Contents

Preface
K.M. Liew, L.X. Zhang ........................................................................................................... 1
Flow Visualization and Wind Uplift Analysis of a Suspended Solar Water Heater
K.-C. Chang, U.-K. Hsu, W.-C. Wang, R.-H. Tyan ................................................................. 3
Accurate and Robust CFD Algorithms Applied to 3D Arbitrary Polyhedral Grids
Z. Kang, C. Yan ..................................................................................................................... 9
Large Eddy Simulation of Turbulent Flow Downstream of a Backward-Facing Step
W. Wang, L. Zhang, Y. Yan .................................................................................................... 16
Calculation of Aircraft Exhaust System Infrared Radiation using Temperature Corrected Turbulence Model
X. Li, Eriqtai, Q. Wang .......................................................................................................... 23
The Productivity Analysis in Tight Gas Reservoir by using Wire-Line Logging and Trial Production Data
W. Wu, Y. Yang, X. Liu, T. Luo, Z. Dai ................................................................................ 29
Rapid Filling of Pipelines with the SPH Particle Method
Hydraulic Model Test on Diversion Structures of Gongguoqiao Hydropower Station during Construction
J. Xie, Y. Ai, W. Zhang, J. Zhang ........................................................................................ 44
Investigation on the Cavity Backwater of the Jet Flow from the Chute Aerators
Y. Xu, W. Wang, H. Yong, W. Zhao ...................................................................................... 51
Numerical Prediction of Turbulent Flow over 3D Sinusoidal Hill using Non-Orthogonal Hexahedron Grid and AMG Method
G. Jiang .................................................................................................................................. 57
A Finite Volume Model for Coupling Surface and Subsurface Flows
Y. Ding, B. Yuan, J. Sun, J. Tao .......................................................................................... 62
Resistance Calculation and Motion Simulation for Free Surface Ship based on CFD
A. Shi, W. Ming, B. Yang, X. Wang, Z. Wang ...................................................................... 68
Virtual Flight Navier-Stokes Solver and its Application
X. Da, T. Yang, Z. Zhao ......................................................................................................... 75
Numerical Simulation of Aerodynamic Performance for Two Dimensional Wind Turbine Airfoils
J. Yao, W. Yuan, J. Wang, J. Xie, H. Zhou, M. Peng, Y. Sun ...................................................... 80
Solid-Liquid Two-Phase Flow Numerical Simulation around Guide Vanes of Mixed-Flow Water Turbine
Q. Li, R. Li, Q. Hui, H. Wei .................................................................................................... 87
Research on the Length Ratio of Splitter Blades for Ultra-High Head Francis Runners
Y. Hou, R. Li, J. Zhang .......................................................................................................... 92
An Improved Moving-Boundary Heat Exchanger Model using the Variable Time Step Method
X. Xue, J. Wang, X. Feng, W. Chen, B. Li ........................................................................... 97
Numerical Investigation on the Reynolds Number Effects of Supercritical Airfoil
D. Liu, Y. Wang, D. Chen, X. Peng, X. Xu ........................................................................... 103
Design and Analysis on Hydraulic Model of the Ultra-Low Specific-Speed Centrifugal Pump
J. Jin, Y. Fan, H. Wei, J. Hu .................................................................................................. 110
The CFD Analysis of Main Valve Flow Field and Structural Optimization for Double-Nozzle Flapper Servo Valve
Z. Peng, C. Sun, R.-B. Yuan, P. Zhang ................................................................................ 115
Uncertainty Analysis of Propellant Compression Mass Gauge for Spacecraft
J. Fu, X. Chen, Y. Huang ..................................................................................................... 122
Aeroelastic Stability of a Slender Missile with Constant Thrust
W. Lei, C. Xie, C. Yang ......................................................................................................... 128
Application of High-Order Panel Method in Static Aeroelastic Analysis of Aircraft
Y. Wang, Z. Wan, C. Yang ................................................................................................... 136
Study on Internal Flow Field of the Three-Phase Separator with Different Entrance Components
Y. Ping, S. Liu, Y. Wang, L. Wei, Z. Xiao, C. Wang .............................................................. 145
Numerical Simulation of Propeller Slipstream Effect on A Propeller-Driven Unmanned Aerial Vehicle
W. Fu, J. Li, H. Wang .......................................................................................................... 150

doi:10.1016/S1877-7058(12)01412-9
Numerical Simulation of Cavitating Turbulent Flow in a High Head Francis Turbine at Part Load Operation with OpenFOAM
H. Zhang, L. Zhang ................................................................. 156

Boundary Layer Velocity Distribution of Two Special Ferromagnetic Fluids
M. Li, S. Hui, Z. Li .............................................................. 166

Analysis on Internal Solid-Liquid Two-Phase Flow in the Impellers of Sewage Pump
W. Li, W. Shi, X. Jiang, B. Chen, Y. Wu ...................................... 170

The Numerical Analysis of Radial Thrust and Axial Thrust in the Screw Centrifugal Pump
H. Wei, M. Wei, R. Li, Q. Li .......................................................... 176

Effect of Acoustic Excitation on Flow Asymmetry over Slender Body at High Angles of Attack
Y. Wang, H. Zhong, D. Liu ............................................................ 182

Optimum Design on Impeller Blade of Mixed-Flow Pump based on CFD
J. Li, Y. Zeng, X. Liu, H. Wang ....................................................... 187

Prediction and Experimental Verification of Vortex Flow in Draft Tube of Francis Turbine based on CFD
J. Zeng, X. Liu, H. Wang ............................................................. 196

Numerical Simulation Research on the Aerodynamic Performance of Concave Building Section
W. Yuan, H. Zhou, Y. Ji, J. Xie ......................................................... 206

Analysis on the Aerodynamic Performance of Vertical Axis Wind Turbine Subjected to the Change of Wind Velocity
H. Wang, J. Wang, Y. Ji, W. Yuan, L. Cao ....................................... 213

The CFD Analysis of Twin Flapper-Nozzle Valve in Pure Water Hydraulic
L. Zhang, L. Jing, R.-B. Yuan, M. He .............................................. 220

Research on Bow Forms of Songhua River Icebreaker
C. Wang, F. Feng, Y. Liu ............................................................. 228


Numerical Simulation on Thermal Energy Storage Behavior of Cu/Paraffin Nanofluids PCMs
S. Wu, H. Wang, X. Song, D. Zhu .................................................. 240

Analysis on the Influence of Rotational Speed to Aerodynamic Performance of Vertical Axis Wind Turbine
L. Cao, H. Wang, Y. Ji, Z. Wang, W. Yuan ....................................... 245

A Solving Method for Nonlinear Equations in the Flow Field
C. Zhang, Y. Zeng ................................................................. 251

The Analysis of Flow Regime in the Aerated Flow

Preliminary Discussion for Improving Cavitating Flow Around Hydrofoil by Punching
F. Yu, L. Zhang, Y. Zeng, Z. Luo .................................................... 261

Periodicity and Self-Similarity of Vortex Evolution in a Doublelid-Driven Cavity Flow
S. He, L. Wu, T. Xu ................................................................. 267

Analysis on the Influence of Turbulence Model Changes to Aerodynamic Performance of Vertical Axis Wind Turbine
Y. Ji, J. Wang, W. Yuan, H. Wang, L. Cao ....................................... 274

Modeling of Crack Nucleating Damage of Concrete
K. Zhou, L. Zhang ................................................................. 282

Modeling of Fatigue Crack in Particle Reinforced Composites with Voronoi Cell Finite Element Method
R. Guo, W. Zhang, T. Tan, B. Qu .................................................. 288

Thermodynamic Description of Si-B Binary System
J. Wu, W. Ma, D. Tang, B. Jia, B. Yang, D. Liu, Y. Dai .......................... 297

Numerical Simulation of Launch Tube based on Container-Type Missile Launch Technology
J. Yang, Z. Wang ................................................................. 302

Numerical Simulation Research of Interior Ballistics Character for Non-Lethal Strike Weapon System
X. Zhai, L. Wei ................................................................. 308

Elastic Deflections of Simply Supported Steel I-Beams with a Web Opening
D. Zhou, L. Li, J. Schnell, W. Kurz, P. Wang ...................................... 315

Progressive Delamination Simulation of Laminated Plates based on a Solid-Shell Interface Element with Damage-Node Model
G. Shi, H. Zhang, J. Wang, Z. Wang ............................................... 324

The Review of the Interior Corner Flow Research in Microgravity
J. Li, X. Chen, Y. Huang ............................................................. 331

Compressive Behaviours of Lotus-Type Porous Copper Fabricated by Gasar Process
Z. Li, T. Yang, Q. Jin, Z. Li, Y. Jiang, R. Zhou .................................... 337

Modeling of Vibrations of Carbon Nanotubes
Y.-G. Hu, K.M. Liew, Q. Wang ..................................................... 343

Finite Element Model Updating based on Field Quasi-Static Generalized Influence Line and its Bridge Engineering Application
J. Liao, G. Tang, L. Meng, H. Liu, Y. Zhang ....................................... 348

Unite Modeling Method for Finite Element Analysis in Tube Tension-Reduced Process
H. Yu, F. Du ................................................................. 354

Stress Strain Analysis of Notched Specimen based on Material Property Gradient
<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Stress Sensitivity of Coal Bed Methane Wells and Impact on Production</td>
<td>Y. Yang, X. Peng, X. Liu</td>
<td>571</td>
</tr>
<tr>
<td>Thermomechanical Coupling Analysis of Heat-Pipe-Cooled Leading Edge Thermal Protection Structure with Thermal Contact Resistance</td>
<td>D. Wei, D. Liu, X. Shang, X. Zheng</td>
<td>580</td>
</tr>
<tr>
<td>Research on Flexibility of Bearing Rings for Multibody Contact Dynamics of Rolling Bearings</td>
<td>T. Yao, Y. Chi, Y. Huang</td>
<td>586</td>
</tr>
<tr>
<td>Implantation of Cuion in Stainless Steel by MEVVA Ion Source and Molecular Dynamic Simulation</td>
<td>J. Yu, J. Chen, R. Chen, W. Ye</td>
<td>595</td>
</tr>
<tr>
<td>Some Ideas and Progress on the Shape Optimization of Nonlinear Structures</td>
<td>Z. Yao, Y. Wei</td>
<td>600</td>
</tr>
<tr>
<td>Computational Morphogenesis of free form Shell Structures by Optimization</td>
<td>M. Liu, M. Xing, Q. Yang, X. Yang</td>
<td>608</td>
</tr>
<tr>
<td>Collaborative Optimization of Container Ship on Static and Dynamic Responses</td>
<td>S. Fu, H. Huang, Z. Lin</td>
<td>613</td>
</tr>
<tr>
<td>Aircraft Preliminary Design Stage Inertia Load Distribution Optimization</td>
<td>F. Qiu, J. Ding, W. Zhang, X. Song</td>
<td>622</td>
</tr>
<tr>
<td>Modified Rejection Ratio for Multiple Load Cases Evolutionary Structural Optimization</td>
<td>X. Hu, H. Cheng, Y. Tao</td>
<td>627</td>
</tr>
<tr>
<td>Analysis of Free Vibration of Embedded Multi-Layered Graphene Sheets</td>
<td>J. Wang, M. Tian, X. He</td>
<td>641</td>
</tr>
<tr>
<td>Investigation of Convection Control under the Non-Uniform RMF in a Liquid Bridge</td>
<td>J. Wang, X. Zeng, J. Chen, L. Li, H. Mizuskei, Y. Kawazoe</td>
<td>659</td>
</tr>
<tr>
<td>First-Principles Calculation of Structure and Mechanical Property of IrY</td>
<td>S. Tao, Y. Pan, J. Chen</td>
<td>665</td>
</tr>
<tr>
<td>Phase Composition of Ti6 Steel during Gas Quenching</td>
<td>L. Hou, H. Cheng, J. Li, Z. Li, B. Shao, J. Hou</td>
<td>682</td>
</tr>
<tr>
<td>Research on Numerical Method of Flow-Induced Vibration on Spiral Casing Structure of Large-Scale Hydropower Station</td>
<td>Z. Li, Z. Zhang</td>
<td>688</td>
</tr>
<tr>
<td>Numerical Simulation of Two-Dimensional Parallel Blade-Vortex Interactions using Large Eddy Simulation</td>
<td>Y. Liu, N. Cao, Q. Wang, B. Li</td>
<td>703</td>
</tr>
<tr>
<td>Numerical Simulation of Supersonic Combustor with Innovative Cavity</td>
<td>D. Zhang, Q. Wang</td>
<td>708</td>
</tr>
<tr>
<td>Large Eddy Simulation of Flow Structure in the Near Region of a Circular Wall Jet</td>
<td>Z. Li, W. Huai, Z. Qian</td>
<td>713</td>
</tr>
<tr>
<td>Simulation and Optimization of Giant Radial Tire Vulcanization Process</td>
<td>Y. Wang, B. Su, J. Wu</td>
<td>723</td>
</tr>
<tr>
<td>Investigation into Key Strata Movement Impact to Overburden Movement in Cemented Backfill Mining Method</td>
<td>Y. Li, B. Qiu</td>
<td>727</td>
</tr>
<tr>
<td>A Numerical Study of the Fire-Extinguishing Performance of Water Mist in an Opening Machinery Space</td>
<td>T. Liang, S. Lo, X. Wang, G. Liao</td>
<td>734</td>
</tr>
<tr>
<td>Study of Uniform Experiment Design Method Applying to Civil Engineering</td>
<td>J. Song, Z. Song, R. Sun</td>
<td>739</td>
</tr>
<tr>
<td>Structural Optimal Design of Grape Rain Shed</td>
<td>J. Wang, H. Yang</td>
<td>751</td>
</tr>
<tr>
<td>Numerical Simulation of Turbulent Flow Past Airfoils on OpenFOAM</td>
<td>L. Gao, J. Xu, G. Gao</td>
<td>756</td>
</tr>
<tr>
<td>Studies of Compression Corner Flowfields using THREE Turbulent Models</td>
<td>C. Zhang, J. Xu, L. Gao, G. Gao</td>
<td>762</td>
</tr>
<tr>
<td>Title</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Numerical Simulation of the Overall Flow Field for Underwater Vehicle with Pump Jet Thruster</td>
<td>769</td>
<td></td>
</tr>
<tr>
<td>Simulating a Typhoon Storm Surge using a Nested Ecomsed Model</td>
<td>775</td>
<td></td>
</tr>
<tr>
<td>High Order Numerical Method and its Analysis of the Anomalous Subdiffusion Equation</td>
<td>781</td>
<td></td>
</tr>
<tr>
<td>The 3D Finite Element Analysis of Cold Wave Impact Effect</td>
<td>791</td>
<td></td>
</tr>
<tr>
<td>The Semi-Physical Simulation System Design of Micro-Satellite based-on HLA</td>
<td>801</td>
<td></td>
</tr>
<tr>
<td>Simulation of the Modern Summer Climate Over Greater Mekong Sub-Region (GMS) by ECHAM5-RegCM3</td>
<td>807</td>
<td></td>
</tr>
<tr>
<td>Modeling and Simulation of an Air-Cooling Condenser under Transient Conditions</td>
<td>817</td>
<td></td>
</tr>
<tr>
<td>The Application of Numerical Simulation in the Output Power of Concentrated Wind Energy Turbine Set</td>
<td>823</td>
<td></td>
</tr>
<tr>
<td>Mechanical Responses of Periodontal Ligament under A Realistic Orthodontic Loading</td>
<td>828</td>
<td></td>
</tr>
<tr>
<td>Full-Scale Mathematical Model and Simulation of Marine Natural Recirculation Drum-Boiler</td>
<td>834</td>
<td></td>
</tr>
<tr>
<td>Numerical Simulation for Turbulent Combustion in Underwater Vehicle Combustor</td>
<td>844</td>
<td></td>
</tr>
<tr>
<td>Numerical Simulation and Analysis of Gas-Solid-Liquid Three-Phase Flow in Mechanical Flotation Cell</td>
<td>850</td>
<td></td>
</tr>
<tr>
<td>Research of Docking Characteristic of Flexible Beam based on Probe-Cone Docking Mechanism</td>
<td>857</td>
<td></td>
</tr>
<tr>
<td>Salt-related Contractual Structure and its Main Controlling Factors of Kela Structural Zone in Kuqa Depression: Insights from Physical and Numerical Experiments</td>
<td>863</td>
<td></td>
</tr>
<tr>
<td>Tendering Evaluation Method of Hydraulic Projects based on Variable Weight</td>
<td>868</td>
<td></td>
</tr>
<tr>
<td>Navigation Algorithm for Floor-Mopping Robot</td>
<td>874</td>
<td></td>
</tr>
<tr>
<td>Aeroelastic Modeling and Analysis of the Wing/Engine System of a Large Aircraft</td>
<td>879</td>
<td></td>
</tr>
<tr>
<td>Investigation of CO2 Storage Capacity in Open Saline Aquifers with Numerical Models</td>
<td>886</td>
<td></td>
</tr>
<tr>
<td>Tracking Response Characteristics of Guide Vane on Active Power Regulation</td>
<td>893</td>
<td></td>
</tr>
<tr>
<td>Direct Modeling Method of Generalized Hamiltonian System and Simulation Simplified</td>
<td>901</td>
<td></td>
</tr>
<tr>
<td>Parametric Control of the Hydraulic Machinery Impeller based on Free-Form Deformation</td>
<td>909</td>
<td></td>
</tr>
<tr>
<td>Parameter Equation Study for Screw Centrifugal Pump</td>
<td>914</td>
<td></td>
</tr>
<tr>
<td>Exterior Trajectory Computation and Modeling of Kinetic Energy Ammunition based on Constant Terminal Effect</td>
<td>922</td>
<td></td>
</tr>
<tr>
<td>Optimization and Numerical Simulation of Multi-Layer Microchannel Heat Sink</td>
<td>928</td>
<td></td>
</tr>
<tr>
<td>Different Oxygen Levels of Dimethyl Ether Combustion Influence Numerical Simulation</td>
<td>934</td>
<td></td>
</tr>
<tr>
<td>Asymmetric Coupling Two-Lane with Same Hopping Probabilities P Simple Exclusion Processes</td>
<td>941</td>
<td></td>
</tr>
<tr>
<td>Hamiltonian Function Selection Principle for Generalized Hamiltonian Modelling</td>
<td>949</td>
<td></td>
</tr>
<tr>
<td>Research on Pressure Optimization Effect of High Level Water Tank by Drinking Water Network Hydraulic Model</td>
<td>958</td>
<td></td>
</tr>
<tr>
<td>Comparisons of Equivalent and Detailed Models of Metallic Honeycomb Core Structures with In-Plane Thermal Conductivities</td>
<td>967</td>
<td></td>
</tr>
<tr>
<td>Higher-Order Constitutive Relationship for Microtubules based on the Higher-Order Cauchy-Born Rule</td>
<td>973</td>
<td></td>
</tr>
<tr>
<td>Interval Maximum-Entropy Method for Min-Max-Min Problem</td>
<td>979</td>
<td></td>
</tr>
</tbody>
</table>
Global Convergence of a Modified PRP Conjugate Gradient Method
Y. Zhang, H. Zheng, C. Zhang

A Spectrum Analysis of Galerkin Meshfree Method
P. Xie, D. Wang

Properties of Vehicle Gap Distribution in the Mixed Traffic Flow
Q. Li, B. Wang

Solving Parameter Identification of Frequency Modulation Sounds Problem by Modified Adaptive Tabu Search under Management Agent
J. Kluawbang, T. Thoonthong

The Convergence Rate of Multidimensional Density Kernel Estimation with Bootstrap
D. Li, M. Qiu

Probabilistic Collocation Method for Yield Approach Index of Heterogeneous Slope
L. Shen

The convergence Rate of p and h-p FEM for Three Dimensional Elasticity Problems on L-Shape Domain
J. Zhang, L. Yi

Three-Layer Dielectric Models with Spherical Cavities for Reaction Potential Calculations
Z. Xu

Modeling and Simulation of Pedestrian Flow Through Hydrodynamics
Y. Jiang, P. Zhang

A Modified Coupled Map Car-Following Model Considering a Nonconstant Driver Sensitivity
X. Han, O. Cheng, X. Li

A Splitting Mixed Space-Time Discontinuous Galerkin Method for Parabolic Problems
S. He, H. Li, Y. Liu, Z. Fang, J. Yang, X. Jia

Asymmetric Effect and Stop-and-Go Waves on Single-File Pedestrian Dynamics
K. Hua, Y. Fan, X. Li, L. Kong

Simulation of Evacuation Processes in a Large Classroom using an Improved Cellular Automaton Model for Pedestrian Dynamics
L. Fu, J. Luo, M. Deng, L. Kong, K. Hua

Violating Traffic Light Behavior in the Biham-Middleton-Levine Traffic Flow Model
Z.-J. Ding, X.-Y. Sun, B.-H. Wang

Approach to Effect of Obstacle on Pedestrian Evacuation with a Small-Grid Lattice Gas Model
Y.-F. Wei, W. Shi, T. Song

The Application of Joint Model for Sugarcane Production Forecast of Guangxi Province
D. Li, M. Qiu

A Local Kriging Meshless Method for Free Vibration Analysis of Functionally Graded Circular Plates in Thermal Environments
Z. Ping, K.M. Liew

Analysis of Multi-Panel Plate Structures with the Moving-Least Square Mesh-Free Method
L.X. Peng, M. Kai, Y. Tao

A Simple Technique to Improve Computational Efficiency of Meshless Methods
X. Zhang, Z. Ping, L. Zhang

The Element-Free Galerkin Method for Two-Dimensional Schrödinger Equation
X. Cai, X.L. Sun, Z. Li, G. Ji, J. Lu

Non-Matching Grid Interface Treatment for the Space-Time Conservation Element and Solution Element Method
S. Cui, G. Gao, L. Jiang, K. Zhou

Interfacial Cracks Analysis of Functionally Graded Materials using Voronoi Cell Finite Element Method
G. Zhang, R. Guo

A Monolithic Solution Procedure for a Thermal Fluid-Structure Interaction System of Thermal Shock
L. Yin, J. Jiang, L. Chen

Study on Performance of Laminated Piezoelectric Pneumatic Servo Valve
H. Zeng, R.-B. Yuan, C. Sun, Z. Zhang

A Study on the Selection of Optimal Roof Type for Low-Rise Buildings Group – in a View of Wind Pressures Action
J.-H. Chen

Computer Simulation Application for Protection Design of Indoor Pedestrian Street
C. Zhao, X. Jia

Surface Pressure Measurements on Supercritical Airfoil Employing Pressure-Sensitive Paint
Q. Zhou, X. Jian, L. Chen, H. Ma, T. Yang

A Remote PLC Laboratory Design and Realization
X. Chen, H. Gao

The Application of Computer-Assisted Method for Smoke Exhausting System Design in Building Atrium Field
B. Lei, S. Zhang

A Method of Converting Finite Element Mesh Data into the Format for Interface Stress Element Model
B. Feng

Analysis of Electro-Hydraulic Proportional Speed Control System on Conveyor
R. Li, L. Jing, C. Sun, S. Liu
<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stationary Response and First-Passage Failure of Hysteretic Systems under Random Excitations of Poisson White Noise and its Filtered Processes</td>
<td>Y. Zeng, G. Li</td>
<td>1200</td>
</tr>
<tr>
<td>Modeling and Simulation of Direct Torque Control Induction Motor Drives Via Constant Volt/Hertz Technique</td>
<td>N. Pimkumwong, A. Onkrong, T. Sapaklom</td>
<td>1211</td>
</tr>
<tr>
<td>Hamiltonian Modeling of Generator Integrated AVR and PSS</td>
<td>Q. Jing, Y. Zeng, L. Zhang, T. Xu</td>
<td>1217</td>
</tr>
<tr>
<td>Research for the Clamping Force Control of Pneumatic Manipulator based on the Mixed Sensitivity Method</td>
<td>Y. Peng, R.-B. Yuan, L. Wei, S. Ba</td>
<td>1225</td>
</tr>
</tbody>
</table>