

XII International Symposium Intelligent Systems (INTELS 2016)

Procedia Computer Science Volume 103

Moscow, Russia
5 - 7 October 2016

Editors:

Askhat Diveev
Ivan Zelinka

Andrew Kusiak
Eugeny Nikulchev

ISBN: 978-1-5108-3629-7

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.

Copyright© by Elsevier B.V.
All rights reserved.

Printed by Curran Associates, Inc. (2017)

For permission requests, please contact Elsevier B.V.
at the address below.

Elsevier B.V.
Radarweg 29
Amsterdam 1043 NX
The Netherlands

Phone: +31 20 485 3911
Fax: +31 20 485 2457

<http://www.elsevierpublishingsolutions.com/contact.asp>

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



Contents

Intelligent Systems 2016	1
Grammatical Evolution for Neural Network Optimization in the Control System Synthesis Problem D.E. Kazaryan, A.V. Savinkov	14
Intelligent Traffic Flows Control Software for Megapolis A.I. Diveev, E.A. Sofronova, V.A. Mikhalev, A.A. Belyakov	20
Prediction of Engine Demand with a Data-driven Approach H. Francis, A. Kusiak	28
Uncertain Programming in Preliminary Design of Technical Systems with Uncertain Parameters G.S. Veresnikov, L.A. Pankova, V.A. Pronina	36
Scalable Service for Professional Skills Analysis Based on the Demand of the Labor Market and Patent Search E. Nikulchev, D. Ilin, E. Matishuk	44
Variational Genetic Algorithm for NP-hard Scheduling Problem Solution A.I. Diveev, O.V. Bobr	52
Study of Using Deep Learning Nets for Mark Detection in Space Docking Control Images I.S. Fomin, A.V. Bakhshiev, D.A. Gromoshinskii	59
Real-time Aerodynamic Parameter Identification for the Purpose of Aircraft Intelligent Technical State Monitoring O.N. Korsun, M.H. Om, K.Z. Latt, A.V. Stulovskii	67
The Conduct of Organic Compounds Applied to Information Display Devices V.V. Belyaev, D.A. Suárez, J.M. Atencia	75
Intelligent Support for Aircraft Flight Test Data Processing in Problem of Engine Thrust Estimation O.N. Korsun, B.K. Poplavsky, S.Ju. Prihodko	82
Acceleration of the Multilayer Network Operator Method Using MPI for Mobile Robot Team Control Synthesis A.I. Diveev, E.Yu. Shmalko, D.N. Zakharov	88
Cognitive Aspects of Timetable Visualization: Support Decision Making N.N. Klevanskiy, M.A. Antipov, A.A. Krasnikov	94
Comparative Analysis of Evolutionary Algorithms for the Problem of Parametric Optimization of PID Controllers S.V. Konstantinov, A.A. Baryshnikov	100
The Modeling Procedure of Illegal Entry into the Information System Based on the Logical Function of Disseminating Information on the Paths within the System A.B. Isaev, A. Alnafda	108
The Analysis of Stochastic Properties of the SVD Decomposition at Approximation of the Experimental Data V.B. Kulikov, A.B. Kulikov, V.P. Khranilov	114
Domain Theory Verification Using Multi-agent Systems G.M. Novikova, E.J. Azofeifa	120
Individually-adapted Control and Support of Pilot's Control Actions Based on Neural Network Models V.N. Evdokimenkov, M.N. Krasil'shchikov, M.H. Om, O.N. Korsun, G.G. Sebryakov	126
Models of Neuro-fuzzy Agents in Intelligent Environments A. Shvetcov	135
Product Lifecycle Management Using Multi-agent Systems Models V.O. Karasev, V.A. Sukhanov	142
The Development of Individually-adapted Neural Network Model of "Pilot-aircraft" System Using Modern Aircraft Simulation Facility R.V. Kim, V.A. Yakimenko, E.A. Burlak, A.M. Nabatchikov, A.A. Jatsko	148
The Comparison of Genetic Programming and Variational Genetic Programming for a Control Synthesis Problem on the Model "Predator-victim" S.I. Ibadulla, E.Yu. Shmalko, K.K. Daurenbekov	155
Conceptual Model of Problem-oriented Heterogeneous Distributed Computing Environment with Multi-agent Management I. Bychkov, G. Oparin, A. Tcherneykh, A. Feoktistov, V. Bogdanova, S. Gorsky	162
Selection of Optimal Frequency Bands of the Electroencephalogram Signal in Eye-brain-computer Interface P. Sotnikov, K. Finagin, S. Vidunova	168
Control system synthesis by means of Cartesian Genetic Programming G.I. Balandina	176
Visual Servoing Based on Theory of Transformation Group V. Makarychev	183

Application the Spiking Neuron Model with Structural Adaptation to Describe Neuromorphic Systems A.V. Bakhshiev, F.V. Gundelakh	190
Technique of Evolutionary Optimization Permanent-magnet Synchronous Motors V.A. Kuznetcov, N.V. Zykov, M.M. Ivanov	198
Usage of Algorithms for the Analysis Natural Languages Texts Based on Intensional Logic of Montague in Area of Finding Answers on Questions A. Shvetcov, D. Gorbunov	205
Criteria of Accuracy and Quality in Intellectual Self-organizing Automatic Control Systems M.F. Stepanov, A.M. Stepanov	209
Attractors in the Development Problem of the Forecasting Model on the Base of the Strictly Binary Trees L. Demidova, Z. Elena, K. Olga, R. Vera, S. Evgeny	214
Intellectual Approaches to Improvement of the Classification Decisions Quality on the Base of the SVM Classifier L. Demidova, I. Klyueva, Y. Sokolova, N. Stepanov, N. Tyart	222
Applications of Multi-height Sensors Data Fusion and Fault-tolerant Kalman Filter in Integrated Navigation System of UAV K. Geng, N.A. Chulin	231
The System for Histopathology Images Analysis of Spinal Cord Slices V.V. Mikhaylov, A.V. Bakhshiev	239
An Algorithm for Constructing Feature Relations between the Classes in the Trading Set K. Alisher	244
Recognition of Separate flat Objects Based on Dimensionless Signs of their Contours by Linear Discriminant Analysis S.S. Sadykov, Y.Y. Kulkov	248
Information-hardware Support of Systems of the Automated Electromagnetic Monitoring of Geodynamic Objects A. Bykov, O. Kuzichkin, N. Dorofeev, A. Koskin	253
Diagnosis of Neuro-physiological State of a Person on the Biomechanical Parameters A.V. Grecheneva, N.V. Dorofeev, O.R. Kuzichkin, I.S. Konstantinov	260
Interpolation of Data Stream by Polynomials of Ultrahigh Degree V.F. Zhirkov, K.N. Bolshakov, G.V. Prokofiev	266
The Features of the Information Integration and Complex Processing in the Airborne Situational Awareness Systems V.S. Verba, V.I. Merkulov, D.A. Milyakov	273
Using of Extended Kalman Filter for Mobile Target Tracking in the Passive Air Based Radar System B.V. Belik, S.G. Belov	280
Electrical Energy Supply Control Support via Meters Data Ellipsoidal Approximation in Smart Grids G. Chrysostomou, V. Shikhin, A. Shikhina	287
Granular Computing Models and Methods Based on the Spatial Granulation S. Butenkov, A. Zhukov, A. Nagorov, N. Krivsha	295
Greedy Algorithms for Granular Computing Problems in Spatial Granulation Technique N. Krivsha, V. Krivsha, Z. Beslaneev, S. Butenkov	303
Application of Unnormalized Neurostructural Models ANFIS for the Tasks of Binary Classification O.A. Nazarkin, P.V. Saraev	308
Decision Support in Intelligent Maintenance-planning Systems Based on Contextual Multi-armed Bandit Algorithm A.V. Savchenko, V.R. Milov	316
The Controllability of Parabolic Systems with Delay and Distributed Parameters on the Graph S.L. Podvalny, E.S. Podvalny, V.V. Provotorov	324
An Algorithm for Determining the Navigation Parameters of AUVs Based on the Combination of Measuring Devices N.Q. Vinh	331
Cognition of Ontology of Open Systems B. Fomin, T. Kachanova	339
The Program System for Automated Parameter Tuning of Optimization Algorithms T. Agasiev, A. Karpenko	347
On PI-controller Parameters Adjustment for Rolling Mill Drive Current Loop Using Neural Tuner Y. Eremenko, A. Glushchenko, V. Petrov	355
Intelligent System for Time Series Forecasting A. Proskuryakov	363
Using Concepts of Scientific Activity for Semantic Integration of Publications I.S. Pavlovskiy	370
The Use of Genetic Algorithm for Construction Objects with Necessary Average Values Scattering Characteristics I.Ya. Lvovich, Ya.E. Lvovich, A.P. Preobrazhenskiy, O.N. Choporov, Yu.S. Sakharov	378
Use of Real-time Operating Systems in the Integrated Modular Avionics E. Fedosov, I. Koverninsky, A. Kan, V. Volkov, Y. Solodelov	384
Use Algorithm Based at Hamming Neural Network Method for Natural Objects Classification O.I. Khristodulo, A.A. Makhmutov, T.V. Sazonova	388
Application of Multi-agent Technology in the Scheduling System of Swarm of Earth Remote Sensing Satellites P.O. Skobelev, E.V. Simonova, A.A. Zhilyaev, V.S. Travin	396

Human Localization in the Video Stream Using the Algorithm Based on Growing Neural Gas and Fuzzy Inference O.S. Amosov, Y.S. Ivanov, S.V. Zhiganov	403
The Principle of Multi-alternativity in Intelligent Systems. Active Neural Network Models S.L. Podvalny, E.M. Vasiljev	410
Multi-agent Approach for Distributed Information Systems Reliability Prediction D.O. Yesikov, A.N. Ivutin, E.V. Larkin, V.V. Kotov	416
Detecting Near-duplicates in Russian Documents through Using Fingerprint Algorithm Simhash N. Rezaeian, G.M. Novikova	421
Algorithm Selection for the Predictive Model in Control Systems with Incompletely Observable Control Coordinate A.A. Kobzev, N.A. Novikova, A.V. Lekareva	426
Software System META-3 for Quantitative Evaluation of Student's Meta-competencies on the Basis of Analysis of his or her Behavior in Social Networking Services E.A. Gavrilina, M.A. Zakharov, A.P. Karpenko, E.V. Smirnova, A.P. Sokolov	432
Features of Control Algorithms for Frequency Distribution in Conditions of Mass Use Internet of Things V. Loginov, S. Pavlov, Y. Fedosenko	439
Integration of Case-based and Rule-based Reasoning Through Fuzzy Inference in Decision Support Systems T.V. Avdeenko, E.S. Makarova	447
Generalized Model of Cyclic Dispatching Discipline in Mobile Robots Based on Swarm Systems E. Larkin, A. Ivutin, V. Kotov, D. Yesikov	454
Autonomous Mobile Robotic System for Environment Monitoring in a Coastal Zone A.A. Kurkin, D.Y. Tyugin, V.D. Kuzin, A.G. Chernov, V.S. Makarov, P.O. Beresnev, V.I. Filatov, D.V. Zeziulin	459
Design of Flat Wheel Braking Control System with three Modes of Motion: Rolling, Sliding, Locking D. Andrikov, D. Andrikov, C.P. Droph Mecapeu	466
Control Design of Ship Robust Active Rolling Stabilizer D. Andrikov, A. Dereviankina	470
INS/GPS Integration System Using Street Return Algorithm and Compass Sensor N.Q. Vinh	475
Neural Network Models of Time Series of Network Traffic Intensities N. Gabdrakhmanova, A. Gabdrakhmanov	483
Improving the Quality of Bionic Resource Retrieval by Visualizing a Specific Bionic-oriented Thesaurus A. Sigov, V. Baranyuk, V. Nechaev, A. Melikhov, O. Smirnova	489
Approach for Forming the Bionic Ontology A. Sigov, V. Baranyuk, V. Nechaev, O. Smirnova, A. Melikhov	495
Using Fuzzy Interacting Observers for Fault Diagnosis in Systems with Parametric Uncertainty N.V. Kolesov, A.M. Gruzlikov, E.V. Lukoyanov	499
Network-centric Supervisory Control System for Mobile Robotic Groups V. Muliukha, A. Ilyashenko, L. Laboshin	505
Automatic Control System for Power Grid Voltage Stabilization E.I. Zabudskiy, G.I. Balandina	511
Structure of System Position–Force Control of the Drive Stewart Platform I.N. Egorov, D.S. Shevtsov	517
Nonlinear Correction of Bilateral Remote Control Systems within a Mobile Robot Pipeline I. Egorov, M.A. Zimin	522
Designing and Modeling of Quadcopter Control System Using L1 Adaptive Control K.M. Thu, A.I. Gavrilov	528
The Big Data Approach to Collecting and Analyzing Traffic Data in Large Scale Networks L.U. Laboshin, A.A. Lukashin, V.S. Zaborovsky	536
Cloud Educational Resource Datacenter Simulator A. Shukhman, I. Bolodurina, P. Polezhaev, L. Legashev	543
Approach to Spacecraft Functional Stability in Changes in Moments of Inertia V.A. Trung, N. Van Thinh	549
Light Propagation Through Composite Heterophase Objects with Liquid Crystal Material V. Belyaev, A. Gorbunov, A. Solomatin, D. Suarez	556
Retrial Queueing Systems in Series of Space Experiments "Kontur" O. Zayats, M. Korenevskaya, A. Ilyashenko, A. Lukashin	562
Development and Research of Models of Organization Distributed Cloud Computing Based on the Software-defined Infrastructure I. Bolodurina, D. Parfenov	569
Foreign Language Training of IT-students with the Programme "Translator in the Directions and Specialties of Engineering Faculty" S.V. Dmitrichenkova, V.A. Chauzova, E.A. Malykh	577
Intelligent Systems: Development and Issues K.A. Pupkov	581
Visual Components of Scientific-technical Text S.V. Dmitrichenkova, E.A. Dolzhich	584

Modelling of Algorithms for Solar Panels Control Systems T.A. Demenkova, O.A. Korzhova, A.A. Phinenko	589
Method of Binary Analytic Programming to Look for Optimal Mathematical Expression A.I. Diveev, N.B. Konyrbaev, E.A. Sofronova	597
The Paradigm of the Integration of Different Types of Management Information Systems in Investment and Construction Company Implementing the Project Approach S.Yu. Eroshkin, N.D. Koryagin, D.V. Kovkov, D.V. Panov, A.I. Sukhorukov	605
Conceptual System in the Modern Information Management S.Yu. Eroshkin, N.A. Kameneva, D.V. Kovkov, A.I. Sukhorukov	609
Locomotion Principles for Mobile Robotic Systems F.L. Chernousko	613
Optimization of Fuzzy PID Controller's Parameters Y.I. Kudinov, V.A. Kolesnikov, F.F. Pashchenko, A.F. Pashchenko, L. Papic	618
Intelligent Control Systems S.N. Vassilyev, A.Yu. Kelina, Y.I. Kudinov, F.F. Pashchenko	623
Logical Linguistic Controllers S.N. Vassilyev, I.Y. Kudinov, Y.I. Kudinov, F.F. Pashchenko	629