Three-Dimension Inverse Design and Optimization Methods for Helium Circulator's Impeller Optimization in HTR	381
Xing Xie, Zhenlin Li, Hong Wang, and Baoshan Zhu	
Considering Linear Buckling for 3D Density Based Topology Optimization	394
Robert Dienemann, Axel Schumacher, and Sierk Fiebig	
Uncertainty Quantification and Model Identification in a Bayesian and Metaheuristic Framework	407
Alexandre Marks Löw and Herbert Martins Gomes	
Low-Fidelity Aerostructural Optimization of Aircraft Wings with a Simplified Wingbox Model Using OpenAeroStruct	418
Shamsheer S. Chauhan and Joaquim R. R. A. Martins	
Global Optimized Shapes of Aerospace Vehicle Models	432
Nastase Adriana	
Optimum Adaptive Slicing Considering the Layer Strength of Fused Deposition Modelling Parts	442
Jothibabu Gokulakrishnan and Gurunathan Saravana Kumar	
Reduction of Shape Variables in B-Spline Based Optimization by Implementation of Analytical Shapes	453
Ivo Marinić-Kragić and Damir Vučina	
Optimization of Object-Relational Database Structure	466
A. Auziņš and J. Eiduks	
Thickness Constraints for Topology Optimization Using the Fictitious Physical Model	483
Takayuki Yamada	

Node to Node Requirements on the Synthesis of Mechanisms Using Minimum Distance Approach	491
I. Fernández de Bustos, V. García Marina, A. Olabarrieta, and D. López Montaña	
Optimal Design of Rotor Blades for an Axial Compressor Using the Gradient Based Method	498
Hyung-Jin Kim, Hyeon-Jae Noh, and Youn-Jea Kim	
Exploring the Fitness Landscape of a Realistic Turbofan Rotor Blade Optimization	510
Jakub Kmec and Sebastian Schmitt	
Topology Optimization for Compliance Minimization and Actuator Layout to Vibration Suppress	523
Juliano F. Gonçalves, Daniel M. De Leon, and Eduardo A. Perondi	
Optimization of Metal Fin Distributions in Latent Heat Storages	531
Bart Peremans, Maarten Blommaert, and Martine Baelmans	
Experimental Compressor Multidisciplinary Optimization Using Different Parameterization Schemes	543
Tatiana Buyukli, Igor Egorov, Grigorii Popov, Evgenii Goriachkin, and Anton Salnikov	
Aerodynamic Optimization of Turbine Airfoils Using Multi-fidelity Surrogate Models	556
Bernhard Poethke, Stefan Völker, and Konrad Vogeler	
Finite Element Model Updating of a Wind Turbine Blade—A Comparative Study	569
Marlene Bruns, Benedikt Hofmeister, Dorian Pache, and Raimund Rolfes	
On the Potential and Challenges of Neural Style Transfer for Three-Dimensional Shape Data	581
Timo Friedrich, Nikola Aulig, and Stefan Menzel	
Infill Analysis and Optimization in Additive Manufacturing Applications	593
Gian Marco Tassi, Qiren Gao, and Alejandro R. Diaz	
Theory of Grillage Optimization—A Discrete Setting	605
Karol Bołbotowski	
Integration of Flange Connections in the Graph and Heuristic Based Topology Optimization of Crashworthiness Structures	619
Simon Link, Dominik Schneider, Axel Schumacher, and Christopher Ortmann	

Sustainable Design Optimization of Reinforced Concrete Frames Considering CO₂ Emission Minimization 632
Alberto M. B. Martins, Luís M. C. Simões, and João H. J. O. Negrão

Optimal Design of New Steel Connections 644
Salvatore Benfratello, Luigi Palizzolo, and Pietro Tabbuso

Optimization of Axially Moving Layered Web 657
Nikolay Banichuk, Svetlana Ivanova, Alexander Sinitsin, and Vladislav Afanas'ev

On Design Optimization of Heat Sinks with Curvature Considerations for Additive Manufacturing 666
Yoshihiro Tateishi, Hiromichi Gohara, Ryoichi Kato, Yoshinari Ikeda, Victor Parque, Tomoyuki Miyashita, Muhammad Khairi Faiz, and Makoto Yoshida

Complex System of Identification of Material Properties of Microstructure Using Bioinspired Method 679
Arkadiusz Poteralski

Worst Geometric Imperfections of Rods and Shells 691
Piotr Alawdin

Applicability of Simplified Models of Railways Tracks Obtained by Optimization and Fitting Techniques 706
André F. S. Rodrigues and Zuzana Dimitrovová

Optimal Spectral Matching of Strong Ground Motion by Opposition-Switching Search 713
Mohsen Shahrouzi

Concurrent Topological Optimisation: Optimisation of Two Components Sharing the Design Space 725
Federico Ballo, Massimiliano Gobbi, and Giorgio Prevati

Efficient Analysis and Reanalysis Techniques

Bio-inspired Optimization Algorithms for Limit Analysis of Frame Structures 741
Annalisa Greco, Alessandro Pluchino, Francesco Cannizzaro, and Ilaria Fiore

Optimization of Parallel Computations for Modeling Water Purification Processes by Electromagnetic Method 754
Sergey Polyakov, Tatiana Kudryashova, and Nikita Tarasov

Optimality Conditions for Sparse Quadratic Optimization Problem . . . 766
Duygu Üçüncü, Süreyya Akyüz, Erdal Gül, and Gerhard Wilhelm-Weber

3D Topology Optimization with h-adaptive Refinement Using Cartesian Grids Finite Element Method (<i>cgFEM</i>)	778
D. Muñoz, J. J. Ródenas, E. Nadal, and J. Albelda	
Modelling and Simulation of a Race-Car Frame Using Graph-Based Design Languages	789
Manuel Ramsaier, Ralf Stetter, Markus Till, and Stephan Rudolph	
Consideration of Structural Member Deformation Constraints Using Lagrange Multipliers	801
Guilherme Coelho Gomes Barros, Evandro Parente Jr., and Luiz Fernando Martha	
Analysis of Slopes Using Elitist Differential Evolution Algorithm	815
Yagizer Yalcin, Murat Altun, and Onur Pekcan	
Sensitivity Analysis	
On the Use of Complex Input Power in Topology Optimization of One-Material Vibrating Structures for Obtaining Displacement Anti-resonances Close to Frequencies of Interest	829
Olavo M. Silva, Miguel M. Neves, and Arcanjo Lenzi	
An Evolution-Based High-Cycle Fatigue Constraint in Topology Optimization	844
Shyam Suresh, Stefan B. Lindström, Carl-Johan Thore, Bo Torstenfelt, and Anders Klarbring	
Second-Order Inverse Reliability Analysis: A New Methodology to the Treatment of Reliability in Engineering System	855
Gustavo Barbosa Libotte, Francisco Duarte Moura Neto, Fran Sérgio Lobato, and Gustavo Mendes Platt	
Adjoint Method for Topological Derivatives for Optimization Tasks with Material and Geometrical Nonlinearities	867
Katrin Weider and Axel Schumacher	
On the Treatment of Multirow Interface in Aerodynamic Turbomachinery Adjoint Solvers	879
Simão S. Rodrigues and André C. Marta	
Sensitivity of Shape Parameters of Brake Systems Under Squeal Noise Criteria	888
P. Mohanasundaram, F. Gillot, S. Besset, and K. Shimoyama	
Efficient Aerodynamic Optimization of Aircraft Wings	897
Pedro M. V. Rodrigues and André C. Marta	

New Challenges in Derivative-Free Optimization Methods for Engineering Optimization

Cartesian Genetic Programing Applied to Equivalent Electric Circuit Identification	913
---	------------

Marco André Abud Kappel, Roberto Pinheiro Domingos,
and Ivan Napoleão Bastos

2-Dimensional Outline Shape Representation for Generative Design with Evolutionary Algorithms	926
--	------------

Paul Lapok, Alistair Lawson, and Ben Paechter

Fire Risk Modeling Using Artificial Neural Networks	938
--	------------

Luiza Cintra Fernandes, Rosangela S. C. Cintra, Marcelo Antonio Nero,
and Plínio da Costa Temba

A Heuristic Approach to Subdomain Oriented Multi-material Topology Optimization	949
--	------------

Katarzyna Tajs-Zielinska and Bogdan Bochenek

Metaheuristic Algorithm for Optimal Swarm Robotic Parameter Configuration in Time-Variant Plume Detection	959
--	------------

Itziar Landa-Torres, Diana Manjarres, and Sonia Bilbao

Financial Early Warning System Model Based on Neural Networks, PSO and SA Algorithms	970
---	------------

Fatima Zahra Azayite and Said Achchab

Radial Basis Functions Influence in CORS Methodology Applied on Aerodynamic Wing Optimization Problems	983
---	------------

Nelson Jose Diaz Gautier, Nelson Manzanares Filho,
and Edna Raimunda da Silva Ramirez

The Use of Bayesian Optimisation Techniques for the Pantograph-Catenary Dynamic Interaction Stochastic Problem	997
---	------------

S. Gregori, M. Tur, A. Pedrosa, and F. J. Fuenmayor

Application of Multiobjective Optimization Based on Differences of Modal Displacements and Modal Rotations for Damage Quantification in Beams	1009
--	-------------

J. V. Araújo dos Santos, J. F. A. Madeira, H. Lopes,
and P. Moreno-García

Optimization of Composite Structures

Optimization of Porous Structure Effective Elastic Properties by the Fast Multipole Boundary Element Method and an Artificial Immune System	1023
--	-------------

Jacek Ptaszny and Arkadiusz Poteralski

Multiobjective Optimization of Composite Materials for Continuous Fiber Orientation	1035
Pedro Bühner Santana, Marcos Daniel de Freitas Awruch, Ewerton Grotti, and Herbert Martins Gomes	
A Gradient-Based Strategy for the Optimization of Stiffened Composite Structures Subject to Multiple Load Cases and Multiple Failure Criteria	1045
F. Farzan Nasab, G. A. Duipmans, H. J. M. Geijselaers, and A. de Boer	
Minimization of the Effective Thermal Expansion Coefficient of Composite Material Using a Multi-scale Topology Optimization Method	1055
Lidy Anaya, William Vicente, and Renato Pavanello	
An Optimization Approach for an Ultra-Efficient Electric Racing Vehicle's Supporting System Based on Composite Shell Elements	1061
Tomasz Pabian and Wojciech Skarka	
Optimization of a Composite Beam-Based Load Bearing Structure, for an Ultra-Efficient Electric Vehicle	1073
Michał Sosnowski and Wojciech Skarka	
Optimisation of Fibre-Paths in Composites Produced by Additive Manufacturing	1083
Rafael T. L. Ferreira, Ian A. Ashcroft, Shuguang Li, and Peng Zhuo	
Multi-objective Memetic Algorithm Based on Learning for Sustainable Design of FRP Composite Structure	1095
Carlos Conceição António	
Development of a Computationally Efficient Fabric Model for Optimization of Gripper Trajectories in Automated Composite Draping	1107
Christian Krogh, Johnny Jakobsen, and James A. Sherwood	
Optimization Methods in Biomechanics and Biomedical Engineering	
Synthesis of a Non-Grashof Six-Bar Polycentric Knee Prostheses Using an Evolutionary Optimization Algorithm	1121
Cuahtémoc Morales-Cruz, Edgar Alfredo Portilla-Flores, Rosaura Anaíd Suárez-Santillán, Noemi Hernández-Oliva, and Maria Bárbara Calva-Yáñez	
Application of Global Optimization Methods in Multiscale Inverse Problem Solution	1133
Wacław Kuś	

Industrial Applications

Mitigation of Railway Wheel Rolling Noise by Using Advanced Optimization Techniques 1141
J. Gutiérrez-Gil, X. Garcia-Andrés, J. Martínez-Casas, E. Nadal, and F. D. Denia

Advanced Methodologies for Topology and Geometry Optimization of Noise Control Devices 1154
B. Ferrándiz, J. Martínez-Casas, E. Nadal, J. J. Ródenas, and F. D. Denia

Distribution of Workload in IMA Systems by Solving a Modified Multiple Knapsack Problem 1166
Vasily Balashov and Ekaterina Antipina

Optimal Design of Adaptive Toothed Variator (CVT) 1178
Konstantin S. Ivanov

Power Loss Reduction Through Network Reconfiguration and Distributed Generation by Means of Feasibility-Preserving Evolutionary Optimization 1193
Slawomir Koziel, Alberto Landeros Rojas, Mohamed F. Abdel-Fattah, and Szczepan Moskwa

Mid-Section Structure Optimization of Oil Tanker Based on CSR Prescriptive Analysis 1205
Yuan Wang and Jia-meng Wu

Multi-Criteria Optimization of Pressure Screen Systems in Paper Recycling – Balancing Quality, Yield, Energy Consumption and System Complexity 1216
Tim M. Müller, Lena C. Altherr, Marja Ahola, Samuel Schabel, and Peter F. Pelz

On the Optimization of Recirculated Aquaculture Systems 1229
Štěpán Papáček, Karel Petera, Ingrid Masaló, and Joan Oca

Optimizing the Design and Control of Decentralized Water Supply Systems – A Case-Study of a Hotel Building 1241
Philipp Leise and Lena C. Altherr

Correlation Analysis Between the Vibroacoustic Behavior of Steering Gear and Ball Nut Assemblies in the Automotive Industry 1253
Paul A. Bucur, Klaus Frick, and Philipp Hungerländer

Adaptive Topology and Shape Optimization with Integrated Casting Simulation 1263
Thilo Franke, Sierk Fiebig, Ronald Bartz, Thomas Vietor, Julian Hage, and Anneke vom Hofe

Optimal Batch Creation for Bell-Type Industrial Batch Annealing Furnace with an Annealing Time Prediction Model	1278
Adil Han Orta, İskender Kayabaşı, Onur Can Saka, Ali Öztürk, Kanan Aghayev, Ali Gözay, Taner Göçen, Erdoğan Özdemir, and Eda Kızıldaş	
Optimization of Two-Stage Centrifugal Pump of Rocket Engine	1290
Vasilii Zubanov, Andrei Volkov, Valeriy Matveev, Grigorii Popov, Oleg Baturin, and Yulia Novikova	
Reversible Cold Rolling Process Time Optimization for an Industrial Application	1304
Kanan Aghayev, Kaan Esendağ, Adil Han Orta, Ali Öztürk, Selim İlker, and Eda Çapa Kızıldaş	
Beyond the Harris' Model to Optimally Define Lot Sizes in a Make-to-Stock Multi-line Production System	1316
Marco Bortolini, Silvia Errani, Mauro Gamberi, Francesco Pilati, and Alberto Regattieri	
Using Multicriterion Optimization Methods to Optimize the 3D Shape of Axial Compressor	1328
Grigorii Popov, Evgenii Goriachkin, Yulia Novikova, Daria Kolmakova, and Andrei Volkov	
Design and Management of Renewable Smart Energy Systems: An Optimization Model and Italian Case Study	1340
Marco Bortolini, Mauro Gamberi, Francesco Pilati, and Alberto Regattieri	
Improving Coordination in Supply Chain Using Artificial Neural Networks and Multi-agent Approach	1353
Halima Bousqaoui, Ilham Slimani, and Said Achchab	
Trajectory Optimization of Industrial Robots with a Feasible Direction Interior Point Algorithm	1360
Michel Alba, Luiz Ribeiro, and José Herskovits	
Optimization of the Propeller-Driven Propulsion System for a Small UAV	1372
Nuno S. M. Moita and André C. Marta	
Multidisciplinary Optimisation of Flexible Aircraft Structures in Consideration of Flight Control System Demands in the Time Domain	1385
Daniel Nussbächer, Ögmundur Petersson, Fernass Daoud, and Mirko Hornung	

Applying the Modified Cuckoo Search to the Customisation of an Industrial Pre-mixer	1398
J. S. Thompson, S. Walton, O. Hassan, and J. Sienz	
Metaheuristic Optimization of Natural Resources in Thermal Cracking Process	1409
Fernando Boto, Diana Manjarres, and Itziar Landa-Torres	
Two-Stage, Multi-objective Optimisation Framework for an Efficient Pathway to Decarbonise the Power Sector	1420
Ruben Bravo and Daniel Friedrich	
Optimal Feed Temperature for Hydrogen Peroxide Decomposition Process Occurring in the Reactor with Fixed-Bed of Commercial Catalase	1434
Grubecki Ireneusz and Zalewska Anna	
An Optimization Approach to Generate Accurate and Efficient Lookup Tables for Engineering Applications	1446
H. Magalhães, F. Marques, B. Liu, J. Pombo, P. Flores, J. Ambrósio, and S. Bruni	
Optimal Scheduling of Tunnel Inspection and Monitoring for Leveling Yearly Budget	1458
Hiroshige Dan, Ayaka Yamamoto, Hiroaki Tanaka-Kanekiyo, Atushi Sutoh, Osamu Maruyama, and Takashi Satoh	
Author Index	1471