

XIII International Conference on Applied Mathematics and Mechanics in the Aerospace Industry (AMMAI'2020)

IOP Conference Series: Materials Science and Engineering
Volume 927

Alushta, Russia
6 - 13 September 2020

Editor:

Anna Bogdan

ISBN: 978-1-7138-4765-6
ISSN: 1757-8981

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

This work is licensed under a Creative Commons Attribution 3.0 International Licence.
Licence details: <http://creativecommons.org/licenses/by/3.0/>.

No changes have been made to the content of these proceedings. There may be changes to pagination and minor adjustments for aesthetics.

Printed with permission by Curran Associates, Inc. (2022)

For permission requests, please contact the Institute of Physics
at the address below.

Institute of Physics
Dirac House, Temple Back
Bristol BS1 6BE UK

Phone: 44 1 17 929 7481
Fax: 44 1 17 920 0979

techtracking@iop.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

Preface	
Peer review declaration	
State-resolved and two-temperature rate coefficients for CO+CO=CO ₂ +C reaction	1
<i>E Kustova, A Savelev</i>	
Effect of coaxially mounted disks on oscillations of a cylinder of large aspect ratio in air flow	8
<i>D V Kaufman, A N Ryabinin</i>	
Development of power processing unit for a low-power ablative pulsed plasma thruster	13
<i>A V Bogatyi, V I Bogatyi, S V Gordeev</i>	
On stability of planar periodic motions of a satellite in vicinity of resonant rotation.....	19
<i>T Churkina</i>	
The implicit fully coupled numerical method for flows in thermochemical nonequilibrium	25
<i>A M Molchanov, M V Siluyanova, Yu M Kochetkov</i>	
Numerical modelling of the reflected waves from gas cavities and methane bombs in the heterogeneous media of the Northern regions	31
<i>P Stognii, I Petrov, N Khokhlov</i>	
Contributions of VT and VV exchanges to the CO ₂ relaxation in the full state-to-state modeling.....	36
<i>V Gorikhovskii, E Nagnibeda</i>	
Critical stress analysis for the basis of a denture prosthesis	43
<i>S D Arutyunov, A D Nikitin, D I Grachev, G G Bagdasaryan</i>	
On the inherent polycrystal stress concentration under external loading on example of single-phase α-Fe samples.....	50
<i>V V Gulin, A D Nikitin</i>	
Verification of numerical model of temperature calculations in radio-frequency ion thrusters	56
<i>V Abgaryan, V Balashov, A Kupreeva, V Nigmatzyanov</i>	
Smooth reconstruction method for surfaces defined by a continuous set of triangles	62
<i>M Kh Abuziarov, D T Chekmarev</i>	
Stability Study of a Relative Equilibrium in the Planar Circular Restricted Four-Body Problem.....	68
<i>B S Bardin, E V Volkov</i>	
Study of methods of supplying a solid phase to a heterogeneous flow at high-pressure of a carrier gas.....	75
<i>S A Borisov, Ju I Glukhovskaya, S V Dobrovolskiy, I M Platonov, I V Podporin</i>	
Modification of Gaussian elimination: technique, high resolution seismic model for area of natural accumulation of gases.....	81
<i>T A Smaglichenko, A V Smaglichenko, N V Sokolova, M K Sayankina</i>	
Stability of the collinear point L 1 in the planar restricted photogravitational three-body problem in the case of equal masses of primaries.....	87
<i>Boris S Bardin, Andrey N Avdyushkin</i>	

On resonant periodic motions close to conical precession of a dynamically symmetric satellite in a weakly elliptic orbit.....	93
<i>B S Bardin, A A Antipov</i>	
Multi-agent modelling of conflicts with uncertainty	99
<i>A Karandeev, V Osipov, V Baluta</i>	
Longitudinal-transverse (“breathing”) vibration modes of orthotropic plates with and without account of its interaction with the surrounding acoustic media.....	105
<i>V N Paimushin, R K Gazizullin</i>	
Through calculation method of fatigue damage	112
<i>I S Nikitin, N G Burago, A D Nikitin, B A Stratula</i>	
Simulation of seismic responses from the 3D non-linear model of the Bazhenov formation.....	119
<i>I S Nikitin, V I Golubev, A V Ekimenko, M B Anosova</i>	
On orbital stability of resonant periodic motions originating from hyperboloidal precession of a dynamically symmetric satellite	125
<i>E A Sukhov</i>	
Nonlinear flutter response of cylindrical shell in thermal field and supersonic gas flow	131
<i>G Y Baghdasaryan, M A Mikilyan, I A Vardanyan, A V Panteleev, N S Severina</i>	
Benchmark analysis of novel multi-agent optimization algorithm using linear regulators for agents motion control	139
<i>M Karane, A Panteleev</i>	
Application of bio-inspired methods for optimal open loop discrete time deterministic control problems	147
<i>A V Panteleev, Y V Stanovskaya</i>	
The mini-batch adaptive method of random search (MAMRS) for parameters optimization in the tracking control problem	153
<i>A V Panteleev, A V Lobanov</i>	
Approximate methods for H-infinity output feedback control	162
<i>A V Panteleev, A A Yakovleva</i>	
Experimental study on viscous fingering in Hele-Shaw cell under acoustic impact	170
<i>E A Marfin, S V Garaeva, A A Abdrashitov</i>	
Trajectory Optimization of a Lunar Direct Landing from Halo-Orbits	175
<i>A V Ivanyukhin, E D Korolevskiy, A E Starchenko</i>	
Experimental study for stochastic pulse component of emission from stationary plasma thrusters in the radio-frequency range.....	181
<i>N A Vazhenin, A P Plokhikh, G A Popov</i>	
Colloid thrusters. Development status and prospects for application	186
<i>V V Nigmatyanov, V A Obukhov, G A Popov, V V Svetina</i>	
On the exoplanet obliquity variations in planetary four – body problem with evolving satellite’s orbit	192
<i>P S Krasil’nikov</i>	

A new numerical approach for solving initial value problems with exponential growth integral curves	198
<i>E B Kuznetsov, S S Leonov, E D Tsapko</i>	
The problem of forecasting Earth pole trajectory when changing the average parameters of its motion.....	203
<i>V V Perepelkin, D S Rumyantsev, Wai Yan Soe</i>	
Features of aggregation of fuzzy expert judgments.....	210
<i>V Sudakov, T Sivakova</i>	
Using GRU based deep neural network for intrusion detection in software-defined networks.....	216
<i>I I Kurochkin, S S Volkov</i>	
Estimation of the contribution of geophysical perturbations to the Earth pole oscillatory process at the precession frequency of the lunar orbit.....	223
<i>S S Krylov, V V Perepelkin, A S Filippova</i>	
A Godunov-type method for a multi-temperature plasma with the tabulated equation of state	230
<i>Alexey G Aksenov</i>	
Packaging and unfolding of shells using highly elastic joints	235
<i>V M Pestrenin, I V Pestrenina, S V Rusakov, V G Gilev, G V Buzmakova</i>	
Effect of ablation at the inlet of submerged nozzle on discharge characteristics	240
<i>A N Kirillova, A N Sabirzyanov</i>	
Development and application of combined methods to expand the potential for predicting the defining characteristics of composites.....	246
<i>E L Gusev, V N Bakulin, V D Chernykh</i>	
Methodology for processing expert judgments based on fuzzy weighted summation	251
<i>V Sudakov, T Sivakova</i>	
Structure of a viscoplastic fluid flow in a pipe with a given obstruction shape.....	257
<i>I Ryltsev, G Shrager</i>	
Stability of the flow with an over-compressed detonation wave in a duct of variable cross section.....	264
<i>A J Egoryan, Kh F Valiyev</i>	
Fluid flow modeling in solid rock fractures	270
<i>I N Cherednichenko</i>	
Effect of viscous dissipation on the flow structure and pressure losses for a viscoplastic fluid flow through a sudden pipe contraction.....	276
<i>K Ryltseva, E Borzenko, G Shrager</i>	
Hierarchical database management model with uncertain parameters	283
<i>T I Korotkova, A A Mokhov</i>	
Improvement of the Landau-Teller model for CO ₂ on the basis of the Chapman–Enskog method.....	289
<i>E Kustova, A Lukasheva, M Mekhonoshina</i>	
The influence of chemical reaction models on shock heated flow parameters in CO ₂ /CO/O ₂ /O/C mixture	298
<i>A Kosareva, E Nagnibeda, A Savelev</i>	

Effect of aspect ratio and end plates on rotational oscillations of thick plates in air flow	305
<i>R V Shmigirilov, A N Ryabinin</i>	
On the formation of a vortex couple in fluid	310
<i>V A Gushchin, I A Smirnova</i>	
Issues of controlling the motion of a space object by the impact of the ion beam	315
<i>V M Kulkov, N N Markin, Yu G Egorov</i>	
Solving equations of 3D elasticity for orthotropic bodies	322
<i>V P Revenko, V N Bakulin</i>	
Study of the low-power krypton-operated stationary plasma thruster plume	328
<i>V P Kim, D V Merkurev, E A Shilov, V S Zakharchenko, V G Kalyazin</i>	
Natural convection in horizontal layers with lateral heating at various Rayleigh and Prandtl numbers	334
<i>A I Fedyushkin</i>	
A coalescence of the droplets	341
<i>A I Fedyushkin, A N Rozhkov</i>	
Biharmonic spline interpolation of spatial dose rate distribution in the minimum dose trajectory optimization problem.....	347
<i>A E Starchenko</i>	
The use of CFD calculations for the solution of the control problem of applying protective coatings of varying thickness.....	353
<i>S A Borisov, Ju I Glukhovskaya, S V Dobrovolskiy, I V Podporin</i>	
On solving the warehouse procession optimization problem using a tuple of heuristics.....	359
<i>D N Gainanov, I G Korablev, V A Raskazova</i>	
H-infinity approach to design optimal output control for the aggregated interpolation model of helicopter motion.....	366
<i>I Kudryavtseva, A Efremov, A Panteleev</i>	
Use of fuzzy areas of preference in tasks of multi – criteria evaluation of freight air transport.....	374
<i>V Sudakov, T Sivakova</i>	
Influence of the nozzle shape on sound generation in a jet-driven Helmholtz oscillator	379
<i>A A Abdrashitov, E A Marfin, E A Plakhova</i>	
Stabilization of a diffusion flame by a non-stationary electric field.....	384
<i>A V Tupikin, V V Zamashchikov</i>	
Numerical study of gas-dynamic and condensation processes in an ejector device used to purify gas-air emissions	388
<i>V S Nazarov, I E Ivanov, I A Kryukov</i>	
Analyzing models of air equilibrium composition calculation.....	395
<i>V N Emelyanov, A G Karpenko, S S Tolstoguzov, K N Volkov</i>	
Studying the applicability of a pulsed magnetic field to biological tissues	401
<i>N Podolskaya, K Kovalev, V Popov</i>	

Investigation of the Stress-Strain State of the Composite Cylindrical Shell with Rectangular Cutouts	405
<i>V N Bakulin</i>	
Analytical Review of Account Methods and Experimental Approaches to Stress-Strain State	
Investigation of Structurally-Anisotropic Aircraft Panels Made from Composite Materials	411
<i>L M Gavva, V V Firsanov</i>	
The strength tests of thin-walled composite shells under non-stationary loads of different physical nature	420
<i>A V Ostrik, V N Bakulin, D N Nikolaev</i>	
How to reduce the probability of erroneous decisions in the systems of collective intelligence.....	427
<i>V Protasov, Z Potapova, G Akhobadze</i>	
Distributed computing based on Container-component model	436
<i>A Semenov</i>	
Influence of the angular momentum on definition of pressure.....	442
<i>E Prozorova</i>	
Research of a two-phase steam system during its flow in the pipe and a device for measuring dryness steam	447
<i>B Y Kaplan, A A Motorin, E L Stupitsky</i>	
Multiple antenna gyro-GNSS attitude determination system	453
<i>M V Zharkov, K K Veremeenko, I M Kuznetsov, A N Pronkin</i>	
Dynamics of initiation of the pseudoshock combustion mode in a constant cross section channel	459
<i>A V Tupikin, P K Tretyakov, A L Kuranov, V M Abashev</i>	
Low-Power Ion Thrusters. State of Development at Research Institute of Applied Mechanics and Electrodynamics, MAI	465
<i>R V Akhmetzhanov, A V Bogaty, D A Kashirin, V A Obukhov, G A Popov, V V Svetina, S A Khartov</i>	
Effect of radiation on the contact thermal resistance in vacuum	471
<i>A D Ezhov, L V Bykov, S V Reznik</i>	
Spectral method for solving linear Caputo fractional stochastic differential equations	477
<i>K Rybakov, A Yushchenko</i>	
Applying of the heat wave equation in the study of the movement of an aggressive environment front	485
<i>Evgenii B Kuznetsov, Sergey S Leonov</i>	
Numerical solving of initial value problems for ordinary differential equations with internal limiting singular points.....	491
<i>A I Ivannikov, E B Kuznetsov, S S Leonov</i>	
Application of Walsh series to represent iterated Stratonovich stochastic integrals.....	497
<i>K Rybakov</i>	
The possibility of draining the boundary layer from the hypersonic nozzle.....	507
<i>L B Ruleva, S I Solodovnikov</i>	

Increasing hypersonic aerodynamic shock tube working time duration.....	513
<i>A V Panasenko, L B Ruleva, S I Solodovnikov</i>	
Heat flow measurements on high-speed aircraft models	520
<i>L B Ruleva, S I Solodovnikov</i>	
Experimental investigation of the thermal loads upon electrodynamic modification of supersonic flow around axisymmetrical body	526
<i>P A Popov, N A Monakhov, M A Kotov, S A Ponjaev</i>	

Author Index