

2021 XXIV International Conference on Soft Computing and Measurements (SCM 2021)

**St. Petersburg, Russia
26 – 28 May 2021**



**IEEE Catalog Number: CFP21C43-POD
ISBN: 978-1-6654-3975-6**

**Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***** *This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP21C43-POD
ISBN (Print-On-Demand):	978-1-6654-3975-6
ISBN (Online):	978-1-6654-3974-9

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
E-mail: curran@proceedings.com
Web: www.proceedings.com

Content

I. GENERAL MEASUREMENT THEORY. METROLOGY, MEASURES AND SCALES. UNCERTAINTY IN MEASUREMENTS

The Convolutional Approach for the Integration of Methods of Artificial Intelligence (AI) and Measurement Science (MS), Based on Bayesian Intelligent Technologies. The Concept of Bayesian Measurement Network. The Concept of IIoT – Intelligent Industrial IoT

Prokopchina S.V.	3
<i>Metrological Approach to Solve Nonlinear Equations and Systems of Nonlinear Equations</i>	
Tselishcheva A.A., Semenov K.K.	8
<i>Identification of the Probability Density Distribution of a Random Value</i>	
Mikus O.A., Tsvetkov E.I.	12
<i>The Systematic Approach for Estimating the Potential Increase of Measurement Results Accuracy Achieved by the Use of Dependencies between Measurands</i>	
Garanin V.A., Semenov K.K.	15
<i>Copper Losses Studying Using a New Real Time V/f Scalar Control Approach</i>	
Mohammed S. Hasan, Mohammed D. Albakhait, Al Mahturi F. Sharaf, Ahmed I. Jaber	19

II. PROBABILISTIC METHODS IN INFORMATION PROCESSING. THE BAYESIAN APPROACH

<i>Regression Model for the Problem of Parameter Estimation in the Gamma Poisson Model of Behavior: an Application to the Online Social Media Posting Data</i>	
Stoliarova V.F., Tulupiyev A.L.	24
<i>Expert Classification: Probabilistic Estimates</i>	
Paderno P.I., Burkov E.A., Tolkacheva E.A., Lavrov E.A., Siryk O.E.	28
<i>Expert Classification: Resource-Based Approach</i>	
Paderno P.I., Burkov E.A., Tolkacheva E.A., Lavrov E.A., Siryk O.E.	31
<i>Researching the Relationship between Information Efficiency and Complexity of Digital Information Processing Devices</i>	
Gubin A.N., Litvinov V.L., Filippov F.V.	34
<i>The Success of Bayesian Statistics in Observational Astrophysics</i>	
Gorokhov V.L., Brusakova I.A.	37
<i>Anti-Jamming Radiometric Automatic Tracking System</i>	
Lutin V.I., Desyatirikova E.N., Mager V.E.	39
<i>Approbation of the Behavior Rate Model with Hidden Variables Based on Respondents' Data on Recent Instagram Posts</i>	
Toropova A.V., Tulupiyeva T.V.	43
<i>Neural Network Approach in the Task of Multi-label Classification of User Posts in Online Social Networks</i>	
Oliseenko V.D., Tulupiyeva T.V.	46
<i>Adaptation of the Multi-pass Social Engineering Attack Model Taking into Account Informational Influence</i>	
Khlobystova A.O., Abramov M.V.	49
<i>Assessing the Degree of the Social Media User's Openness Using an Expert Model Based on the Bayesian Network</i>	
Frolova M.S., Korepanova A.A., Abramov M.V.	52

III. SYSTEMS SIMULATION. COMPLEX OBJECTS CONTROL UNDER UNCERTAINTY

<i>Synthesis of PID Controller with Neural Network for Nonlinear Electric Drive Exoskeleton</i>	
Belov M.P., Dinh Dang Truong, Tran Dang Khoa	56
<i>Methods for Mechanical Failures Assessment to Determine the Technical State of Aircraft Control Surface Electromechanical Actuator</i>	
Skryabin A.V., Veresnikov G.S.	60
<i>Distributed Multi-agent Modeling of Complex Systems</i>	
Verkhova G.V., Akimov S.V., Prisyazhnyuk S.P.	63
<i>Neural Network Control of the Liquid Cooling System</i>	
Kozlova L.P., Kozlova O.A.	67
<i>The Study of Controlled Cooling and Condensation Processes during Preparation for Transportation</i>	
Abramkin S.E., Dushin S.E.	70
<i>Adaptive Load Compensation Algorithm Based on Signal Compensation Structure</i>	
Nguyen Dinh Khanh, Kuznetsov V.E.	74
<i>Algorithmic Measurement of the Railway Track Defects</i>	
Alekseev V.V., Korolev P.G., Orlova N.V.	78
<i>Translator of Complex Hierarchical VLSI Objects Layout Description from a Real Form to a Virtual Layout Model</i>	
Mironov S.E., Andreev L.E.	81

<i>Analysis of Production Quality Indicators Depending on the Deviation of Technological Parameters</i>	85
Cherepanov N.A., Petrochenkov A.B., Dadenkov D.A.	85
<i>Adaptive Robust Control of a Multi-degree-of-freedom Mechanical Plant with Resilient Properties and Parametric and Functional Uncertainty</i>	
Le Hong Quang, Putov V.V., Sheludko V.N., Rusyaeva T.L.	89
<i>Spatially Distributed System for Monitoring of Fields Technical Condition in Mineral Resources Sector</i>	
Zolotov O.I., Ilyushina A.N., Novozhilov I.M.	93
<i>Decision Support System for Color Control of Polymer Products Based on Fuzzy Models</i>	
Chistyakova T.B., Makaruk R.V., Tedtoev A.Ch.	96
<i>Neuro-fuzzy Model of Gas Balance Control</i>	
Sinitca A.M., Petrova A.K.	99
IV. NEUROCOMPUTING NETWORKS AND NEUROTECHNOLOGIES	
<i>One of the Options for Implementing a Control System for Accessing Vehicles to a Protected Area</i>	
Tatarnikova T.M., Cehanovsky V.V., Bimbetov F.	102
V. MODELS AND METHODS FOR ARTIFICIAL INTELLIGENCE SYSTEMS. COGNITIVE SYSTEMS	
<i>Analysis of Modern Approaches to Optimizing Traffic Control Systems</i>	
Seliverstov S.A., Sazanov A.M., Lukomskaya O.Yu., Nikitin K.V., Shatalova N.V., Benderskaya E.N.	106
<i>Comparative Analysis of Text Information Clustering Methods</i>	
Karuna E.N., Sokolov P.V.	109
<i>Implementation and Analysis of Algorithms for Pitch Estimation in Musical Fragments</i>	
Voinov N.V., Ivanov D.A., Leontieva T.V., Molodyakov S.A.	113
<i>Methodology for the Formation of a Set of Features for Describing Objects of a Social Network</i>	
Katenko Yu.V.	117
<i>Usage Features of Semantic Query and Rule Languages of Semantic Web in the Intelligent Systems, Based on Conceptual Graphs Technologies</i>	
Vlasenko S.V.	120
<i>The Method for Searching Patterns in Log Files of Telecommunication Devices for Monitoring their State</i>	
Zhukova N.A., Kulikov I.A., Utkin N.Yu.	124
<i>Researching Cognitive Tasks Solving Taking into Account Visual Uncertainty</i>	
Kotova E.E., Pisarev I.A.	127
<i>Evaluation of the Fuzzy Cognitive Model of Professional Competences</i>	
Gerasimov I.V., Ankoudinov I.G.	131
VI. FUZZY METHODS AND SYSTEMS	
<i>Fuzzy Neural Networks for Classification of Problems</i>	
Chetyrbok P.V.	133
<i>Fuzzy Assessment of the Competitiveness of Cloud Software Products</i>	
Semenov V.P., Sokolov R.V., Andreevskiy I.L.	136
<i>Fuzzy Control Algorithms for a Simulating Thermogasdynamic Parameters System on a Test Bench</i>	
Shmidt I.A., Narbekov R.R., Ivanov P.V.	140
<i>Algebraic Bayesian networks: the Generation of the Knowledge Pattern Canonical Representation</i>	
Kharitonov N.A., Tulupiyev A.L.	144
<i>Ability of Solving Augmented Reality Problems with Fuzzy Logic Algorithms</i>	
Kozlova L.P., Kozlova O.A.	147
<i>An Approach to Identifying the Type of Uncertainty of Initial Information Based on the Theory of Fuzzy Logic</i>	
Simankov V.S., Buchatskiy P.Yu., Shopin A.V., Teploukhov S.V., Buchatskaya V.V.	150
VII. NEW APPROACHES IN MEASUREMENTS: INTELLECTUAL, SOFT AND FUZZY MEASUREMENTS	
<i>Development of a Convolutional Layer of a Neural Network for Detecting Defects in Sheet Metal Products on Defectoscopic Images</i>	
Mortin C.V., Privezentsev D.G.	154
<i>Soft Measurement of Process Improvement Potential</i>	
Zemlyakova A.S., Jaschenko V.V., Dukeov I.I.	157
<i>Detection of Low-toxic Texts in Similar Sets Using a Modified XLM-RoBERTa Neural Network and Toxicity Confidence Parameters</i>	
Seliverstov Ya.A., Komissarov A.A., Poslovskaya E.D., Lesovodskaya A.A., Podtikhov A.V.	161

VIII. INTELLIGENT MEASUREMENTS SYSTEMS AND SENSORS

<i>Asynchronous-cyclic Automatic Control System with Feedback on Permissible Deviation</i>	165
Antonyuk E.M., Antonyuk P.E., Varshavskiy I.E.	
<i>Algorithm for Path Planning of Mobile Robot</i>	167
Nimai Chandra Das, Raihan Uddin, Md. Ziaul Haque Zim, Skakun A.D.	

IX. TECHNOLOGIES AND SYSTEMS BIG DATA, DATA SCIENCE, BUSINESS INTELLIGENCE

<i>Secure Outsourcing of Fuzzy Linear Regression in Cloud Computing</i>	172
Gisin V.B., Volkova E.S.	
<i>Comprehensive Analysis of Cyber-Physical Systems Data</i>	175
Plakhotnikov D.P., Kotova E.E.	
<i>Efficient User Inspection Algorithm Based on Dual Bloom Filters Oriented for Blockchain Data Management Systems</i>	179
Wenlong Yi, Qiude Li, Hua Yin, Hao Tang, Yingding Zhao	

X. IoT AND INDUSTRIAL 4.0. TECHNOLOGIES AND SYSTEMS

<i>Context Aware Data Collection Systems for Cyber-Physical Systems</i>	183
Vodyaho A.I., Zhukova N.A., Abbas S.A., Kulikov I.A.	
<i>Conceptual Approach to the Implementation of the Proactive Defense Subsystem of the Operational Cybersecurity Center</i>	186
Makaryan A.S., Putyato M.M.	
<i>Rationale for Information Security Requirements of Fog Computing</i>	190
Tatarnikova T.M., Gryzunov V.V., Kumanyaeva A.U.	

XI. ARTIFICIAL INTELLIGENCE AND MEASUREMENTS IN INDUSTRY, ECOLOGY AND ECONOMICS

<i>Predicting RTS Index Futures Using Machine Learning</i>	193
Voinov N.V., Voroshilov M.K., Molodyakov S.A., Drobintsev P.D., Prokofiev O.V., Zajtsev I.V.	
<i>Measurement Virtualization Technologies for Intelligent Information and Measurement Systems</i>	197
Brusakova I.A.	
<i>Development of the Intelligent Traffic Management System Architecture</i>	200
Seliverstov S.A., Sazanov A.M., Seliverstov Ya.A., Benderskaya E.N., Nikitin K.V.	
<i>Multi-agent Approach to the Formation of a Unified Geoinformation Environment</i>	204
Verkhova G.V., Akimov S.V.	
<i>Principles of Geodatabase Arrangement for Studying the Sequestration Potential of Carboniferous Territories</i>	208
Zhdanova E.N., Suloeva E.S., Filippov M.M., Minina A.A.	
<i>Design of the Afterburning Chamber Mock-up Casing</i>	211
Goncharenko M.E., Romantsova N.V.	
<i>Resilience Management of an Industrial Enterprise in the Face of Uncertainty</i>	215
Nedosekin A.O., Abdoulaeva Z.I., Zhuk A.E., Konnikov E.A.	
<i>Fuzzy Modeling of Economic Systems: Main Problems</i>	218
Nedosekin A.O., Abdoulaeva Z.I., Vul O.A., Konnikov E.A.	
<i>On Software and Information Support for the Design and Operation of the Recycling Infrastructure</i>	221
Kupriianov G.A., Solnitsev R.I.	
<i>A Web-Data Driven HR Decision Support System Based on the IT Specialist Vector Model</i>	225
Fayzrakhmanov R.A., Yarullin D.V., Fominykh P.Y.	
<i>Cryptography Professional Rival (CPR): A Game Designing Model to Learn Cryptography</i>	229
Ivanov S.G., Dorostkar Zahra	

XII. APPLICATION OF METHODS AND MEANS OF ARTIFICIAL INTELLIGENCE AND MEASUREMENTS IN MEDICINE

<i>Identification of Risk Factors for Mortality after Myocardial Infarction Using Machine Learning Methods</i>	233
Kashirina I.L., Firyulina M.A., Bondarenko Yu.V., Desyatirikova E.N., Efimova O.E., Chernenkaya L.V.	
<i>Applying Machine Learning in Fog Computing Environments for Panoramic Teeth Imaging</i>	237
Subbotin A.N.	
<i>Using Deep Learning Techniques for Endoscopic Image Analysis</i>	240
Sheliakina N.M., Mashevsky G.A.	
<i>Algorithm for Detecting Alarming Fetal Conditions</i>	243
Bobrova Yu.O., Kapranova O.N., Filipenko K.V.	
<i>Intelligent Information-measuring System for the Study of Acoustic Reflex</i>	247
Dragan S.P., Olenina I.V., Larkin Eu.V., Bogomolov A.V.	

XIII. APPLICATION OF METHODS AND SYSTEMS OF ARTIFICIAL INTELLIGENCE AND MEASUREMENTS IN
AGRICULTURAL COMPLEXES FOR SUSTAINABLE DEVELOPMENT OF TERRITORIES

Computer Simulation of Shape Evolutions of Plant Cells Based on Physical and Chemical Interactions

Wenlong Yi, Deheng Zhao, Jun Yang, Tingzhuo Chen 251