

Contents

Part I Mathematical Methods

Explicit Discrete Dispersion Relations for the Acoustic Wave Equation in d-Dimensions Using Finite Element, Spectral Element and Optimally Blended Schemes	3
<i>Mark Ainsworth, Hafiz Abdul Wajid</i>	
hp-Adaptive Finite Elements for Coupled Multiphysics Wave Propagation Problems	19
<i>Leszek Demkowicz, Jason Kurtz, Frederick Qiu</i>	
Nonconvex Inequality Models for Contact Problems of Nonsmooth Mechanics	43
<i>Stanislaw Migórski, Anna Ochal</i>	
Quadrature for Meshless Methods	59
<i>John E. Osborn</i>	
Shape and Topology Sensitivity Analysis for Elastic Bodies with Rigid Inclusions and Cracks	75
<i>Jan Sokołowski, Antoni Żochowski</i>	
A Boundary Integral Equation on the Sphere for High-Precision Geodesy	99
<i>Ernst P. Stephan, Thanh Tran, and Adrian Costea</i>	
Unresolved Problems of Adaptive Hierarchical Modelling and hp-Adaptive Analysis within Computational Solid Mechanics	111
<i>Grzegorz Zboiński</i>	

Part II Soft Computing and Optimization

Granular Computing in Evolutionary Identification 149
Witold Beluch, Tadeusz Burczyński, Adam Długosz, Piotr Orantek

Immune Computing: Intelligent Methodology and Its Applications in Bioengineering and Computational Mechanics 165
Tadeusz Burczyński, Michał Bereta, Arkadiusz Poteralski, Mirostaw Szczepanik

Bioinspired Algorithms in Multiscale Optimization 183
Wacław Kuś, Tadeusz Burczyński

Sensor Network Design for Spatio-Temporal Prediction of Distributed Parameter Systems 193
Dariusz Uciński

Part III Multiscale Methods

A Multiscale Molecular Dynamics / Extended Finite Element Method for Dynamic Fracture 211
Pascal Aubertin, Julien Réthoré, René de Borst

Nonlinear Finite Element and Atomistic Modelling of Dislocations in Heterostructures 239
Paweł Dłużewski, Toby D. Young, George P. Dimitrakopoulos, Joseph Kioseoglou, Philomela Komninou

Accuracy and Robustness of a 3-D Brick Cosserat Point Element (CPE) for Finite Elasticity 255
M. Jabareen, M.B. Rubin

Possibilities of the Particle Finite Element Method in Computational Mechanics 271
Eugenio Oñate, Sergio R. Idelsohn, Miguel Angel Celigueta, Riccardo Rossi, Salvador Latorre

A Framework for the Two-Scale Homogenization of Electro-Mechanically Coupled Boundary Value Problems 311
Jörg Schröder, Marc-André Keip

Part IV Geomechanics

Modeling Concrete at Early Age Using Percolation 333
Lavinia Stefan, Farid Benboudjema, Jean Michel Torrenti, Benoît Bissonette

Simulation of Incompressible Problems in Geomechanics 347
Dieter Stolle, Issam Jassim, Pieter Vermeer

Effect of Boundary, Shear Rate and Grain Crushing on Shear Localization in Granular Materials within Micro-polar Hypoplasticity 363
Jacek Tejchman

Part V Biomechanics

Biomechanical Basis of Tissue–Implant Interactions 379
Romuald Bedzinski, Krzysztof Scigala

Tooth-Implant Life Cycle Design 391
Tomasz Łodygowski, Marcin Wierszycki, Krzysztof Szajek, Wiesław Hędzielek, Rafał Zagalak

Predictive Modelling in Mechanobiology: Combining Algorithms for Cell Activities in Response to Physical Stimuli Using a Lattice-Modelling Approach 423
Sara Checa, Damien P. Byrne, Patrick J. Prendergast

Part VI Structural Mechanics

The Beam-to-Beam Contact Smoothing with Beziers Curves and Hermites Polynomials 439
Przemysław Litewka

Synergic Combinations of Computational Methods and Experiments for Structural Diagnoses 453
Giulio Maier, Gabriella Bolzon, Vladimir Buljak, Tomasz Garbowski, Bartosz Miller

Optimization of Marine Propulsion System’s Alignment for Aged Ships 477
Lech Murawski, Wiesław Ostachowicz

Experimental-Numerical Assessment of Impact-Induced Damage in Cross-Ply Laminates 493
Gigliola Salerno, Stefano Mariani, Alberto Corigliano, Francesco Caimmi, Luca Andena, Roberto Frassine

Finite Element Modeling of Stringer-Stiffened Fiber Reinforced Polymer Structures 505
Werner Wagner, Claudio Balzani

Index 525